DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. Box 3378
Honolulu, HI 96801-3378
doh.testimony@doh.hawaii.gov

Testimony COMMENTING on and with Reservations S.B. 800
Relating to the Health Impact of Pesticides

SENATOR JOSH GREEN, CHAIR
SENATE COMMITTEE ON HEALTH

SENATOR MIKE GABBARD, CHAIR
SENATE COMMITTEE ON ENERGY AND ENVIRONMENT

SENATOR MICHELLE N. KIDANI, CHAIR
SENATE COMMITTEE ON EDUCATION

Hearing Date: **February 12, 2015** Room Number: 414
3:30 p.m.

Fiscal Implications: Unknown

Department Testimony: S.B. 800 seeks to amend H.R.S. Chapter 321. The Hawaii Department of Health (DOH) would like to offer comments and reservations regarding this proposed measure.

S.B. 800 seeks to modify Chapter 321 Hawaii Revised Statutes to include pesticide buffer zone for schools. The restrictions apply to outdoor application of all pesticides for individuals or entities using unspecified quantities of restricted use pesticides. DOH supports science-based public health actions to protect the health of our children. In this regard over the past two years, DOH has prepared a report on atrazine occurrence in Hawaii for the Legislature, conducted stream sampling across the State for hundreds of currently used pesticides and coordinated a cancer cluster evaluation for Kauai with the University of Hawaii. DOH is also continuing to build laboratory capacity for pesticides so that more environmental sampling can be done to evaluate offsite movement of pesticides in air, drinking water, our streams and coastlines. We have conducted these efforts in close collaboration with state agencies, such as the Department of Agriculture (DOA), federal agencies, and county governments.

Under federal law, EPA's Office of Pesticide Programs is responsible for evaluating the human health and environmental risk and ensuring the safety of pesticides when properly applied. EPA requires extensive scientific data on the potential health and environmental effects of a pesticide before granting a registration. The evaluation of pesticide risks is a dynamic process and EPA collects reports of adverse effects from various sources, including pesticide manufacturers, other federal and state agencies, and from individual consumers. The EPA can and does take action to lower risks to workers and the public by restricting or cancelling the use of pesticides shown to be harmful to human health and the environment.

Because pesticides occur and move very differently from each other in the environment, DOH believes the need for buffer zones more stringent than EPA's should be data-driven and pesticide specific. Pesticide air monitoring could be used to evaluate offsite movement of pesticides near sensitive communities. However, DOH does not have existing funding or equipment that would be required to conduct such monitoring.

DOH regulates pesticide residues in food crops, surface water, groundwater, and drinking water. Pesticide disposal is covered by DOH solid and hazardous waste rules. In our State Response Program, DOH investigates pesticide residues in soils and groundwater to protect local communities from historic impacts due to historic pesticide mixing sites. DOH also assists other agencies and community members who have health and environmental concerns related to pesticides and other chemical exposures. Both DOH and DOA follow an incident command system protocol for emergency response situations. In cases where suspected pesticide related release are determined, DOA is the lead IC and DOH and other responders provide support, as necessary.

DOH does not regulate use and application of pesticides, or possess necessary pest management expertise. In addition, DOH does not have existing positions to implement pesticide buffer zones. Establishing these functions at DOH would be duplicative, require establishment of a new program within the Department and could cause confusion for pesticide applicators.

Pesticide buffer zones are most efficiently implemented by DOA Pesticides Branch which regulates the use, sale, and distribution of pesticides in the State of Hawaii, and has expert staff providing oversight, applicator education, and enforcement of proper pesticide use practices.

In summary, DOH is prepared to assist DOA with scientific and technical expertise to identify data gaps needed to determine whether off-target movement of pesticides requires additional state regulatory protections to protect sensitive communities from drift.

Thank you for the opportunity to provide comments on this important measure.

Written Only

DAVID Y. IGE
GOVERNOR

KATHRYN S. MATAYOSHI
SUPERINTENDENT

STATE OF HAWAI`I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI`I 96804

Date: 02/12/2015
Time: 03:30 PM
Location: 414
Committee: Senate Health

Department: Education

Person Testifying: Kathryn S. Matayoshi, Superintendent of Education

Title of Bill: SB 0800 RELATING TO THE HEALTH IMPACT OF PESTICIDES.

Purpose of Bill: Establishes buffer zones around schools that restrict pesticide use for any entity or person.

Department's Position:
Thank you for the opportunity to provide input to SB 800 which establishes buffer zones around schools that restrict pesticide use for any entity or person. While the Department of Education is concerned about providing our students, teachers and administrators with a safe school environment, the Department of Education defers to the Department of Health on this bill as the subject matter expert.

DAVID Y. IGE
Governor

SHAN S. TSUTSUI
Lt. Governor

SCOTT E. ENRIGHT
Chairperson, Board of Agriculture

PHYLLIS SHIMABUKURO-GEISER
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512
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TESTIMONY OF SCOTT E. ENRIGHT
CHAIRPERSON, BOARD OF AGRICULTURE

BEFORE THE SENATE COMMITTEES ON HEALTH, ENERGY AND ENVIRONMENT, AND EDUCATION

Thursday, February 12, 2015
3:30 P.M.
CONFERENCE ROOM 414

SENATE BILL NO. 800
RELATING TO THE HEALTH IMPACTS OF PESTICIDES

Chairpersons Green, Gabbard, and Kidani and Members of the Committees:

Thank for the opportunity to testify on Senate Bill No. 800. This bill establishes buffer zones around schools that restrict pesticide use for any entity or person. The Department of Agriculture (HDOA or Department) has strong reservations about SB 800.

We feel that it is the purview of the HDOA to regulate the use of pesticides under the Hawaii Pesticides Law, Chapter 149-A, and not the Department of Health.

The protection of school children to pesticide exposure is of equal concern to the HDOA. The Department, however, does need to point out that pesticides are already highly regulated at both federal and state levels to ensure safety for users, the general public, and the environment.

Before a pesticide product is registered with the U.S. Environmental Protection Agency (EPA) for sale or use within the U.S., scientific risk assessments are conducted to evaluate the potential for harm to humans, wildlife, plants and fish including endangered species and non-target organisms, and contamination of surface water or groundwater from leaching, runoff, and spray drift. A pesticide product label lists restrictions on use against applying the pesticide when weather conditions are likely to result in drift to sensitive areas, such as schools and hospitals, or requiring buffer zones from wells and water bodies to protect groundwater and surface water. Pesticide products are reviewed for short-term toxicity to long-term effects on infants and elderly, risk to farm workers, bystanders, potential off-target drift, and volatization before EPA grants a registration number for the product.

The Department submits that concerns underlying SB 800's proposed buffer zone restriction are addressed by the scientific testing required by EPA's pesticide registration process and by the pesticide label restrictions that EPA imposes.

In summary, the Department submits that language in this bill seems to target a segment of the farming community. The Department supports all agricultural activity that is being conducted in accordance with federal, state, and county regulations.

Thank you for the opportunity to present testimony.

COUNTY COUNCIL
Mel Rapozo, Chair
Ross Kagawa, Vice Chair
Mason K. Chock
Gary L. Hooser
Arryl Kaneshiro
KipuKai Kuali'i
JoAnn A. Yukimura

OFFICE OF THE COUNTY CLERK

Ricky Watanabe, County Clerk
Jade K. Fountain-Tanigawa, Deputy County Clerk

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Council Services Division
4396 Rice Street, Suite 209
Līhu'e, Kaua'i, Hawai'i 96766

February 11, 2015

TESTIMONY OF GARY L. HOOSER
COUNCILMEMBER, KAUA'I COUNTY COUNCIL
ON
SB 800, RELATING TO THE HEALTH IMPACT OF PESTICIDES
Committee on Health
Committee on Energy and Environment
Committee on Education
Thursday, February 12, 2015
3:30 p.m.
Conference Room 414

Dear Chair Green, Chair Gabbard, Chair Kidani and Committee Members:

My name is Gary L. Hooser and I presently serve on the Kaua'i County Council. I am here today testifying as an individual Councilmember in strong support of SB 800 Relating to the Health Impact of Pesticides.

SB 800 establishes buffer zones to restrict any entity or person from using pesticides around schools.

The threshold amount I would suggest would be 5 lbs. or 15 gallons of any Restricted Use Pesticide purchased or used. I would also recommend buffer zones of ¼ mile or a minimum of 1,000 feet.

I applaud this Senate Joint Committee and the introducers of the Bill for recognizing the importance of this issue.

There is no question in terms of scientific studies that pesticides in general, but especially Restricted Use Pesticides, have the potential to cause great harm to health and the environment.

Our research on Kaua'i shows that while a handful of very large companies use large amounts of Restricted Use Pesticides on a regular basis, most regular farmers use very little – focusing instead on the application of only general use pesticides.

On Kaua'i we found these companies utilizing 22 different types of Restricted Use Pesticides, many of which are banned in other countries. We also discovered these same companies experimenting with pesticides and using them in amounts that far exceeded national norms.

Please see the attached file entitled "9 Most Frequent Misstatements Made By Chemical Companies In Hawai'i". The electronic version contains links to the source documents and can be found at http://tinyurl.com/9Misstatements-02-04-15.

It is without question that pesticides are harmful and they should not be applied in sensitive areas adjacent to homes, hospitals, schools, and waterways.

Although full disclosure is not included in this bill, it is an essential element for regulating Restricted Use Pesticides. Without full disclosure, the public is not able to avoid the areas being treated and they do not know when to shut their windows. When they seek medical attention for exposure to pesticide drift, the attending physician has no idea as to the impacts of the exposure as they do not know what chemicals were applied or when.

It is also without question that we as a community cannot determine the extent or degree of risk without further studies. Those studies are not possible without full and public disclosure of the types, amounts, and location in which these chemicals are applied.

For the reasons stated above, the need for strong buffer zones are clear and I urge this Senate Joint Committee to vote in full support of this measure. Should you have any questions, please feel free to contact me or Council Services Staff at (808) 241-4188.

Sincerely,

GARY L. HOOSER
Councilmember, Kaua'i County Council

AB:lc
Attachment

9 Most Frequent Misstatements Made by Chemical Companies in Hawai'i

1) **CHEMICAL COMPANIES: "All of these chemicals and pesticides have been tested and found to be safe when used according to the label."**

THE TRUTH:

- No one has ever tested the combined impacts of these chemicals over time in the communities in which they are being used.

- Many of the chemicals (including Atrazine; Paraquat, also known as Gramoxone; and Chlorpyrifos, also known as Lorsban) that are regularly used near Hawai'i homes, schools, and hospitals are banned in other countries.

- Atrazine, manufactured by Syngenta, has been banned in the European Union since October 2003. See also Paraquat bans and Chlorpyrifos bans.

- The American Academy of Pediatrics' "Pesticide Exposure in Children" (2012) specifically recommends disclosure and buffer zones, and offers strong cautions about pesticides and children.

- The American Cancer Society's "Increased Cancer Burden Among Pesticide Applicators and Others Due to Pesticide Exposure" (2013) states definitively that people who live and work around agricultural areas that have high pesticide use suffer a greater incidence of certain cancers and other medical problems.

- The University of California at Davis recently released a report, "Neurodevelopmental Disorders and Prenatal Residential Proximity to Agricultural Pesticides: The CHARGE Study" (2014), linking the long term use of Glyphosate to the increased incidence of autism.

- Restricted Use Pesticide (RUP) labels forbid their use in conditions which allow the pesticides to drift onto neighboring properties. Nevertheless, there are numerous incidents of drift occurring in Hawai'i, with no legal consequences for the companies. The attached links of two modest studies on Kaua'i indicate that while the quantities are small, Restricted Use Pesticides are drifting into neighborhood schools and into adjacent streams:

    - "Air sampling and analysis for pesticide residues and odorous chemicals in and around Waimea, Kaua'i" (March 15, 2013)

    - "2013-14 State Wide Pesticide Sampling Pilot Project Water Quality Findings" (May 2014)

2) **CHEMICAL COMPANIES: "We use less pesticides, not more."**

THE TRUTH:
Despite the fact that no other farmer in Hawai'i uses anything close to what these chemical companies use, the chemical companies attempt to compare apples to oranges:

- The chemical companies compare themselves to conventional corn growers (who harvest one (1) crop growing cycle per year). In Hawai'i, the chemical companies are engaging in industrial and experimental agriculture, and planting three (3) or more crop growing cycles per year. See the non-confidential records obtained in the lawsuit by Waimea, Kaua'i residents against Pioneer Hi-Bred International, Inc..

- The chemical companies are experimenting with "Roundup Ready" and other chemical-resistant crops, encouraging greater pesticide use. "Roundup resistance has led to greater use of herbicides, with troubling implications for biodiversity, sustainability, and human health."

- The *Cascadia Times* reported: "Our investigation found that annualized pounds-per-acre usage of the seven highly toxic pesticides on Kaua'i was greater, on average, than in all but four states: Florida, Louisiana, North Carolina and Indiana."

- According to Kyle Smith, an attorney representing Waimea Residents in their lawsuit against DuPont Pioneer, during the August 5, 2013 Kaua'i Council Meeting regarding Bill No. 2491 (Ordinance No. 960): "Sixty-five percent (65%) of the days of the year on average, so about two hundred forty (240) days, they are applying pesticides. You can look at the combinations that are applied. You could look at it by on the application days, the average is between eight (8) and maybe sixteen (16) applications per day of pesticides on these research fields. Most importantly though and I think what is most relevant for this discussion is the total usage. Recently, the industry statistics I saw put out at the public comment was that Kaua'i was using about one (1) pound per acre, per season and that the mainland uses about two (2) pounds per acre and I have these charts to show you. Again, I believe it is a seed company graph. The reality is if you double that because we have multiple seasons, we have three (3) seasons. Typically, two (2) seasons are planted, you are looking at closer to two (2) pounds per acre, that puts us in the upper-level of the mainland usage. . . . 2010, 2009 you are looking at close to twelve (12) pounds per acre and the average usage, and this is Restricted-Use Pesticides, over that same time period would be eight (8) pounds per acre."

3) CHEMICAL COMPANIES: "The information regarding the pesticides we use is already public information."

THE TRUTH:

- The only State records kept are of Restricted Use Pesticides SOLD in the State of Hawai'i—NOT the Pesticides USED. Additionally, these records are for RUPs only, not all pesticides.

- The State does not keep records of, and the companies have refused to release any information regarding, the amount of "General Use Pesticides" (such as Glyphosate) that they are using.

- The HDOA will no longer provide company-specific data but only aggregated data, which makes it impossible to determine what chemicals are being used by whom at what geographical location.

- The HDOA has charged hundreds of dollars to provide the data.

- Hawai'i Revised Statutes 149A-31.2 (Pesticide use; posting online) (2013), mandating that HDOA "shall publish on its website the public information contained in all restricted use pesticide records, reports, or forms submitted to the department" still has yet to be implemented by HDOA.

4) CHEMICAL COMPANIES: "We are highly regulated."

THE TRUTH:
Not really.

- Federal agencies do not always have a Hawai'i presence, rarely conduct on-site physical inspections, and have delegated responsibilities to the States and localities. See also Wisconsin Public Intervenor v. Mortier, 501 U. S. 597 (1991).

- Even though the chemical companies are by far the largest agricultural users of RUPs in the State and operate on over 20,000 acres often adjacent to homes, schools, and sensitive environmental areas, the HDOA infrequently inspects their operations.

    - Approximately 43% of the HDOA inspection log incidents are redacted from public view indicating inspection cases that remain "open" and/or otherwise contain information not available to the public.

    - It takes YEARS to investigate violations and complaints of pesticide drift. See the following:

        - *Honolulu Civil Beat*, "Does Hawai'i's Failure to Enforce Pesticide Use Justify Action by Kaua'i?" (October 8, 2013)

        - Video of HDOA responses to the Kaua'i County Council during proceedings for Bill No. 2491 (Ordinance No. 960)

    - Licensed physicians on Kaua'i who practice in areas impacted by the chemical companies' operations have expressed that they believe there is 10 times the national rate of certain rare congenital heart defects in newborns.

    - The State birth defects registry until very recently has not been updated since 2005.

5) CHEMICAL COMPANIES: "We only use what every other farmer uses."

THE TRUTH:
Based on raw Kaua'i data provided by HDOA showing three (3) years of RUPs purchased for use in Kaua'i County – *NO OTHER REAL HAWAI'I FARMER USES ANYTHING EVEN CLOSE TO WHAT IS USED BY THE CHEMICAL COMPANIES.* Just in 2012, and just on Kaua'i, over 5,477 pounds and 4,324 gallons were purchased by the chemical companies. The chemical companies have used at least 22 different types of RUPs, while regular food farmers use one (1) to possibly three (3) different types and use only a few gallons every few years. Summary data is here.

6) CHEMICAL COMPANIES: "We do not experiment with pesticides."

THE TRUTH:

- Bacillus thuringiensis corn ("Bt Corn") is considered a pesticide by the United States Environmental Protection Agency (EPA), and experiments with Bt Corn require an "Experimental Use Permit" (EUP) issued by the federal government. See for example here, and here (documents were provided by HDOA with all redactions as shown).

- The chemical companies have other federal Experimental Use Permits; however, the total number of experiments conducted with pesticides is not known and public records contain redactions. See for example here, and here (documents were provided by HDOA with all redactions as shown).

7) CHEMICAL COMPANIES: "The State and County also use large quantities of pesticides."

THE TRUTH:

- The State and County primarily use general use pesticides such as Roundup for roadside spraying and park maintenance. These products are considered non-RUPs by the EPA and HDOA.

- The State uses very small amounts of RUPs in targeted efforts to fight invasive species.

8) CHEMICAL COMPANIES: "The County of Kaua'i uses more RUPs than anyone."

THE TRUTH:

- The only RUP the County uses is chlorine gas to eliminate bacteria in water. Chlorine gas is by definition a RUP but it is not applied in the open air near homes, schools, hospitals, or other sensitive areas. Its application is very controlled and the information pertaining to its use is public.

9) CHEMICAL COMPANIES: "What about golf courses? They use lots of pesticides, too."

THE TRUTH:

- Reporting of golf course RUP sales on Kaua'i in 2012 shows only approximately 50 pounds and 20 gallons of RUPs are used annually by all of the golf courses on Kaua'i combined—compared to over 5,477 pounds and 4,324 gallons used by the 4 chemical companies each year. The raw data is here and the summary data is here.

- Information provided by Kaua'i County Councilmember Gary Hooser -

From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: warrenmcfb@gmail.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Wednesday, February 11, 2015 11:54:07 AM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Warren Watanabe	Maui County Farm Bureau	Oppose	No

Comments:

Please note that testimony submitted less than 24 hours prior to the hearing, improperly identified, or directed to the incorrect office, may not be posted online or distributed to the committee prior to the convening of the public hearing.

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HAWAII
STATE
COMMISSION
ON THE
STATUS
OF
WOMEN

Chair
LESLIE WILKINS

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February 11, 2015

To: Senator Josh Green, Chair
Senator Glenn Wakai, Vice Chair
Members of the Senate Committee on Health

Senator Mike Gabbard, Chair
Senator Josh Green, Vice Chair
Members of the Senate Committee on Energy and Environment

Senator Michelle Kidani, Chair
Senator Breene Harimoto, Vice Chair
Members of the Senate Committee on Education

From: Cathy Betts, Executive Director
Hawaii State Commission on the Status of Women

Re: Testimony in Strong Support, SB 800, Relating to Health Impact of Pesticides

The Commission strongly supports SB 800, which would create pesticide buffer zones around schools. Women and children are negatively impacted by rampant pesticide use near schools and neighborhoods. While the growing body of evidence provides that neonatal, maternal and infant/child health is negatively impacted by pesticide exposure, Hawaii remains one of twelve states that does not have a buffer zone law. Creating a buffer zone law would ensure that our children and teachers are not put in harm's way.

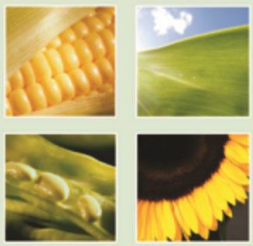
According to the American Academy of Pediatrics (AAP) in a recently published major report entitled "Pesticide Exposure in Children", their chief concerns of pesticide exposure to women and children include:

1) *Childhood cancers*, especially leukemia and brain tumors;
2) *Neurobehavioral and cognitive deficits*, such as reduced IQ and attention deficit/hyperactivity disorder;
3) *Adverse birth outcomes*, including preterm birth, low birth weight, and congenital anomalies; and
4) *Asthma*

Further, a study by the University of California, San Francisco detailed the populations at high risk for harmful pesticide exposure as "pregnant women, infants and children living in poverty in densely populated inner cities" and "pregnant women, infants and children who reside in agricultural communities". The study further details the potential harm from pesticide drift and exposure: "[V]irtually every pregnant woman in the U.S. has measurable levels of pesticides in her body. Everyone of reproductive age is potentially vulnerable to pesticide-related adverse health consequences, and women and men exposed at work and in agricultural communities are at even greater risk."[i] The study's findings detail the harmful health risks directly associated with pesticide exposure: adverse reproductive health outcomes, greater risk of birth defects, reduced fertility, earlier menopause, and heightened risk of breast cancer.

The Commission respectfully urges the Committees to pass this common sense measure to protect our most vulnerable populations from health risk. Thank you.

[i] *Pesticides Matter*, A Primer for Reproductive Health Physicians, UCSF, Dec. 2011



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Hawaii Crop Improvement Association

Growing the Future of Worldwide Agriculture in Hawaii

SENATE COMMITTEES ON HEALTH, ENERGY AND ENVIRONMENT, and EDUCATION
Testimony on Senate Bill 800
RELATING TO THE HEALTH IMPACT OF PESTICIDES
February 12, 2015. Room 414. 3:30 PM

Aloha Chairs Green, Gabbard, and Kidani, and Vice Chairs Wakai and Harimoto, and Members of the Committees:

I am Bennette Misalucha, Executive Director of the Hawaii Crop Improvement Association (HCIA) and HCIA respectfully opposes Senate Bill 800.

Although the term pesticide has become a dirty word, pesticides are used beneficially throughout the world and in Hawaii to control pests and disease carriers, such as mosquitoes, ticks, and rodents. They are used in our drinking water to prevent disease and in our watersheds to control invasive species. Pesticides are also used in agriculture to control weeds, insect infestation, and diseases that can completely destroy a crop. Even organic agriculture uses pesticides.

Our member companies are very aware of their responsibility to use pesticides properly and they take this duty very seriously. The many employees of HCIA members are likely people you know as friends, relatives, and neighbors who contribute to communities throughout the Islands where we farm. We have been a part of these communities and local economies for over 50 years.

Our farms use trained employees who are experienced in pesticide application and apply pesticides only when necessary. The safety of our employees and the community is of utmost importance to us and we follow the strict federal and State pesticide laws and regulations carefully. We are regularly inspected by the State Department of Agriculture Pesticide Branch whose duty is to enforce these laws.

The U. S. Environmental Protection Agency evaluates and registers pesticides to ensure that they will not harm people, non-target species, or the environment. After thorough risk assessments, EPA determines if a pesticide can be sold and used. It dictates where a pesticide can be used, the amount, frequency, and timing of its use; and how it will be stored or discarded. EPA determines the conditions under which the pesticide can be used based upon ongoing research of any possible health or environmental effect.

We disagree with the idea that there are wide-spread problems associated with pesticide applications in the state, and the need for arbitrary buffer zones that will disproportionately impact farmers. Recent incidents involving odors at schools were found to be a result of improper pesticide use by neighboring homeowners or the schools themselves. SB 800 would not prevent these types of occurrences. Although the proposed legislation would go far beyond science-based regulations and would impose restrictions that would prevent a farmer who meets the RUP threshold from using ANY pesticide within an unspecified distance of a school, the school itself can apply exactly the same pesticide, or even a more toxic pesticide, directly on school grounds. This defies logic.

This bill and others introduced this session have been developed by non-farmers who do not understand existing pesticide regulations and enforcement nor farmers' need to control insects, weeds, and disease. The bills are designed to unfairly target one segment of Hawaii's pesticide users - our member company farmers who grow genetically modified crops. The well-funded national organizations that are promoting this type of legislation here and across the country hope to set a precedent in Hawaii and make this farming as difficult as possible. Their claims that similar laws have been adopted across the country, in "33 states", are simply not true. A closer look at the laws they refer to reveals that they are concerned with requirements for schools' own procedures to use Integrated Pest Management; not pesticide use on farms.

These measures undermine EPA's role and will harm Hawaii farmers without providing increased safety. Before any additional State or county pesticide restrictions are imposed, they should be determined to be justifiable and necessary. The Hawaii Department of Agriculture, not the Department of Health, nor the individual counties, currently already has the authority and expertise to promulgate additional pesticide regulations to protect the public if it determines that further regulations are warranted.

We respectfully request that this bill be held. Rather than create new and arbitrary laws that will make it more difficult for farmers to stay in business in Hawaii, we support the concepts in other pesticide-related bills introduced this session, such as SB 734, that would give the HDOA and the University of Hawaii increased funding and capacity to more effectively perform their roles, including educating growers and others to ensure proper pesticide use, assistance in implementation of pesticide drift reduction strategies, and appropriate enforcement capability. We believe that a strong state pesticide regulatory program is essential to assuring the public that pesticide products are used properly.

Thank you for this opportunity to submit testimony in opposition to this measure.

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

Hawaii Chapter

AAP - Hawaii Chapter
5414 Kirkwood Place
Honolulu, HI 96821

Sylvia R. Pager, MD, representing the American Academy of Pediatrics, Hawaii Chapter, presented the following testimony the morning of February 5th to the Hawaii House Committee on Energy and Environmental Protection.

Dr. Pager passed away on Sunday, February 8th following a severe stroke that occurred just after she testified at the state Legislature on Thursday.

To honor Dr. Pager's long-standing service and advocacy on behalf of Hawaii's pregnant women, breast-feeding mothers, and young children, the American Academy of Pediatrics, Hawaii Chapter will submit her testimony for HB1514 to committee hearings on every bill related to disclosure, notification, and buffer zones of toxic, restricted use pesticides and to our concern about pesticide exposure that science demonstrates negatively impacts the health and well-being of Hawaii's keiki.

Mahalo for the opportunity to honor Dr. Pager in this way, ensuring the voice of the American Academy of Pediatrics, Hawaii Chapter continues to be heard throughout this legislative session.

Aloha,

R. Michael Hamilton, MD, MS, FAAP

Committee on Energy and Environmental Protection
Representative Chris Lee, Chair
Representative Nicole E. Lowen, Vice Chair

Thursday, February 5, 2015
8:30am, Conference Room 325

Sylvia R. Pager, MD, MS, FAAP, FABM, IBCLC
Pediatrics Breastfeeding Medicine
Assoc. Clin. Prof., Dept. of Pediatrics
JABSOM, University of Hawaii
AAP Hawaii Chapter Breastfeeding Coordinator

TESTIMONY IN STRONG SUPPORT OF HB1514 – RELATING TO ENVIRONMENTAL PROTECTION

Aloha Kakou, Members of the Committee on Energy and Environmental Protection,

My name is Dr. Sylvia Pager and as a practicing pediatrician for over 38 years, I am writing to urge your strong support of HB1514 - Relating to Environmental Protection. This bill requires that the state to protect keiki and kupuna health by requiring disclosure, notification, and buffer zones of toxic restricted use pesticides around schools and nursing homes.

This bill protects our communities who could be potentially impacted by pesticide drift by requiring that restricted-use pesticide users disclose the pesticides they are spraying and notify communities who could be potentially impacted by pesticide drift**. Such regulations are in line with the regulations of 31 other states that understand it is vital for states to protect children and sensitive populations from the toxic impacts of pesticide use by regulating pesticide use on or around schools.**

It is critical that the state take action to reduce childhood pesticide exposure because toxic exposure to pesticides during fetal,[1] neonatal,[2] and infant life can disrupt critical developmental processes.[3] Early life pesticide

[1] Rull RP, Gunier R, Von Behren J, Hertz A, Crouse V, Buffler PA, and Reynolds P. 2009. Residential Proximity to Agricultural Pesticide Applications and Childhood Acute Lymphoblastic Leukemia. *Environmental Research*, 109(7): 891-899.

[2] Chevrier C, Limon G, Monfort C, Rouget F, Garlantezec R, Petit C, Durand G, and Cordier A. 2011. Urinary Biomarkers of Prenatal Atrazine Exposure and Adverse Birth Outcomes in the PELAGIE Birth Cohort. *Environmental Health Perspectives*, 119(7): 1034-1041.

[3] Shelton, JF et al. 2014. Neurodevelopmental Disorders and Prenatal Residential Proximity to Agricultural Pesticides: The CHARGE Study. *Environmental Health Perspective*, 122(10): 1103-1110.

exposure has been linked to long-term health effects including cancer,[4] decreased cognitive function,[5,6,7] behavior problems,[8,9] birth defects and other adverse birth outcomes,[10,11] and asthma.[12]
The American Academy of Pediatrics (AAP) recently published a major report entitled **"Pesticide Exposure in Children"** that comprehensively reviewed 195 medical studies on the subject (see Roberts and Karr 2012). Among other impacts, their chief concerns were as follows:

1) ***Childhood cancers***, especially leukemia and brain tumors;
2) ***Neurobehavioral and cognitive deficits***, such as reduced IQ and attention deficit/hyperactivity disorder;
3) ***Adverse birth outcomes***, including preterm birth, low birth weight, and congenital anomalies; and
4) ***Asthma.***

We briefly discuss each of these impacts below, with reference to the AAP's comprehensive review.

Childhood cancers:
Five of six recent case-control studies found a statistically significant relationship between pesticide exposure and leukemia (see Roberts and Karr 2012, p. e1773-e1774). Two of the studies had the most detailed exposure assessment conducted to date, and found increasing risk with rising exposure, a strong indication that the observed associations are real. Maternal exposure to pesticides between the periods of preconception through pregnancy was the

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[4] Infante-Rivard C, Labuda D, Krajinovic M, Sinnett D. 1999. Risk of childhood leukemia associated with exposure to pesticides and with gene polymorphisms. Epidemiology 10(5): 481-487.
[5] Rauh V, Arunajadai S, Horton M, et al. 2011. Seven-year neurodevelopmental scores and prenatal exposure to chlorpyrifos, a common agricultural pesticide. Environ Health Perspect. 119(8): 1196–1201.
[6] Bouchard MF, Chevrier J, Harley KG, et al. 2011. Prenatal exposure to organophosphate pesticides and IQ in 7-year-old children. Environ Health Perspect. 119(8): 1189–1195.
[7] Engel SM, Wetmur J, Chen J, et al. 2011. Prenatal exposure to organophosphates, paraoxonase 1, and cognitive development in childhood. Environ Health Perspect. 119(8): 1182–1188.
[8] Roberts EM, English PB, Grether JK, Windham GC, Somberg L, and Wolf C. 2007. Maternal Residence near Agricultural Pesticide Applications and Autism Spectrum Disorder among Children in the California Central Valley. *Environmental Health Perspectives,* 115(10): 1482-1489.
[9] Bouchard MF, Bellinger DC, Wright RO, Weisskopf MG. 2010. Attention-deficit/hyperactivity disorder and urinary metabolites of organophosphate pesticides. Pediatrics. 125(6). Available at: www.pediatrics.org/cgi/content/full/125/6/e1270.
[10] Garry VF, Harkins ME, Erickson LL, Long-Simpson LK et al. 2002. Birth Defects, Season of Conception, and Sex of Children Born to Pesticide Applicators Living in the Red River Valley of Minnesota, USA. Environmental Health Perspectives 110 (Suppl. 3): 441-449.
[11] Garry VF, Harkins ME, Erickson LL, Long-Simpson LK et al. 2002. Birth Defects, Season of Conception, and Sex of Children Born to Pesticide Applicators Living in the Red River Valley of Minnesota, USA. Environmental Health Perspectives 110 (Suppl. 3): 441-449.
[12] Salam MT, Li YF, Langholz B, Gilliland FD; Children's Health Study. 2004. Early-life environmental risk factors for asthma: findings from the Children's Health Study. Environ Health Perspect. 112(6): 760–765.

primary risk factor. Maternal use of either herbicides or insecticides was associated with nearly double the risk of childhood leukemia (Infante-Rivard et al. 1999). A meta-analysis provided additional support, also showing double the risk of leukemia in mothers exposed to pesticides while pregnant or while their children were young (Wigle et al. 2009). Monge et al. (2007) also found increased risk of leukemia in children borne to parents exposed occupationally to pesticides in Costa Rica.

Nine of the ten studies examining pesticides and brain cancer that have been conducted since 1998 demonstrated an **increased risk estimate of brain tumors with maternal and/or paternal exposure to pesticides**, though not all achieved statistical significance. One study, which involved 321 cases demonstrated that **maternal exposure to insecticides before or during pregnancy was associated with a 90% greater risk of astrocytoma** (a type of brain cancer) in the child, as well as a trend to higher risk in exposed fathers (van Wijngaarden et al. 2003).

Neurobehavioral and cognitive deficits:

Exposure to many pesticides causes acute neurological symptoms, such as headaches and dizziness. However, a spate of recent studies is building an irrefutable case that long-term, low-level exposure to organophosphate insecticides (OPs) in early life (particularly *in utero*) has profoundly negative impacts on children's neurological development.

The National Institutes of Health and the EPA are sponsoring three large-scale studies into this subject, two in urban settings and one in a rural community (see Roberts and Karr 2012, e1775-e1776). Women were enrolled during pregnancy, and their exposure to OPs carefully measured. Their children were tested for neurological development in the following years. The studies demonstrate that at two to four years of age, higher prenatal OP exposure was associated with "significantly poorer mental development," "pervasive developmental disorder," and in one group "increased scores for attention-deficit/hyperactivity disorder" (Eskenazi et al. 2007, Rauh et al. 2006). At seven years of age, kids more highly exposed to OPs in the womb had lower IQ scores in all three groups (Rauh et al. 2011, Bouchard et al. 2011, Engel et al 2011). Bouchard et al (2010) similarly found increased rates of attention-deficit/hyperactivity disorder in eight to 15-years olds whose urine had higher levels of OP breakdown products, a sign of greater exposure.

These findings are even more concerning when one considers the intensive use of chlorpyrifos in Hawai'i's seed corn operations, coupled with its propensity to drift. **Chlorpyrifos has been linked to lung cancer, colorectal cancer, and non-Hodgkin's lymphoma**. An examination of California's Pesticide Illness Surveillance Program shows that chlorpyrifos was among the most frequently cited culprits in drift-related pesticide illnesses over the past two decades (CA PISP 1992-2011). The US Geological Survey has found "toxic rainfall"

containing excessive levels of chlorpyrifos (for aquatic life) in California (USGS 2003).

Records released by DuPont-Pioneer show the company sprays OPs on Kaua'i frequently, once every four days (91 days/year). The OP insecticide chlorpyrifos is also one of the most heavily used RUPs on Kaua'i, and **according to the Kauai Good Neighbor Program, in the last 13 months 1,975lbs of chlorpyrifos has been used on Kauai**. Air sampling at Waimea school has consistently detected chlorpyrifos. Thus, based on these lines of evidence, there is sure reason to expect that chlorpyrifos drift is adversely affecting the health of residents.

Adverse birth outcomes

The American Academy of Pediatrics is also concerned about the possible role of pesticides in triggering adverse birth outcomes (see Roberts and Karr 2012, e1776-e1778). Two studies in Minnesota have revealed a **higher rate of birth defects in children fathered by male pesticide applicators in areas of the state where chlorophenoxy herbicides (e.g. 2,4-D) and fungicides are most heavily applied.** These studies also found a seasonal effect, with **children conceived in the spring, when herbicide use is heaviest, exhibiting the highest birth defect rates** (Garry et al. 1996, Garry et al. 2002). Six additional studies described by Roberts and Karr (2012) found higher risk ratios for birth defects in mothers exposed to pesticides, with three of them showing statistically significant effects. A study of expectant mothers carried out in New York demonstrated an association between exposure to chlorpyrifos and reduced birth weight and length (Perera et al. 2003). Wolff et al. (2007) also found reduced birth weight in infants born to mothers exposed to OPs during pregnancy, but only in those children with a mutation that reduces their ability to detoxify OPs. Another study found that *in utero* exposure to OPs was associated with reduced gestation time (Eskenazi et al. 2004). Prenatal atrazine exposure has been associated with suppression of fetal growth (Chevrier et al 2011) and **exposure to chlorophenoxy herbicides and certain other classes of herbicide, such as triazines (e.g. atrazine), with increased risk of spontaneous abortion** (Arbuckle et al. 1999, 2001).

Asthma

The AAP also considers asthma to be a major adverse health outcome of pesticide exposure (see Roberts and Karr 2012, e1779). Asthma is the most common, chronic noninfectious disease of childhood, and is estimated to affect 300 million people worldwide, causing a quarter of a million deaths each year (Strina et al. 2014). Asthma is characterized by intermittent breathing difficulty, including chest tightness, wheezing, cough and shortness of breath. There have been few studies of pesticides and asthma in children, but those conducted raise serious concerns. For instance, **exposure to either herbicides or insecticides in the first year of life was strongly linked to a diagnosis of asthma before the age of five** in a study carried out in southern California – an over four-fold higher risk from herbicides and more than two-fold greater risk from insecticide

exposure (Salam et al 2004). Studies of adults provide similar evidence. **Farmers are at high risk of asthma and other respiratory diseases** (Hoppin 2002), and exposure to organophosphate and carbamate insecticides has been linked to asthma in Canadian farmers (Senthilselvan et al. 1992). Two studies in the U.S. have associated exposure to a number of pesticides with wheezing, one of the major symptoms of asthma. Hoppin et al (2002) found a higher incidence of wheezing in farmers exposed to the herbicides atrazine, alachlor and paraquat, as well as the OP insecticides chlorpyrifos, parathion and malathion. **All of these pesticides are used heavily and frequently in Hawai'i.** These findings take on added weight when one considers the testimony of Kaua'i physicians that Westside residents are very frequently afflicted with symptoms of respiratory distress.

Children may be exposed to and harmed by pesticides even when they are exposed only at second hand. For example, farmworkers exposed to pesticides may accumulate residues on their skin and clothing, and thereby inadvertently expose their families (Thompson et al., 2003). Similarly, rural homes have much higher levels of pesticide residues in dust than non-rural residences (Simcox et al, 1995, 1999; Rull et al., 2009). These take-home pathways can contribute to children's exposure to pesticides in agricultural communities (Lu et al, 2000).

Health Harms Specifically Linked to Pesticide Drift

The medical studies discussed above address the harms of pesticides from a variety of exposure pathways: food, water, dermal contact, inhalation and/or drift. Below, we discuss studies that specifically address health outcomes where drift is the presumed exposure pathway.

A growing body of research supports the proposition that living near pesticide-sprayed fields increases the risks of a number of serious diseases, and exposure via pesticide drift is the only logical explanation. Many of these studies have been conducted in California, which has an extremely fine-grained pesticide reporting system that provides precise information on which pesticides are sprayed near any given community, when, and in what amounts. Epidemiological studies based on this information have made some troubling findings. For instance, Costello et al. (2009) have found that **exposure to paraquat and maneb within 500 meters of the home increased the risk of Parkinson's disease by 75%, with those under 60 years of age at higher risk.**

Autism

Roberts et al. (2007) conducted an analysis, which found that **expectant mothers residing within 500 meters of fields sprayed with organochlorine insecticides (e.g. dicofol and endosulfan) during early pregnancy had a six-fold higher risk of bearing children with autism spectrum disorder than**

mothers not living near such fields; this ASD risk declined with increasing distance from field sites and increased with rising application amounts. Shelton et al. (2014) found a 60% increased risk of autism spectrum disorder (ASD) in children of mothers who lived near fields sprayed with organophosphate insecticides at some point during their pregnancies, with much higher risk when exposure occurred in the second trimester of their pregnancies. Similarly increased risk – for both ASD and developmental delay – was found for children of mothers near fields treated with pyrethroid insecticides just prior to conception or during their third trimester. Proximity to carbamate-treated fields was also linked to higher risk of developmental delay.

Several of the insecticides at issue in this California study are used on Kaua'i and likely on other islands as well: one of the three organophosphates (chlorpyrifos); four of the five pyrethroid insecticides – permethrin, lambda-cyhalothrin, cypermethrin and esfenvalerate; and one of the two carbamates (methomyl). **With at least 26 schools in Hawaii located within one mile of large agricultural companies, this is of grave concern.**

The medical evidence is staggering and highly unnerving. As a doctor, it is my obligation to tend to the health of my community. I take this responsibility with great seriousness. I respectfully urge the committee members to take their role as policymakers with the same level of seriousness, and pass this measure to protect our keiki.

Thank you for this opportunity to provide testimony, I am happy to provide further analysis or respond to follow-up questions from the Committee.

Sincerely,

Sylvia R. Pager, MD

A Generation in Jeopardy

How pesticides are undermining our children's health & intelligence

PESTICIDE ACTION NETWORK NORTH AMERICA

Pesticide Action Network North America

Pesticide Action Network North America (PAN North America) works to replace the use of hazardous pesticides with ecologically sound and socially just alternatives. As one of five PAN Regional Centers worldwide, we link local and international consumer, labor, health, environment and agriculture groups into an international citizens' action network. This network challenges the global proliferation of pesticides, defends basic rights to health and environmental quality, and works to ensure the transition to a just and viable society.

Acknowledgements

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A Generation in Jeopardy

How pesticides are undermining our children's health & intelligence

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October 2012
Pesticide Action Network North America

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A Generation in Jeopardy

Executive Summary

Children today are sicker than they were a generation ago. From childhood cancers to autism, birth defects and asthma, a wide range of childhood diseases and disorders are on the rise. Our assessment of the latest science leaves little room for doubt: pesticides are one key driver of this sobering trend.

As the recent President's Cancer Panel reports, we have been "grossly underestimating" the contribution of environmental contamination to disease, and the policies meant to protect us have fallen far short. Nearly 20 years ago, scientists at the National Research Council called for swift action to protect young and growing bodies from pesticides.[1] Yet today, U.S. children continue to be exposed to pesticides that are known to be harmful in places they live, learn and play.

This report reviews dozens of recent studies that examine the impact of pesticides on children's health. Our analysis reveals the following:

- **Compelling evidence now links pesticide exposures with harms to the structure and functioning of the brain and nervous system.** Neurotoxic pesticides are clearly implicated as contributors to the rising rates of attention deficit/hyperactivity disorder, autism, widespread declines in IQ and other measures of cognitive function.
- **Pesticide exposure contributes to a number of increasingly common health outcomes for children, including cancer, birth defects and early puberty.** Evidence of links to certain childhood cancers is particularly strong.
- **Emerging science suggests that pesticides may be important contributors to the current epidemic of childhood asthma, obesity and diabetes.**
- **Extremely low levels of pesticide exposure can cause significant health harms,** particularly during pregnancy and early childhood.

Children's developing bodies are particularly vulnerable to the health harms of pesticides.

Prioritizing children's health requires real change

As a nation, we value the wellbeing of our children. In addition to our natural urge to protect what we love, we know that at a societal level their successful development is key to a vibrant, secure future. Poll after poll shows more than 80 percent of Americans consider healthy children a top priority. We must line up our practice and policies with these values.

Many communities across the country have stepped up to create local or state policies to protect children from pesticide exposure. From pesticide-free schools, parks and playgrounds to protective buffer zones in agricultural areas, locally-driven actions are leading the way to healthier childhood environments.

But to ensure protection of all children from the harms of pesticides, we must dramatically reduce the use of these chemicals nationwide. An estimated 1.1 billion

pounds of pesticides are used in the U.S. every year, with more than 20,000 products on the market. This volume of use is undermining the health of the next generation and, as the science demonstrates, derailing development of our children's potential.

Scientists have understood for decades that children are particularly vulnerable to the harms of pesticide exposure. Quickly growing bodies take in more of everything; they eat, breathe and drink more, pound for pound, than adults. As physiological systems undergo rapid changes from the womb through adolescence, interference from pesticides and industrial chemicals—even at very low levels—can derail the process in ways that lead to significant health harms.

Reducing overall pesticide use would not only limit children's exposure during their most vulnerable years, it would also lower pesticide levels in the bodies of men and women of childbearing age—protecting current and future generations in one fell swoop. Those pesticides most harmful to children should be first on the list.

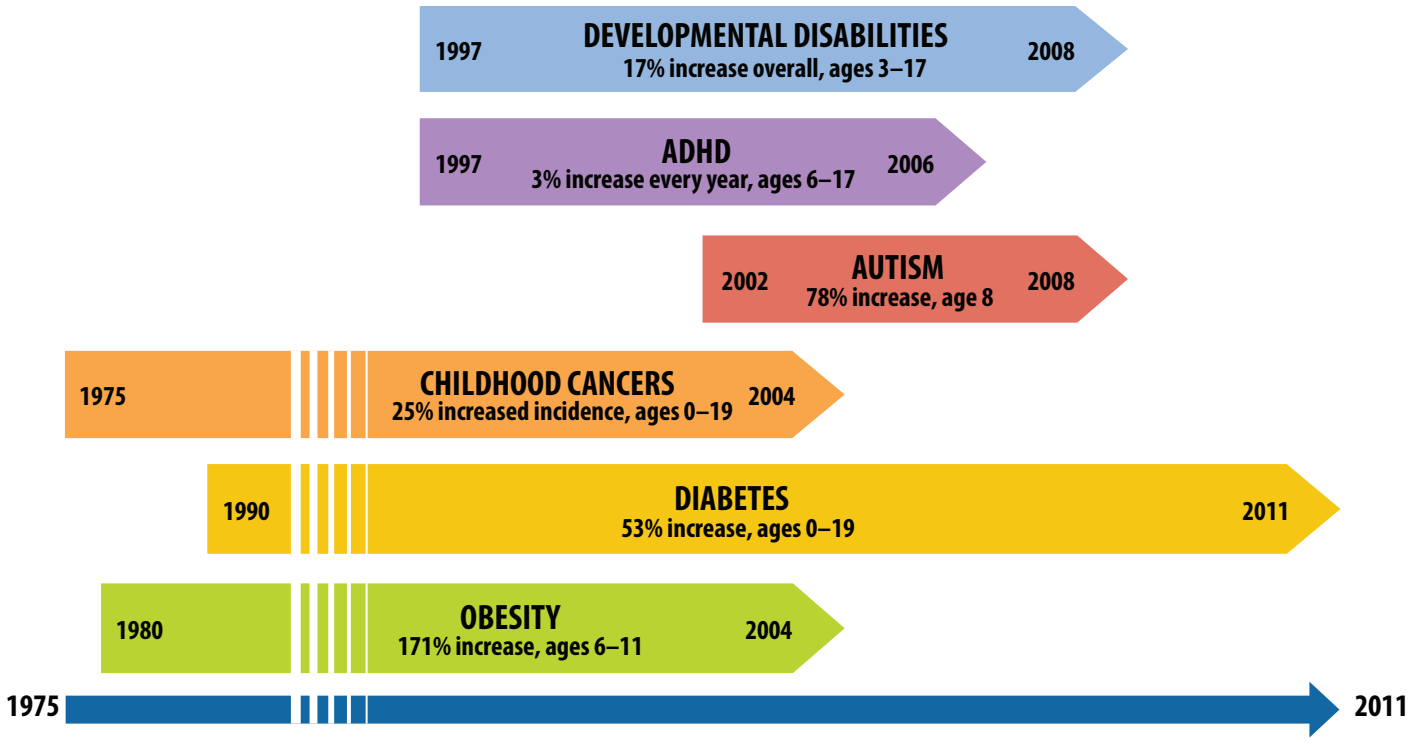
While we must each do what we can with food choices and decisions about home pest control, we cannot accomplish this goal at an individual household level. Policy change is required.

Effective policies urgently needed

To protect children from the health harms of pesticides, policymakers need much more effective tools. We believe change is most urgently needed in the way decisions are made about these three questions:

- Which pesticides are used in agriculture?
- Which pesticides are used in places children live, learn and play?
- How are farmers supported as they reduce reliance on pesticides?

Figure 1: Children's Health Harms on the Rise, 1975–2011*



Statistics show steady increases in many childhood diseases and disorders over the past 30 years. Those highlighted here are just some of the health harms on the rise.
Sources: see endnotes 4, 13,24, 52 and 94.

* With the exception of cancer, all other data are prevalence data, i.e., representing the U.S. population or based on data at several sites within the U.S. Prevalence is total number of cases in a population at a given time, while incidence is a measure of the number of new cases per year. The autism data are from 14 sites in the Autism and Developmental Disabilities Monitoring Network and are not considered fully representative of the U.S. population. The 1990 diabetes data are for type 1 only (type 2 being extremely rare among children at that time), while 2011 data include both type 1 and 2. Prevalence of type 2 diabetes among children is difficult to determine for various reasons, including difficulty of diagnosis.

We recommend the following policy changes in each of these arenas:

1. Prevent the pesticide industry from selling agricultural products that can harm children's health

- *Take swift action on existing pesticides:* If studies find a pesticide to be a neurodevelopmental or reproductive toxicant, endocrine disruptor or human carcinogen—*and* it has been measured in humans, in schools or homes, or as residues on food or in drinking water—EPA should target the pesticide for rapid phaseout, triggering USDA resources to assist rapid farmer transitions to safer pest control methods.

- *Block harmful new pesticides:* EPA should not approve any new pesticide that scientific studies suggest is a neurodevelopmental or reproductive toxicant, endocrine disruptor or human carcinogen—including short-term "conditional" registrations.

- *Prevent harmful low-level exposures:* EPA should act on existing evidence that exposures to endocrine disrupting pesticides pose a particular danger to developing children; the long-delayed endocrine disruptor screening program (EDSP) should be swiftly implemented.

2. Protect children where they live, learn & play

- *Kid-safe homes, daycares & schools:* EPA should withdraw approval of existing pesticide products and not approve new pesticides for use in homes, daycare centers or schools when scientific evidence indicates the chemicals are possible neurodevelopment or reproductive toxicants, endocrine disruptors or human carcinogens.

- *Safer parks & playgrounds:* State and local officials should enact policies requiring that all public playgrounds, playing fields and parks be managed without using pesticides that studies show are harmful to children's health.

Table 1: Pesticides & Childhood Health Harms

		Childhood Health Harms*					
		Brain & nervous system impacts	Childhood cancers	Birth defects	Reproductive & developmental harms	Metabolic effects (e.g., obesity, diabetes)	Immune disorders, asthma
Pesticides	**Herbicides** 442 million lbs † *e.g., atrazine, glyphosate, 2,4-D*	✓	✓	✓	✓		✓
	Insecticides 65 million lbs *e.g., chlorpyrifos, malathion, permethrin*	✓	✓		✓	✓	✓
	Fungicides 44 million lbs *e.g., mancozeb, chlorothalonil*	✓	✓	✓	✓		✓
	Fumigants 108 million lbs *e.g., metam sodium, methyl bromide, chloropicrin*	✓	✓		✓		

Researchers have linked exposure to various pesticides with a range of childhood health harms. A ✓ indicates that links to the health harm are particularly well supported by scientific evidence.

* See Appendix A and www.pesticideinfo.org

† 2007 use estimates, refers to "active ingredient." From *Pesticide Industry Sales & Usage, 2006 and 2007 Market Estimates,* U.S. EPA, Washington, DC, Feb 2011. See www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf. Table 3.4.

3. Invest in farmers stepping off the pesticide treadmill

- *Corral resources for farmers:* Federal and state officials should mobilize and coordinate existing resources to help farmers adopt well-known, effective pest management strategies that reduce reliance on pesticides.

- *Increase investment in innovative farming:* Congress should authorize significant funding for programs supporting farmers' adoption of sustainable practices that reduce use of harmful pesticides.

- *Set use reduction goals:* EPA and USDA should set specific and aggressive national pesticide use reduction goals, focusing first on pesticides that studies show to be harmful to children. To track progress toward this goal, farmers should work with applicators and pest control advisors to report their pesticide use to a nationally searchable database.

- *Source for children's health:* Food distributors should require that their suppliers limit use of pesticides that harm children's health.

These proposals are all common-sense measures in the face of clear evidence that our children's wellbeing is at risk. It's time to muster the political will to prioritize the health of our children, grandchildren and future generations.

Even at very low levels, pesticide exposure can derail development and undermine the ability to learn.

1 Brainpower at Risk

New studies find pesticides can compromise intelligence

Knowledge of environmental causes of neurodevelopmental disorders is critically important because they are potentially preventable. — Dr. Philip Landrigan

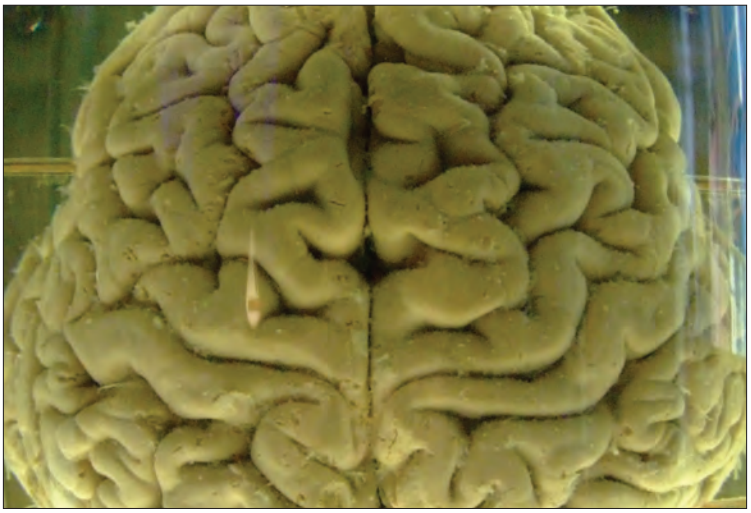
The process of establishing the architecture of the human brain begins in the womb and continues into early adulthood. During this long window of development, many complex processes take place, involving tens of billions of nerve cells making trillions of connections. Cells migrate from one section of the brain to another, and nerve tracts are laid as the final structure of the brain is created.

Many of the processes that occur during brain development are vulnerable to disruption from pesticides. Exposure to neurotoxic pesticides during critical moments of fetal development, even at very low levels, has been shown to fundamentally alter brain architecture.[2] Pesticides that disrupt the hormone system—and particular those affecting the functioning of the thyroid, which plays a key role in brain development—can cause lasting damage. The impacts of exposures are often irreversible because unlike other organs, the brain cannot repair damaged cells (see sidebar).

Children whose brain infrastructure or nervous system fails to develop normally may be disabled for the rest of their lives. Developmental disabilities include autism spectrum disorders, attention deficit disorders, hearing loss, intellectual impairment and vision loss. People with developmental disabilities are often challenged by everyday life activities such as language, mobility, learning and independent living. Reduced cognitive abilities can also lead to behavioral problems, from aggression and social alienation to increased risk of drug abuse.[3]

A "Silent Pandemic"

Some 15 percent of all U.S. children have one or more developmental disabilities—representing a 17 percent increase in the past decade. For some disorders, the numbers are rising even more rapidly.[4] Overall, researchers estimate that between



Pesticides can interfere with brain function in several ways, from altering architecture during fetal development to interfering with neurostransmitter control. Gaetan Lee

Mechanisms of Harm

Misfiring neurons & altered brain architecture

Pesticides can interfere with brain function and development in several ways; we describe three of the most common and best understood mechanisms of harm here:

Neurotransmitter control: Organophosphate pesticides can block the normal functioning of acetylcholinesterase, an enzyme that degrades—and thus controls—a neurotransmitter called acetylcholine. When the functioning of the enzyme is blocked, acetylcholine is not degraded and neurons continue firing instead of shutting down after they've accomplished their mission. This can cause serious problems in the normal functioning of the nervous system.

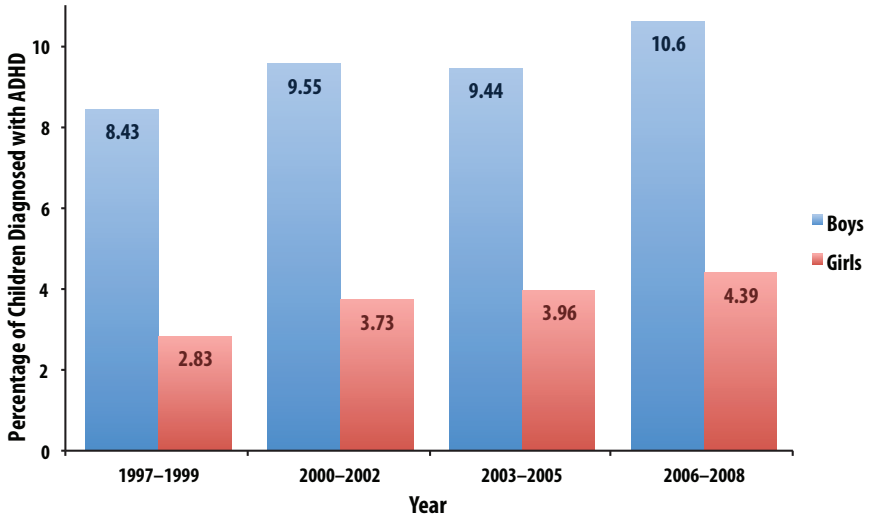
Developing brain cells: To date, EPA assessments have relied on acetylcholinesterase levels as a marker of organophosphate exposure risk, yet studies now show adverse effects can occur at much lower doses than those that block acetylcholinesterase. For example, chlorpyrifos has been shown to interfere with neural cell replication, differentiation and survival. As the brain structure is developing—particularly at key stages *in utero*—chlorpyrifos can disrupt the process in ways that permanently alter the architecture of the brain.*

Sodium flow into nerve cells: Pyrethroid insecticides act on neurons by perturbing voltage-sensitive sodium channels. These sodium "gates" are what allow sodium to flow into a nerve cell, controlling how a neuron fires and transmits signals along a nerve. Pyrethroids cause these gates to open and close more slowly, changing how the nerve cell normally responds—either inducing repetitive firing or causing the nerve cell not to fire at all.†

* Rauh, V. A., F. P. Perera, M. K. Horton, R. M. Whyatt, R. Bansal, X. Hao, et al. "Brain Anomalies in Children Exposed Prenatally to a Common Organophosphate Pesticide." *Proceedings of the National Academy of Sciences.* May 2012 109 (20): 7871-6. See http://www.pnas.org/cgi/doi/10.1073/pnas.1203396109.

† Shafer T.J., D.A. Meyer and K.M. Crofton. "Developmental neurotoxicity of pyrethroid insecticides: critical review and future research needs." *Environ Health Persp.* Feb 2005 113(2):123-36. See http://www.ncbi.nlm.nih.gov/pubmed/15687048.

Figure 2: ADHD Prevalence among Children Ages 3 to 17, from 1997–2008



The number of children diagnosed with ADHD increased an average of 3 percent every year from 1997 to 2008. Boys are much more likely to be affected. Source: C. Boyle et al., "Trends in the Prevalence of Developmental Disabilities in U.S. Children, 1997– 2008."

400,000 and 600,000 of the four million U.S. children born each year are affected by a neurodevelopmental disorder.[5]

Public health experts from Harvard and Mt. Sinai Hospital have called the damage that chemicals are causing children's developing minds a "silent pandemic,"[6] and scientists now point to a combination of genetic and environmental factors to explain this rapid rise of developmental, learning and behavioral disabilities.[7]

Some children, for example, may have a genetic susceptibility to attention deficit/hyperactivity disorder (ADHD) or autism, but it may only develop if the child is exposed to a triggering chemical during a certain period of development. Other children may be genetically programmed to produce less of a common detoxifying enzyme, rendering their brain and nervous system more susceptible to lasting harm when they are exposed to neurotoxic pesticides (see sidebar, p. 25).[8]

Genetic mutations that occur in parents (both men and women) in response to chemical exposures over the course of their lifetime can also, according to recent research, raise the risk of neurodevelopmental disorders for their children.[9, 10]

The National Academy of Sciences now estimates that about one third of all neurobehavioral disorders (such as autism and ADHD) are caused either directly by pesticides and other chemicals or by interaction between environmental exposures and genetics.[11] Some experts say this estimate is likely to be low, as the health profession is just beginning to fully recognize the contributions of environmental factors to disease formation.*

Whatever the mechanism of harm, recent studies leave little doubt that exposures to pesticides during fetal development, infancy and childhood may contribute significantly to decline in the cognitive abilities of our children. A recent comprehensive review of the science on health effects of pesticides by the Ontario College of Family Physicians found exposure to pesticides in the womb to be "consistently associated with measurable deficits in child neurodevelopment."[12]

We look here at three areas where the evidence is particularly strong: ADHD, autism and falling IQs. A few of the key studies are highlighted below, and more detailed descriptions—along with additional studies—are provided in Appendix A.

ADHD rates continue to rise

ADHD is quite clearly on the rise, and though changes in diagnosis play a role, this cannot fully explain the trend. The number of children diagnosed with ADHD increased an average of three percent every year from 1997 to 2006, and an average 5.5 percent per year from 2003 to 2007 (see Figure 2).[13, †]

The Centers for Disease Control and Prevention (CDC) estimates that ADHD now affects three to seven percent of all school children in the U.S.; one independent study puts the figure at 14 percent.[14] Boys are much more likely to be diagnosed with ADHD, although the American Psychological Association notes that girls are more likely to suffer from the "attention deficit" part of the disorder, and their symptoms are often overlooked.[15]

A variety of brain functions are compromised in children exhibiting ADHD. Learning is often impaired, and those with the disorder may exhibit impulsive behavior and hyperactivity, and lack the ability to sustain attention.

As with other neurodevelopmental disorders, the social impacts can be immense. Parents report that children with ADHD have almost three times as many problems interacting with peers as children without. Diagnosed children are almost 10 times as likely to have difficulties that interfere with friendships, including experiencing exclusion from peer groups.[16]

The Science

Researchers estimate that from 20 to 40 percent of ADHD cases are caused by something other than genetics.[17] Studies have found links to a variety of environmental contaminants, including exposure to organophosphate and pyrethroid insecticides during pregnancy and throughout childhood.

* See for example the 2010 President's Cancer Panel report "Reducing Environmental Cancer Risk: What we can do now" http://deainfo.nci.nih.gov/advisory/pcp/annualReports/index.htm.

† The CDC outlines diagnostic criteria here: http://www.cdc.gov/ncbddd/adhd/diagnosis.html, specifying that children must display at least six characteristic behaviors within six months, and that some symptoms must be present before the age of seven. CDC explains shifts in diagnostic criteria here: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5810a1.htm.

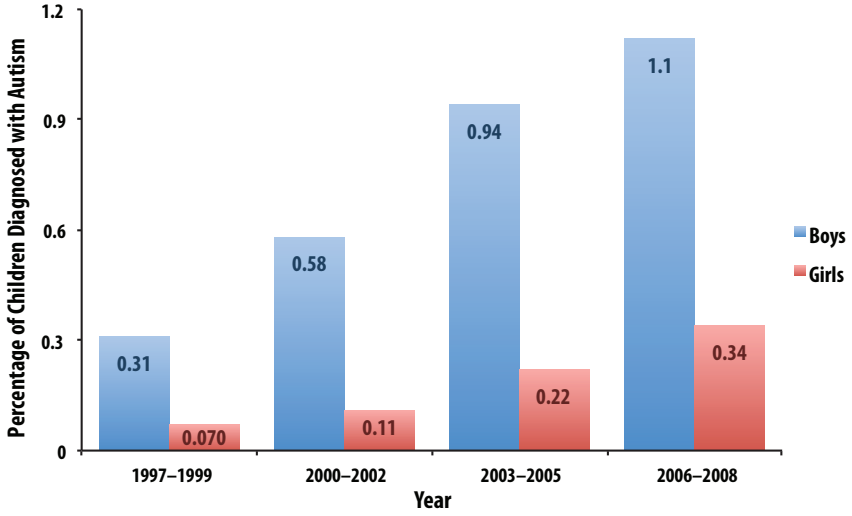
- Children with higher levels of organophosphate breakdown products in their urine were more likely to have ADHD. Researchers found that 94 percent of the 1000+ children tested by CDC had detectable levels of these metabolites, and those with levels above the median were twice as likely to be diagnosed with ADHD as those with no metabolites found.[18]
- Organophosphate metabolites at levels commonly found in the bodies of U.S. children are linked to increased likelihood of ADHD. Every 10-fold increase in levels of organophosphate metabolites in the urine of children aged eight to 15 years was associated with a 55 to 72 percent increased likelihood of the disorder.[19]
- Prenatal organophosphate exposure has been linked to attention problems. Each ten-fold increase in a pregnant mother's urinary concentration of organophosphate metabolites led to a five-fold increased risk that her child would be diagnosed with ADHD by age five.[20]
- Children with low birth-weight are more likely to have ADHD,[21] and there is considerable evidence linking reduced birth-weight with prenatal exposure to organophosphate pesticides.[22]
- Mouse pups were hyperactive after being exposed to the pyrethroid insecticides pyrethrin or cypermethrin, and adult mice injected with permethrin or deltamethrin had long-term elevation of the dopamine transporter, a marker that has been linked to ADHD.[23]

Table 2:
Chemicals Contributing to Autism

- Lead
- Methylmercury
- Polychlorinated biphenyls
- **Organophosphate pesticides**
- **Organochlorine pesticides**
- **Endocrine disruptors**
- Automotive exhaust
- Polycyclic aromatic hydrocarbons
- Brominated flame retardants
- Perfluorinated compounds

This list from public health experts includes both commonly used organophosphate pesticides and long lasting organochlorine pesticides, as well as other chemicals commonly found in consumer products. Source: Landrigan, et al., 2012

Figure 3: Autism Prevalence among Children Ages 3 to 17, from 1997–2008



Rates of autism have risen dramatically in the past decade. While overall prevalence is higher among boys, the rate of increase is higher among girls. Source: C. Boyle et al, "Trends in the Prevalence of Developmental Disabilities in U.S. Children, 1997–2008."

Autism rates jump 250% in one decade

The autism spectrum includes classic autism, Asperger's Syndrome and atypical autism. Incidence rates have risen rapidly in recent years; in its 2012 report, CDC estimated—based on 2008 data on eight-year-olds from 14 states—that 1.1 percent of U.S. children, or one in every 88, are now on the autism spectrum. Boys are more likely to have the disorder, with one in 54 affected.

Data from the National Health Interview Surveys reveal a dramatic rate of increase. Between 1997 and 2008, autism prevalence among boys ages three to 17 years increased 261%. Prevalence among girls, while much lower than boys overall, rose even more quickly, showing an increase of more than 385% over the same period (see Figure 3).[24]

In California, the number of children with autism who are enrolled in statewide programs rose from 3,864 in 1987 to 11,995 in 1998, an increase of more than 210 percent in 11 years.[25] Other states saw similar rates of increase between 2002 and 2006.[26] Though shifts in diagnosis account for some of this dramatic rise, public health experts have determined that diagnostic changes do not fully explain the trend.

Researchers believe autism spectrum disorders reflect changes in brain structure occurring during critical windows of development in the womb. These shifts in brain architecture may be caused by genetics, environmental insults such as chemical exposure, or an interaction between the two.[27, 28]

In 2012, a group of researchers led by Dr. Philip Landrigan of Mt. Sinai Medical Center released a list of ten types of chemicals most likely to be linked to the development of autism (see Table 2), and laid out an urgent strategy for research into the role of these contaminants and how children can be better protected from them. The list includes both commonly used organophosphate pesticides and longlasting organochlorine

pesticides, as well as other chemicals commonly found in consumer products.[29]

The Science

Studies examining the links between pesticide exposure and autism suggest prenatal exposures are particularly damaging.

- One study in California's Central Valley found that when mothers were exposed early in pregnancy to the organochlorine pesticides endosulfan and dicofol, the risk of autism among their children increased sharply. Children whose mothers lived within 500 feet of fields being sprayed were six times more likely to be on the autism spectrum.[30]
- Mothers in California's central coast region who had higher levels of organophosphate metabolites in their urine during pregnancy were much more likely to have children with pervasive developmental disorder—which can include or be an indicator of autism. The risk more than doubled each time metabolite concentrations went up by a factor of 10.[31]
- A study in New York City found that infants most exposed to chlorpyrifos *in utero* were significantly more likely to have pervasive developmental disorders—including autism—by the time they were three years old.[32]
- A trio of U.S. studies examined links between environmental exposures among parents (including, but not limited to, pesticides) and incidence of autism among their children.[33] Among other findings, the scientists reported that older fathers are more likely to transmit tiny, spontaneous gene mutations—that occur over a lifetime in response to environmental stressors—to their offspring, that in turn increase the risk of autism. Recent research in Iceland confirmed these findings.[34]
- Minnesota researchers explored the interaction of exposure to organophosphate pesticides, gene expression and dietary factors as potential contributors to autism.[35] Among other things, they found that mineral deficiencies linked to high fructose corn syrup consumption* make developing minds more susceptible to the neurotoxic effects of pesticides.

These various recent studies show how complex the path to our current autism epidemic has been. But evidence suggests that pesticide exposure—particularly during pregnancy—is implicated in a number of ways.

Derailed brain development means falling IQs

The societal implications of reduced cognitive abilities across an entire generation are nothing short of staggering and have been a concern among public health specialists since the IQ effects of lead exposure became clear in the 1970s. As Dr. Ted Schettler observed back in 2000:

> A loss of five points in IQ is of minimal significance in a person with an average IQ. However a shift of five IQ points in the average IQ of a population of 260 million increases the number of functionally disabled by over 50 percent (from 6.0 to 9.4 million), and decreases the number of gifted by over 50 percent (from 6.0 to 2.6 million).[36]

Twelve years later, Dr. David Bellinger echoed this observation. He pointed out that cognitive effects, often dismissed as "clinically unimportant" at the individual level, become very significant across a whole society in terms of declining intellectual capacity, lost economic productivity and increased costs for education and health care.

Bellinger reviewed published data linking organophosphates and cognitive effects, and concluded that overall, exposure to organophosphate insecticides may be responsible for lowering U.S. children's IQ level† by 17 million points—not much less than the 23 million point loss attributed to lead poisoning.[37]

Bellinger argues that because the potential impacts of organophosphates are so widespread and significant to society, "a risk assessment that focuses solely on individual risk, and fails to consider the problem in a public health context" is misleading and will not lead policymakers to sound and protective decisions.

The Science

Pesticide exposure during pregnancy can have dramatic effects on cognitive development. From a wide range of animal research to studies tracking the intellectual development of children over time, the evidence points squarely at prenatal pesticide exposures as significantly harming the development and functioning of the brain. These harms can then lead to both lower IQ levels and neurodevelopmental delays.

- A particularly compelling study used Magnetic Resonance Imaging (MRI) technology to observe the developing brains of infants who had been exposed to chlorpyrifos during pregnancy. Researchers observed significant structural changes, including abnormal areas of thinning and enlargement. Areas of the brain related to attention, language, reward systems, emotions and control were affected.[38]
- Three cohort studies‡ released in 2011 document cognitive impairment caused by exposure to organophosphates in the womb.§ The first study found that higher metabolite levels in a mothers' urine late in pregnancy increased the likelihood of reduced cognitive development in their children.[39] The second study linked prenatal exposure to a seven-point reduction in IQ by age seven.[40] The third study found that even very low levels of chlorpyrifos residues in cord blood resulted in lower IQ and reduced working memory.[41]
- Pregnant mothers exposed to chlorpyrifos through household use (before this use was withdrawn)¶ had infants with lower birth weight and reduced head circumference, both indicators of impaired cognitive ability later in childhood.[42]

* High fructose corn syrup is found in a wide range of processed foods and beverages.

† The accuracy of Intelligence Quotient (IQ) testing to measure intellectual capacity has long been a source of contention, but IQ is currently the best index for measuring cognitive abilities across a population.

‡ See sidebar in Appendix A for a description of the various types of scientific studies highlighted in this report.

§ See this editorial in *Environmental Health Perspectives* for a discussion of the importance of these three studies: "Strength in Numbers: Three Separate Studies Link in Utero Organophosphate Pesticide Exposure and Cognitive Development," available online at: http://ehp03.niehs.nih.gov/article/fetchArticle.action?articleURI=info%3Adoi%2F10.1289%2Fehp.1104137

¶ Chlorpyrifos was withdrawn from home use in 2001, but remains widely used in agricultural settings where farm, farmworker and rural community mothers and children still face exposure. Children also continue to be exposed from residue on fruits and vegetables.

- Exposure to the organophosphate pesticides diazinon and parathion during early childhood may reduce cognitive function, according to results from animal studies. Low-dose exposures caused changes in the developing brains of rats known to correspond to reduced ability to learn.[43] Other animal studies indicate that *in utero* and neonatal exposure to organophosphates increases the risk of developmental delays.[44]
- Children at three months of age who were most highly exposed to the pyrethroid pesticide synergist piperonyl butoxide,* as assessed by personal air monitors, scored 3.9 points lower on the Bayley Mental Developmental Index. These scores are predictive of school readiness, and the authors described their results as modest, yet "worrisome."[45]
- Prenatal exposure to the DDT† breakdown product DDE is also associated with neurodevelopmental delays in children, especially the "psychomotor" skills linking movement or muscular activity with mental processes.[46] And exposure *in utero* to DDT itself has been associated with reduced cognitive functioning, memory and verbal skills among preschoolers.[47]

Strong emerging evidence links childhood pesticide exposure to other, adult-onset neurological effects such as Parkinson's and Alzheimer's diseases; these studies are not examined here.[48]

The combined, society-wide impact of the various syndromes, disorders and deficits resulting from damage to children's brains and nervous systems early in life is immense. Health professionals and educators across the country have indicated concern that our current policies don't adequately protect our children as their nervous systems develop.[49] Something must be done to address this gap, as the results of such exposures have profound consequences for individuals, families and society as a whole.

Exposure of a developing fetus, infant or child to neurotoxic pesticides can lead to greater risk of learning disabilities and significant drops in IQ.

* Piperonyl butoxide, or PBO, is commonly included in formulations of pyrethroid pesticide products to increase the potency of the active ingredient.

† Agricultural uses of DDT were banned in the U.S. in 1972, but because of its persistence, DDT and its breakdown products continue to appear in human blood samples. DDT use continues in some countries for malaria control programs.

2 Cancer, Birth Defects & Early Puberty

Latest science links many childhood health harms to pesticide exposure

If we are going to live so intimately with these chemicals—eating and drinking them, taking them into the very marrow of our bones—we had better know something about their nature and their power. —Rachel Carson

Our children face a range of health challenges that were not encountered by past generations. Public health experts are concerned, and are increasingly focusing on the contributing role of environmental factors such as pesticides and other chemicals.

The President's Cancer Panel's 2010 report, for example, concluded that the role environmental contaminants play in contributing to cancer has been "grossly underestimated" and called for urgent action to reduce the current widespread exposure to carcinogens. The Panel's chair, Dr. LaSalle Leffall, urged preventative measures to protect public health—even in the face of some uncertainty.*

> The increasing number of known or suspected environmental carcinogens compels us to action, even though we may currently lack irrefutable proof of harm.[50]

Meanwhile, evidence continues to mount linking chemical exposure to a range of children's health harms. Below we present a summary of some of the growing body of recent findings on pesticides and childhood cancer, birth defects and early puberty. More detailed descriptions and additional studies are included in Appendix A.

Some childhood cancers linked to pesticides

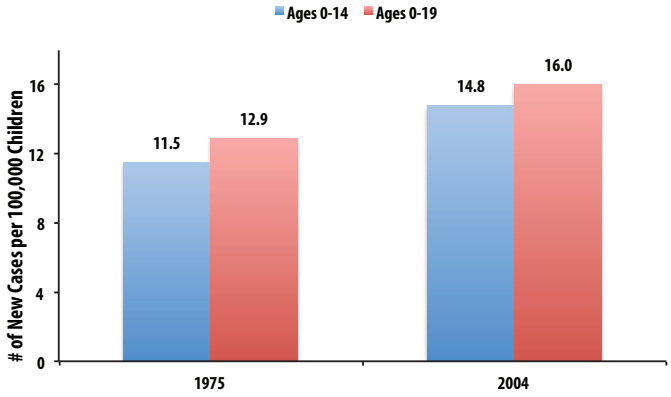
Cancer is the second most common cause of death among U.S. children one to 14 years old.† Over the past 30 years, the number of children diagnosed with all forms of invasive cancer has increased 29 percent, from 11.5 cases to 14.8 cases per 100,000 children per year (see Figure 4).[51]

There are many types of childhood cancer, and incidence rates vary widely. Leukemia and childhood brain cancers are now the most common cancers among children, with rates for these two cancers rising 40 to 50 percent since 1975: leukemia from 3.3 to 4.9 per 100,000 children, and brain cancers from 2.3 to 3.2 (see Table 3).[52]

Survival rates have also risen. Improved cancer treatments have led to dramatic increases in survival of all types of childhood cancer, particularly leukemia (from 50 percent survival in 1975 to more than 80 percent in 2004) and non-Hodgkins lymphoma (from 43 to 87 percent survival over the same time period.) For all types of childhood cancers, African-American children have a lower survival rate than do white children (73 vs. 81 percent).[53]

For some cancers, genetics is a powerful predictor. But as outlined by the President's Cancer Panel, cancers can have multiple and often interacting causes. In some cases genetic factors make an individual more susceptible, and exposure to environmental carcinogens may trigger cancer development.

Figure 4: Incidence of Cancer among Children, 1975 & 2004



Over the past 30 years, the number of children diagnosed with all forms of cancer has increased from 11.5 to 14.8 cases per 100,000 children per year.
Source: SEER, 2004

Table 3: Top 5 Childhood Cancers

- Leukemia
- Brain and other nervous system tumors
- Neuroblastoma
- Wilms' tumor
- Lymphoma

The types of cancers that occur most often in children are different from those seen in adults.
Source: American Cancer Society

The Science

A large number of recent studies link pesticide exposure to childhood leukemia, brain tumors and neuroblastoma. Some evidence suggests pesticide exposure may also be associated with other types of children's cancer, such as non-Hodgkin's lymphoma, Wilms' tumor and Ewing's sarcoma. Many studies

* This call for action in the face of some uncertainty is an example of the "Precautionary Principle," an approach to decision making that has been adopted by many local governments in the U.S. and in countries around the world. For a definition and more information, see the Science and Environmental Health Network's FAQ: http://www.sehn.org/ppfaqs.html

† Lethal accidents are the most common cause of death.

find *in utero* exposure during key windows of fetal development or parental exposure before conception to be particularly important.

- Home insecticide use during pregnancy can increase risk of childhood leukemia, according to a review of 15 studies over the past two decades. Timing of exposure appears to be particularly important.[54]
- The risk of a child developing acute lymphocytic leukemia—the most common type of childhood leukemia—is higher when the mother is exposed to home insecticides during pregnancy. Risk increased with the frequency of the mother's exposure; the highest risk was associated with use of household insecticides more than five times over the course of gestation.[55]
- Mothers who have a particular genetic variant of an enzyme involved with the metabolic processing of wastes and toxins (including carcinogens)* are more likely to have a child with leukemia when they use pesticide products during pregnancy.[56]
- Several case-control studies link exposure to herbicides and household insecticides during pregnancy to an increased risk of childhood brain cancer.[57]
- Higher risk of neuroblastoma, the most common cancer among infants, was observed in children whose parents reported garden and home pesticide use.[58] An older case-control study of U.S. and Canadian children indicated increased risk of neuroblastoma among children whose fathers were landscapers and groundskeepers.[59]
- In a national case-control study in Australia, increased risk of Ewing's sarcoma tumors among children was linked to occupational exposures of mothers and fathers who worked on farms around the time of conception.[60]
- Children who lived in areas of high agricultural activity in the U.S from birth to age 15 experienced significantly increased risk of childhood cancers.[61] And a study in Norway of agricultural census data found that of 323,359 children under 14, those who grew up on a farm—combined with a high level of pesticides purchased by the family—were nearly twice as likely have brain tumors.[62]

A number of studies—not reviewed here—explore potential links between prenatal or childhood pesticide exposures and incidence of cancers later in life. For example, according to the President's Cancer Panel, girls who were exposed to DDT before they reach puberty are five times more likely to develop breast cancer in middle age.[63]

In general, the association between pesticide exposures and childhood cancer outcomes may be underestimated, as data are somewhat limited and studies focus on certain cancers more than others. In addition, common methodological problems—such as occupational exposures being identified only through self-reporting or job title, considerations of other routes of exposure, small sample sizes, and relying on recall to estimate exposures—may contribute to skewed findings.[64]

* The CYP1A1 gene codes for the expression and activity level of an enzyme that helps clear the body of potentially harmful compounds.

Birth defects rise with seasonal or occupational exposures

Birth defects are the leading cause of infant mortality in the U.S., accounting for 19 percent of the 29,138 infant deaths in 2007. And the overall incidence of birth defects is rising.[65] According to CDC data, about one in every 33 babies born today has some kind of birth defect.[66] Birth defects can affect almost any part of the body; some are mild and impact appearance only, others affect the functioning of organs and can be life threatening, although overall survival rates have increased significantly since 1979.[67]

Incidence trends vary by specific birth defect. Cleft lip/palate is the most common birth defect reported, and incidence has declined slightly over the last decade. Rates of Down Syndrome, gastroschisis (an abdominal wall defect resulting in protrusion of the intestines) and anencephaly (absence of portions of the brain, skull and scalp) have all increased since 1999.[68]

Like many children's health outcomes, a combination of genetic and environmental factors is often at play. CDC's research on environmental factors has focused primarily on smoking, alcohol intake, obesity and diabetes.[69] Other scientists, however, have examined the role of parental exposure to pesticides and other chemicals before conception, and of mothers' exposure to environmental contaminants during pregnancy (see sidebar, p. 17).

The Science

Parents exposed to pesticides occupationally, from exposures in their community or by in-home pesticide use may increase the risk of birth defects in their newborn. Studies indicate that exposure of both mothers and fathers, particularly during the period of conception, can influence birth defect outcomes. Several studies in agricultural areas have correlated conception during peak pesticide spray season with increased birth defect risk.

A mother's exposure during pregnancy can also play a key role, with specific timing once again emerging as a critically important variable.

Children whose mothers were exposed to herbicides and household insecticides during pregnancy have an increased risk of developing brain cancer.

Farmworker Families & Pesticides

As a community organizer and health educator in North Carolina, Ana Duncan Pardo works with many communities directly affected by pesticides.

When we spoke with Ana about her experience working with farmworkers, she described a particular instance—when she was setting up for a presentation to farmworker parents—that awoke her to the health harms faced by many of these families:

> Within five minutes I had noted multiple cleft palates and several children with apparent Down Syndrome…. It was shocking and disturbing to walk into a room with a group of parents and children that easily represented three to four times the national average for birth defects.

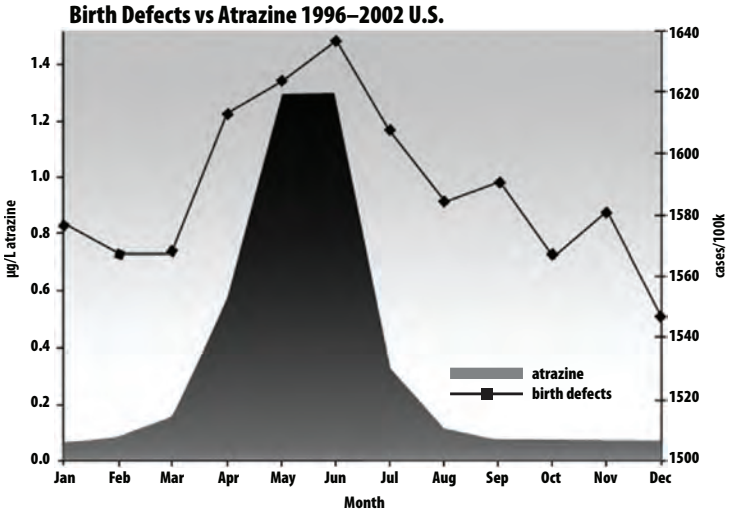
Farmworkers and their families face unique risks, as the harmful chemicals applied in the field follow workers home on their skin, shoes and clothing, and may also drift into their homes from the nearby fields. And, like all families, the food they eat every day may contain pesticide residues.

Ana Duncan Pardo is the farmworker organizer & communications coordinator for Toxic Free North Carolina, and a member of PAN's board.

- A multi-year, national review of USGS water data and CDC birth defect records found a strong seasonal association between birth defects and the presence of the herbicide atrazine in surface water. Infants conceived between April and July, when elevated concentrations of the herbicide are found, have a significantly higher birth defect risk (see Figure 5).[70]
- In Washington state, a seasonal analysis of the risk of the abdominal wall defect gastroschisis showed prevalence peaking when conception occurred between March and May. The birth defect occurred most frequently among infants whose mothers lived within 50 kilometers of a site with high surface water concentration of atrazine.[71]
- Male pesticide applicators in Minnesota had a significantly higher number of children with birth defects, in a study examining 4,935 births to pesticide applicator fathers over three years. The birth defects were more common among boy offspring than girls.[72] Egyptian fathers exposed to pesticides at work also had a greater risk of having children with congenital malformations.[73]
- Increased risk of boys' urogenital malformations such as hypospadia, micropenis and cryptorchidism* has been linked in many studies to prenatal exposure to environmental contaminants. One recent meta-analysis of studies from seven countries (Canada, Denmark, Italy, Netherlands, Norway, Spain and the U.S.) indicated a 36 percent increased risk of hypospadia when mothers were exposed to pesticides at work, and a 19 percent increased risk with fathers' occupational exposure to pesticides.[74]

* Hypospadia is a defect in which the urethral opening develops in the wrong location along the shaft of the penis. Micropenis is a defect where boys have severely reduced penile size, and cryptorchidism is a defect where the testes descend improperly, or not at all.

Figure 5: Atrazine Seasonal Exposure & Birth Defects



Seasonal exposure to pesticides during pregnancy has been linked to increased risk of birth defects. Source: Winchester, P.D., J. Huskins and J. Ying. "Agrichemicals in surface water and birth defects in the United States." Acta Paediatrica. 2009 98: 664–669.

- The risk of having a child with neural tube defects, which are birth defects of the brain and spinal cord, has also been linked to pesticide exposure. Studies indicate a higher risk of this birth defect if insecticide bombs or foggers are used in the home during the period of conception. Risk is also higher if women live within a quarter mile of a cultivated field where pesticides are sprayed.[75]
- Mothers exposed to pesticides at work during a particular period of pregnancy have a significantly greater risk of having a child with anencephaly (a rare defect involving absence of a large part of the brain and skull).[76] A meta-analysis of studies examining fathers' exposure to Agent Orange (containing the herbicides 2,4-D and 2,4,5-T) found the risk of having offspring with spina bifida, a "split spine" defect caused by incomplete formation of the neural tube, was twice as high among those fathers who were exposed.[77] †

Many epidemiological studies over the years have found no association between pesticide exposure and birth defects. It must be considered, however, that these studies may not have taken timing of exposure into account, a variable that is proving to be a critical factor in birth defect outcomes. And as with cancer studies, results may be skewed by use of inappropriate surrogates for pesticide exposure (e.g. job title) or inaccurate subject recall.

Changes in puberty timing linked to low-level exposures

Young girls in the U.S. are moving from childhood to adolescence at an ever-younger age. Changes in the timing of sexual development over the past two decades have been so widespread that the age of "normal" puberty onset has been redefined by health professionals.[78]

† Agent Orange was widely used as a defoliant during the Vietnam War and was often contaminated with dioxins which have also been linked to birth defects. One of the herbicide ingredients, 2,4-D, is still in use in the U.S., and a proposal is currently under consideration for a genetically engineered variety of corn designed to allow increased 2,4-D application.

Dr. Herman-Giddens and her colleagues first documented this acceleration in 1996, in a study finding that the number of girls having some sign of puberty onset before the age of eight was "substantially higher" than previously found.[79]

These initial findings of early puberty were corroborated in 2010 by researchers who found that by age seven, 10 percent of white girls, 23 percent of black non-Hispanic girls, and 15 percent of Hispanic girls had begun the process of breast development, also known as thelarche.[80] Some changes in pubertal development in boys have also been documented.

Changes in puberty timing are concerning for several reasons. For both boys and girls, self-esteem and body image issues can sometimes lead to self-destructive behaviors and poor performance in school. Additionally for girls, both early puberty and obesity (a contributing factor for early puberty) have been linked to health impacts later in life, increasing the risk for breast cancer and later reproductive health issues such as polycystic ovary syndrome.[81, 82]

These changes cannot be fully explained by ethnic, geographic, or socioeconomic factors, and thus a growing body of research has turned to examining the role of endocrine-disrupting chemicals in accelerating puberty in children.[83]

The Science

Although the number of studies is relatively small, researchers have found some associations between pesticide exposure—either during fetal development or early childhood—and effects on puberty.

Most studies focus on *in utero* exposures to pesticides with endocrine-disrupting effects that can interfere with the healthy development of the reproductive system—particularly if exposure occurs at certain times in the process (see sidebar).[84] The majority of studies focus on precocious puberty in girls, but a few studies have also found links between pesticide exposure and changes in the timing of puberty among boys.

Much of the research to date examines impacts of long-lasting organochlorine pesticides. Some of these are chemicals that have already been banned in the U.S. (e.g., DDT, hexachlorobenzene); others are in the process of being phased out (e.g., lindane, endosulfan); but all are still present in our food supply, environment, and in our bodies.[85, *] Though few studies have yet examined the connections, pesticides currently in use are also implicated in some studies.

- Prenatal exposure to the herbicide atrazine was linked to delayed pubertal development in both male and female rats in a recently released animal study.[86]
- Danish greenhouse workers exposed to a range of pesticides during pregnancy were more likely to have daughters showing breast development from 6–11 years old.[87] Increased likelihood of early puberty in girls in Jerusalem was found to coincide with seasons of intensified pesticide usage.[88]
- Daughters in Michigan were more likely to reach puberty at a younger age if their mothers had higher blood levels of the DDT breakdown product, DDE. Participants in this study included women who regularly consumed fish from the Great Lakes, which for years have been heavily contaminated with industrial pollutants such as PCBs and DDT.[89]
- Higher blood levels of hexachlorobenzene and DDE were associated with early puberty among Flemish boys.[90] Two recent studies of boys in India and Russia linked exposure to the pesticide endosulfan and the industrial by-product dioxin to delayed puberty among boys.[91]
- The pyrethroid insecticide esfenvalerate[†] has shown endocrine-disrupting effects related to puberty timing in female rats. Rats exposed to low levels (half of EPA's "no observable effect" level) for seven days showed significant delays in onset of puberty.[92]

As evidence mounts that developmental exposures to pesticides can have an effect on puberty timing, additional studies are now focusing on such endocrine-disrupting effects of pesticides currently in use.

Mechanisms of Harm

Endocrine disruption = development derailed

The term "endocrine" refers to systems in the body that are controlled by hormones, such as brain development, growth, reproduction and puberty. Hormones are chemicals synthesized in the body that bind to receptors to trigger actions at the cellular level resulting in physiological changes. Once their job is done they are released and free to act again.

Some pesticides act as "endocrine disruptors" that mimic hormones and can interfere with systems normally controlled by hormonal action. If such disruption occurs at times during development known as "windows of vulnerability,"—such as when the reproductive system is coalescing, brain or nervous systems are developing, immune system is forming or puberty is getting underway—the process can be derailed in significant ways, sometimes with life-long effects.

Because hormones themselves act at extremely low levels, biological processes controlled by hormones are tremendously sensitive. This means there often is no "threshold" or "safe" dose when it comes to endocrine disrupting compounds.[*]

* Zoeller, R.T., T. R. Brown, L. L. Doan, A. C. Gore, N. E. Skakkebaek, A. M. Sotp et al. "Endocrine-Disrupting Chemicals and Public Health Protection: A Statement of Principles from The Endocrine Society." *Endocrinology* June 2012. See http://endo.endojournals.org/content/early/2012/06/21/en.2012-1422.abstract.

Vandenberg, L., T. Colborn, T. Hayes, J. Heindel, D. Jacobs, D.H. Lee, et al. "Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Responses." *Endocrine Reviews.* March 2012 33(3): 378-455.

* CDC sampling from 1999–2000, for example, found DDT's breakdown product in blood samples of 99 percent of U.S. population. See http://www.cdc.gov/exposurereport/.

† Esfenvalerate is listed for Tier 1 screening under EPA's Endocrine Disruptor Screening Program. See http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2009-0634-0001.

3 Emerging Science
Obesity, diabetes & asthma

Chemicals that disrupt hormone messages have the power to rob us of rich possibilities that have been the legacy of our species and, indeed, the essence of our humanity. —Theo Colburn

Many of the health challenges facing children today have strong genetic and/or behavioral components. The rise in childhood obesity, for example, in part reflects the increasingly sedentary habits of many U.S. children.* But it's becoming increasingly clear that personal lifestyle choices do not tell the whole story.

The speed and scope of the society-wide rise in childhood health problems suggest a complex interaction of genetic, behavioral and environmental variables. Researchers are beginning to tease apart these interactions to more fully understand how exposure to environmental contaminants are involved.

We examine here the rapidly emerging science exploring how pesticides may contribute to the recent rise in childhood obesity, diabetes and asthma. Additional studies are included and described in Appendix A.

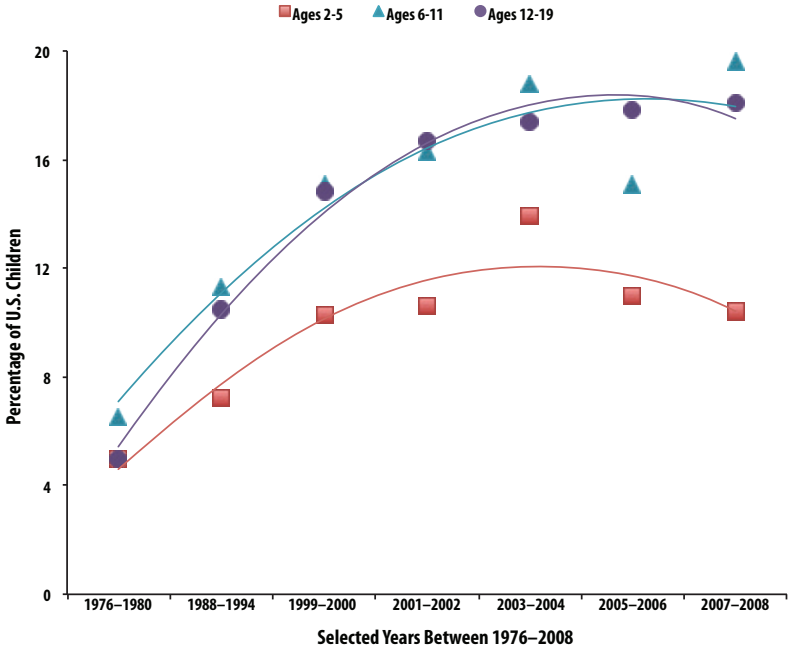
Childhood obesity, diabetes & disrupted metabolism

The recent dramatic rise in childhood obesity in the U.S. has the focused attention of health specialists and the public. The number of clinically obese children has more than tripled in the past 30 years, with obese children ages six to 11 jumping from seven percent of the total in 1980 to nearly 20 percent in 2008. The percentage of obese adolescents (12–19 years old) increased from five to 18 percent over the same period (see Figure 6).[93, †]

Obesity is closely linked to childhood diabetes, which is also on the rise. According to the National Institutes of Health, about 215,000 Americans under the age of 20 had diabetes in 2010—up from roughly 123,000 in 1990.[94, 95]

In addition to increasing related health risks, both obesity and diabetes can have a negative effect on quality of life in terms of ability to engage in physical activities, societal acceptance and self-image.

Figure 6: Prevalence of Obesity among Children Ages 2 to 19 between 1976–2008



Prevalence of obese U.S. children ages 6 -11 jumped from 7 percent in 1980 to 20 percent in 2008, while the percentage of obese adolescents increased from 5 to 18 percent. Source: Center for Disease Control, "Prevalence of Obesity Among Children and Adolescents: United States, Trends 1963-1965 Through 2007-2008."

The Science

So much new science exists around the links between obesity and environmental contaminants that a new term, "obesogen" (like carcinogen) has emerged in the literature.‡ Findings increasingly suggest that exposures to pesticides and other chemicals play a role by altering developmental programming in ways that raise the likelihood of obesity and related metabolic effects such as diabetes.[96]

In 2002, Baillie-Hamilton reviewed data suggesting that the obesity epidemic coincided with the marked increase in usage of industrial chemicals, including pesticides, over the past 40 years (see Figure 7). The author suggested that pesticides and other industrial chemicals potentially cause weight gain by affecting the hormones that control weight, altering sensitivity

* CDC points to estimates that U.S. children spend an average 4.5 hours a day watching television and 7.5 hours using entertainment media (TV, computers, video games, cell phones and movies) as a contributing factor to childhood obesity. See http://www.cdc.gov/obesity/childhood/problem.html

† See CDC's "History of State Obesity Prevalence" showing trends in adult obesity by state from 2000-2010, at the bottom of this page: http://www.cdc.gov/obesity/data/adult.html

‡ See Wendy Holtcamp's review article, "Obesogens: An Environmental Link to Obesity" *(Environmental Health Perspectives,* Feb. 2012) for an overview of the current literature. Available online at http://ehp03.niehs.nih.gov/article/info%3Adoi%2F10.1289%2Fehp.120-a62#r13.

to neurotransmitters, or altering the activity of the sympathetic nervous system.[97]

In the 10 years since this review, many studies have linked exposure to endocrine-disrupting chemicals with increased incidence of obesity and diabetes.[98] The National Institutes of Health is offering grants to study "the role of environmental chemical exposures in the development of obesity, type 2 diabetes and metabolic syndrome,"[99] and the National Children's Study, an ongoing 21-year prospective study of 100,000 U.S. children, is now exploring the hypothesis that prenatal exposures to endocrine disruptors are linked to obesity.[100]

- In one animal study, rats exposed to low-level doses of the organophosphate pesticide chlorpyrifos early in life developed metabolic dysfunction resembling pre-diabetes.[101]
- In Denmark, children exposed prenatally to pesticides through their mothers' work in greenhouses had significantly higher BMI (body mass index) scores than greenhouse worker mothers who were not occupationally exposed, with highly exposed children also having larger skin folds and higher body fat percentages.[102]
- Exposure to the pesticide lindane* during childhood has been linked with increased abdominal fat, increased waist circumference, higher BMI and fat mass percentage in adults.[103]
- Organochlorine pesticide exposure† can be a predictor of developing type 2 diabetes later in life, particularly among obese individuals. Serum concentrations of organochlorines were strongly associated with type 2 diabetes, and the association was stronger among obese persons than non-obese persons.[104]
- Obese children are more likely to have higher concentrations of 2,5-DCP in their urine, a metabolite of the pesticide found in mothballs (p-dichlorobenzene). This correlation was observed in data from the National Health and Nutrition Examination Survey (NHANES).[105]

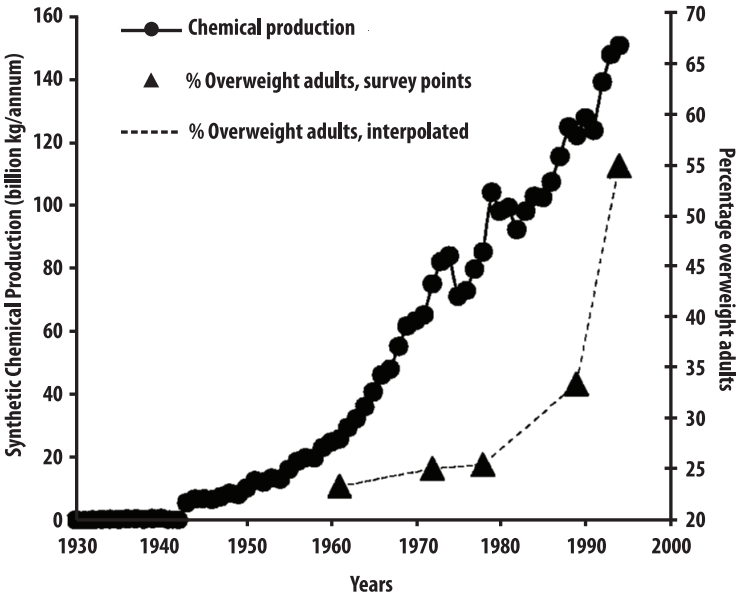
A number of specific genes have been identified as contributing to obesity, with several thought to specifically contribute to obesity in children. Such genes may play a role in regulating metabolic hormones.[106]

Scientists are now investigating the role of environmental factors (such as exposure to pesticides) in influencing the expression of such genes. Such "epigenetic" changes can include the expression of genes that are typically "silent," or inactivation of a gene that is normally active. Researchers are finding that some of these changes can be passed from one generation to the next (see sidebar).[107]

* Lindane, an organochlorine insecticide, is slated for global phaseout under the Stockholm Convention on Persistent Organic Pollutants. Agricultural uses were phased out in the U.S. in 2006; pharmaceutical uses (lice shampoos and scabies treatments) were phased out in California in 2001, but are still allowed in other states.

† Most organochlorine pesticides are now banned in the U.S., and many have been targeted for international phaseout under the Stockholm Convention. Rapid implementation of this treaty will reduce further exposure to these long lasting chemicals that continue to travel the globe on air and water currents.

Figure 7. Chemical Production & the Percentage of Overweight Adults in the U.S.



Researchers note that the obesity epidemic coincides with the increase in use of industrial chemicals, including pesticides, over the past 40 years. Source: Baillie-Hamilton, P.F. "Chemical toxins: a hypothesis to explain the global obesity epidemic." *J Altern Complement Med.* 2002 8: 185–192.

Mechanisms of Harm

Changing gene signals

Many environmental pollutants can strip or add chemical tags to DNA, locking the expression of genes on or off and changing how they function. These changes are called "epigenetic tags," and have been linked to various health effects including early puberty, disrupted ovarian function, death of sperm-forming cells and changes in metabolic rate.

Recent studies suggest that some chemicals can even override the genetic "reset button" that usually protects a developing fetus from such changes being passed from one generation to the next.

Today, more than seven million children have asthma, up from just over two million 30 years ago.

Asthma epidemic affects more than seven million children

Asthma is a chronic disease of the pulmonary system that causes wheezing, breathlessness, chest tightness and coughing. The number of U.S. children with asthma today is much higher than it was 30 years ago, rising from 2.1 million in 1980 to 7.1 million in 2009.[108] Today, it is the most common chronic childhood disease in the U.S. (see Figure 8).

Asthma is the leading cause of hospital admission among urban children, with over 200,000 hospitalizations every year. Asthma is also the top cause of days lost from school, with more than 10.1 million school days missed every year.[109] Missed school days in turn negatively impact academic performance, such that children with severe asthma symptoms are more likely to suffer academically than children with milder symptoms.[110]

Asthma disproportionately affects people of color. Data from 2009 show that roughly one in six (17 percent) non-Hispanic black children had asthma in 2009, the highest rate among any racial/ethnic group. Overall, boys are more likely than girls to suffer from asthma (11.3 vs 7.9 percent) from birth through adolescence. As adults, women are more likely to be asthmatic than men.[111,*]

The Science

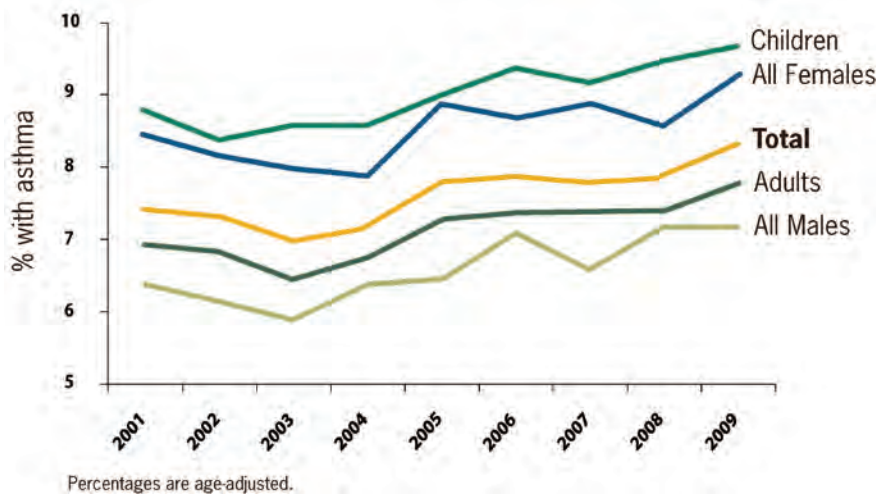
Many studies have explored the relative importance of common "respiratory irritants" in the home environment to triggering the onset of asthma, including cockroaches, dust mites, molds and air pollutants. Many pesticides are considered respiratory irritants,[†] and studies suggest that pesticide exposures may play a role in triggering asthma attacks, exacerbating symptoms, or heightening the overall risk of developing asthma.[112]

Pesticides may also play a role in increasing asthma incidence by affecting the body's immune system, triggering either hypersensitivity or suppression of the body's immune response. Allergic responses, for example, are a hypersensitivity of the immune system to an allergen in the environment.[113]

Numerous studies have documented the association of pesticides and asthma incidence for adults, and more recent studies have examined potential links to both asthma incidence and triggering or exacerbation of wheezing episodes among children.

- In a study of over 4,000 children from 12 southern California communities, exposure to pesticides in the first year of life significantly increased the risk of being diagnosed with asthma by age five.[114]
- A cross-sectional study of 3,291 Lebanese school children found a potential association between childhood asthma and parental occupational exposure to a range of current use pesticides.[115]
- In Spain, children diagnosed with asthma at age six had higher levels of cord serum DDE at birth than children without asthma. And in a study of 343 German children aged 7–10 years who had the DDT breakdown product

Figure 8: Asthma Prevelence by Age and Sex in U.S., 2001–2009



Source Centers for Disease Control and Prevention, Vital Signs: Asthma in the U.S. See http://www.cdc.gov/VitalSigns/Asthma/index.html, viewed May 2012.

* In May 2012, the President's Task Force on Environmental Health and Safety Risks to Children released the *Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities.* The effort lays out a plan to address this crucial public health challenge during the next three to five years. See http://www.epa.gov/asthma/childrenstaskforce.

† See the *Recognition and Management of Pesticide Poisonings* page of EPA's National Pesticide Information Center site: http://npic.orst.edu/health/child.html

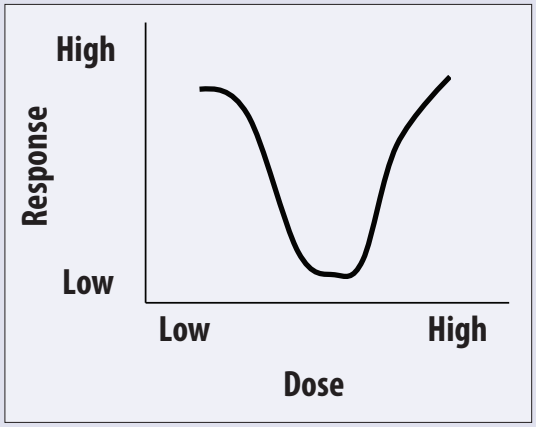
Rethinking "Safe"

Why the dose does not make the poison

Traditional toxicology relied for years on the mantra "the dose makes the poison." We now know that this statement is, in many cases, simply inaccurate. It assumes that the level of harm always increases as the level of exposure goes up (i.e., that every "dose response curve" follows a linear pattern). Assuming a higher dose is always more dangerous, policymakers often base regulations on a level below which no health risks is expected—a "safe" threshold. The reality, as scientists now understand, is quite different.

For some pesticides, the linkage between exposure and effect actually follows a ∪-shaped curve. In this scenario, a very low dose elicits a high level of "response" or health harm. At a higher dose that is along the bottom of the ∪, this same chemical elicits little or no response. Then at the highest doses, the effects increase again. For other pesticides, an inverted ∪–shaped curve can occur, where intermediate doses cause the greatest response, and testing at high doses can completely miss the effect.

Given these complex dose-response patterns, picking a threshold dose—below which exposure can always be considered "safe"—is simply not possible. Throw into the mix the dramatic differences in how sensitive individuals may be to chemical exposures, plus the vulnerabilities of children at particular times during development, and it quickly becomes clear that it is much more than the "dose" that determines how much harm a pesticide will cause.*



* Vandenberg, L., T. Colborn, T. Hayes, J. Heindel, D. Jacobs, D.H. Lee, et al. "Hormones and Endocrine-Disrupting Chemicals: Low-Dose Effects and Nonmonotonic Responses." *Endocrine Reviews*. March 2012 33(3): 378-455.

DDE present in their blood, the risk of having asthma was significantly higher.[116, *]

- Childhood exposure to organophosphate, carbamate and pyrethroid insecticides may trigger or exacerbate asthma symptoms among children by promoting bronchial constriction.[117]

Recognizing the rising prevalence of asthma among U.S. children, Dr. David Schwartz recently called on fellow researchers to focus more attention on the potential links between exposure to air pollutants and environmental contaminants like pesticides and childhood asthma.[118]

* These measurements were taken from blood serum and were thought to represent early life or prenatal exposures, but the actual route of exposure was not known.

4 Critical Junctures

Children exposed just as they are most vulnerable

Children cannot make choices about their environment; it is up to adults to make the right decisions to ensure that they are protected. — Dr. Lynn R. Goldman

Environments we would like to consider "safe" often bring children into contact with pesticides and other chemicals that have been linked to health harms. Many chemicals pass across the placenta into the womb, where they become part of the first environment of a developing fetus. In the months after birth, infants begin to explore their new world, often testing new sights and smells by touching and bringing objects to their mouths. When harmful chemicals are present, they are often taken in.

The environments of toddlers and school-age children expand to include daycare centers, classrooms, playing fields and parks, all of which may offer risk of pesticide exposure. Residues on and in food—from breastmilk to the highchair to the school lunch tray—are also an important source of pesticides throughout childhood.

Many pesticides can pass across the placenta into the womb, where they become part of the first environment of a developing fetus.

Physiological systems undergo rapid development at various stages of childhood, in finely tuned processes often triggered and orchestrated by hormones. During this same period, children take in more food, water and air than adults pound-for-pound, and their biological systems are less able to process harmful contaminants than adults.

In short, the multiple pathways of pesticide exposure mean that in a given day, a child may absorb a wide range of potentially harmful chemicals just as their young bodies are at their most vulnerable.

Fetal pesticide exposures can have life-long effects

Exposure to pesticides has been clearly documented during one of a human organism's most vulnerable stages: fetal development.

Pesticides that have accumulated for years in an expectant mother's body—stored in blood and fatty tissues—can be mobilized during pregnancy and cross the placental barrier. A mother's exposures to pesticides during pregnancy add to this chemical mixture in the womb.[119]

Many studies have documented the pesticide load newborns bring with them into the world. Researchers in New York documented pesticides and their breakdown products in umbilical cord blood of more than 80 percent of newborn infants tested.[120] One 2001 study found metabolites of organophosphate pesticides in 100 percent of the cord blood samples taken.[121] A pilot study of amniotic fluid also found organophosphate metabolites, providing further evidence of fetal exposure.[122]

Pesticide residues from the food mothers eat during pregnancy have also been found in infants. A recent Canadian study showed that when pregnant women consumed soybeans, corn and potatoes that had been genetically modified for use with particular herbicides, metabolites of one of the herbicides showed up in cord blood of 100 percent of their babies.[123] *

Fetal development is almost entirely controlled by the expectant mother's hormones, acting at very low levels to trigger and control growth of the various systems of the body. Some chemicals—including many pesticides—mimic hormones and so interfere with natural developmental processes. This disruption of hormone function can lead to irreversible life-long effects including birth defects or learning disabilities in childhood, or adult onset cancer or infertility later in life (see sidebar, p. 17).[124]

Pesticide exposures common at home, daycare & school

Pesticides tend to be especially persistent in the indoor environment where sunlight, rain, soil microorganisms and high temperatures cannot degrade them, which means longer windows of exposure.

At home & in daycare facilities

Infants and toddlers have busy hands that often reach their mouths, and they commonly play on or near the floor—so

* The women in the study were in urban environments, and had no contact with the herbicides beyond residues on or in their food.

Children as Farmworkers

Some children are exposed to pesticides as they work in agricultural fields. Specific rules vary from state to state, but federal law allows children under 12 to do field work outside of school hours on farms where their parents are employed.*

Age restrictions for hazardous work such as applying pesticides are more lenient in the agriculture sector, and age restrictions simply do not apply for children working on farms owned or operated by a parent or guardian.

Documenting the exact number of child workers in U.S. agriculture is difficult, and estimates vary widely. A Human Rights Watch report published in 2000 put the number somewhere between 300,000 and 800,000.† The nonprofit group Toxic Free North Carolina recently documented the experience and voices of young farmworkers facing pesticide exposure in the field; the stories can be viewed at www.panna.org/youngfarmworkers.

* U.S. Dept. of Labor. "Child Labor Requirements in Agricultural Occupations Under the Fair Labor Standards Act." June 2007. See http://www.dol.gov/whd/regs/compliance/childlabor102.htm.

† Human Rights Watch. *Fingers to the Bone: United States Failure to Protect Child Farmworkers.* Washington: Human Rights Watch, 2000.

National Center for Farmworker Health. *Child Labor.* Buda, Texas. 2009. See www.ncfh.org/docs/fs-Child%20Labor.pdf

Davis, S. and J.B. Leonard, *The Ones the Law Forgot: Children Working in Agriculture,* Farmworker Justice, Washington DC. 2000.

when pesticides are used in homes or daycare facilities, exposure is a near certainty. Inhaling spray droplets, vapors or pesticide-contaminated dust from indoor use of pesticide products is one of the primary routes of exposure for many U.S. children. Pesticides used to control ticks and fleas on pets are another important source of children's exposure.[125]

One Massachusetts study found residues of DDT in house dust many decades after use of the chemical had been discontinued.[126] Even pesticides that are relatively short-lived in the environment are more persistent indoors; one study found the semi-volatile insecticide chlorpyrifos to be longer lasting than expected in closed apartments, detectable for more than two weeks on rugs, furniture, soft toys and pillows.[127] Pesticide vapors often settle after application indoors, so levels tend to be highest in the infant breathing zone.[128]

Exposure from home lawns and gardens or outdoor play areas at daycare centers can also be significant. Children often roll and play on lawns and sit or lie on bare soil, and toddlers are known to put dirt directly into their mouths.[129] If pesticides have been used in these areas, the likelihood of ingestion or inhalation is high.

In rural communities, the risk may be compounded by drift from nearby agricultural fields. A study conducted in Washington State found residues of several agricultural pesticides—including chlorpyrifos and ethyl parathion—in outdoor play areas.[130] Air monitoring studies using PAN's Drift Catcher in

Evidence shows that when pesticides are used at home, on pets or in daycare centers, children's exposure is a near certainty.

California and Minnesota have documented a range of agricultural pesticides in backyards and play areas as well.[131, 132]

Rural infants and toddlers also face potential exposure from drift directly into their homes, and from pesticide contamination of water supplies. Water sampling results from Illinois, Nebraska, Iowa and Minnesota detected the common herbicide atrazine at levels above those linked to low birth weight.[133] Young children in farmworker families face additional exposure from residues carried into the home on the bodies and work clothes of working family members.[134]

At school & on playgrounds

Pesticides used in school buildings can settle on desks, books, counters and walls. When children touch contaminated surfaces, they may absorb chemical residues that can remain in the school environment for days. Herbicides used to keep playing fields free of weeds may be picked up on children's hands, bodies, clothes and tennis shoes, or drift into classrooms after application.

According to one recent national review, of the 40 pesticides most commonly used in schools, 28 are probable or possible carcinogens, 26 have been shown to cause reproductive effects, 26 damage the nervous system, and 13 have been linked to birth defects.[135]

In rural areas, pesticides often drift into schoolyards during and after spraying on nearby fields. Community air monitoring studies across the country using the Drift Catcher device have documented pesticides in or near school grounds in agricultural communities,[136] and incidents of pesticide poisonings in schools are not uncommon. For example:

- In Florida, high school students used a Drift Catcher to measure the pesticides endosulfan, diazinon and trifluralin* drifting into the school from nearby cabbage fields.[137]

* Endosulfan is currently being phased out in the U.S., and also globally under the Stockholm Convention on Persistent Organic Pollutants. See http://www.epa.gov/oppsrrd1/reregistration/endosulfan/endosulfan-cancl-fs.html.

- Schoolchildren in Strathmore, CA were exposed to pesticides sprayed in a neighboring field, feeling dizzy and falling sick in November, 2007.[138]
- Seven children were hospitalized and a total of 11 people sickened in Kahuku, Hawaii, in 2007, when fumes from an organophosphate insecticide drifted over the school from a nearby sod farm.[139]

Pesticide use on playing fields has raised concerns among families and environmental health advocates nationwide. The National Coalition for Pesticide-Free Lawns notes that "the common, everyday practices used to maintain our children's playing fields are unintentionally and unnecessarily exposing them to carcinogens, asthmagens, and developmental toxins," and calls for a shift to organic turf management on playing fields across the country.[140]

Pesticide residues, from breastmilk to the school lunch tray

Pesticide residues in food and drink are a key source of constant, low-level exposure to mixtures of pesticides throughout childhood.

Nature's Finest, Compromised
Pesticides in breastmilk

Human breastmilk is without doubt the best source of nutrition for infants, offering the perfect combination of fats, carbohydrates and proteins for developing babies. It also offers protection from infection, increases resistance to chronic disease and contributes to the emotional wellbeing of both infant and mother.

But decades of breastmilk sampling also leaves no doubt that around the world, nature's perfect food for infants is compromised by pesticides and other toxic chemicals. Today there is no corner of the planet where human breastmilk remains pure. The chemicals found in a mother's milk represent a combination of long-lasting pesticides and industrial pollutants that have accumulated over a lifetime (many of which the body tends to store in fatty tissues), and shorter-lived chemicals that a woman is exposed to during pregnancy and breastfeeding.

This chemical burden is transferred to nursing infants just as their bodies are most vulnerable to chemical harms. The good news is that analysis of decades of banked breastmilk in Sweden shows that bans on specific chemicals can result in rapid and dramatic decreases in the levels of some of those compounds in human milk.*

* Norén K., D. Meironyté. "Certain organochlorine and organobromine contaminants in Swedish human milk in perspective of past 20-30 years." *Chemosphere.* May-Jun 2000;40(9-11):1111-23. See http://www.ncbi.nlm.nih.gov/pubmed/10739053.

Natural Resources Defense Council. "Healthy Milk, Healthy Baby: Chemical Pollution and Mother's Milk." See www.nrdc.org/breastmilk.

Children take in more food, water and air than adults pound-for-pound, just as their bodies are less able to process harmful contaminants.

Studies from around the world have documented pesticides in human breastmilk, though experts agree it remains the best source of nutrition for infants (see sidebar). Baby foods and fruit juices consumed by infants and toddlers tend to be highly processed, which can sometimes concentrate pesticide residues existing on the fresh produce.[141] U.S. researchers measuring pesticides in baby foods found low-level residues of many pesticides, including eight known to be toxic to the nervous system, five that disrupt hormones and eight that are potential carcinogens.[142]

Food consumed by school-age children can also contain pesticide residues. Researchers examining the diets of urban children found that 14 percent of the foods sampled contained at least one organophosphate pesticide. In total, 11 different organophosphates and three pyrethroids were found.[143] USDA residue sampling of produce commonly eaten by children—such as carrots, apples and peaches—found metabolites of dozens of different pesticides in each of these foods over the course of their testing (26 found in carrots, 42 in apples and 62 in peaches).*

Pesticides directly measured in children's bodies also tell a story about the importance of dietary exposure. Researchers compared levels of organophosphate metabolites in the urine of children who were eating organic fruit, vegetables and juice with children eating conventionally farmed produce. They found that those with more organic diets had metabolite levels six times lower than those with conventional diets.[144] Other studies show that when families switched to organic fruits and vegetables, metabolites of the insecticides chlorpyrifos and malathion fell quickly to undetectable levels.[145]

The widespread presence of pesticide metabolites in children's bodies,[146] combined with studies showing that changes in these levels are linked to changes in dietary exposure, make a very clear case that pesticide residues in food are a consistent source of children's daily intake of a mixture of pesticides.

* These numbers do not necessarily reflect residues on a single sample. See USDA data at www.whatsonmyfood.org.

Why children are particularly vulnerable

So what do all of these well-documented pesticide exposure pathways mean for children's health?

In their first six months of life, children take in roughly 15 times more water than the average adult per pound of body weight.[147] Children also inhale more air. Up to around age 12, a child's breathing rate is roughly twice that of an adult, which means a child will inhale roughly double the dose of a pesticide in the air from spray drift or household use.[148]

Exposure to pesticides occurs largely through touching, inhaling or ingesting. For each of these routes, children are much more likely to absorb what they come into contact with than adults. The skin of infants and young children, for example, is particularly permeable, and the skin surface area relative to body weight is much greater in children than adults.[149] The lung surface area relative to rate of breathing is also higher among children,[150] and absorption levels in the gastrointestinal tract are also greater (especially for alkaline pesticides), as adult levels of gastric acid are not reached until a child is about two years old.[151]

As noted above, the brain and nervous system are especially vulnerable during fetal development and for the first six months of life. During this period the blood-brain barrier,* which provides the adult nervous system some protection from toxic substances, is not yet fully developed.[152]

Finally, young bodies are less equipped to process and excrete harmful chemicals as the liver and kidneys—the body's primary detoxifying organs—are not yet fully developed. Levels of enzymes that help the body process chemicals are also not yet at full strength (see sidebar). Genetic variations lead to tremendous range in the production of these protective enzymes—with some newborns as much as 164 times more vulnerable to chlorpyrifos than less sensitive adults.[153]

According to researchers, this finding alone means that most, if not all infants and toddlers—as well as a subpopulation of adults—are much more likely to have adverse health effects from organophosphate exposure. Policies that don't account for this variability fail to protect the most vulnerable, leaving many children in harm's way.

Mechanisms of Harm

When enzymes don't detoxify

Enzymes are proteins that catalyze reactions on a molecular level, and there are many that occur naturally in the human body. Without enzymes to catalyze reactions, some of the chemical reactions that make up the normal functioning of our body could take much longer, or not happen at all.

One key human enzyme, known as paraoxonase 1 (or "PON1"), catalyzes the metabolic process that renders organophosphate pesticides and other compounds less harmful to our systems. Researchers say infants have very low levels of this enzyme up to age two, and children don't reach adult PON1 levels until about age seven.* This suggests that children are less protected from harmful contaminants by enzyme activity, and newborns may be especially vulnerable.

There is also tremendous natural variability in the level and effectiveness of the PON1 enzyme, which means some individuals are much more susceptible to health harms of organophosphate pesticides and other contaminants.†

* Huen K., K. Harley, A. Bradman, B. Eskenazi, N. Holland. "Longitudinal changes in PON1 enzymatic activities in Mexican-American mothers and children with different genotypes and haplotypes." *Toxicol Appl Pharmacol.* 2010. 244(2):181-9. See http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2846980/?tool=pubmed

† Holland, N., C. Furlong, M. Bastaki, R. Richter, A. Bradman, K. Huen, et al. "Paraoxonase Polymorphisms, Haplotypes, and Enzyme Activity in Latino Mothers and Newborns." *Environ Health Persp.* July 2006 114 (7): 985–991. See http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1513322/.

The human body undergoes rapid growth and development throughout childhood, with many processes vulnerable to disruption from pesticides and other chemicals.

* The blood-brain barrier is made up of high-density cells that protect the brain from potentially harmful substances circulating in the bloodstream.

5 Case Studies
Communities win protections for children

What we love we must protect. — Sandra Steingraber

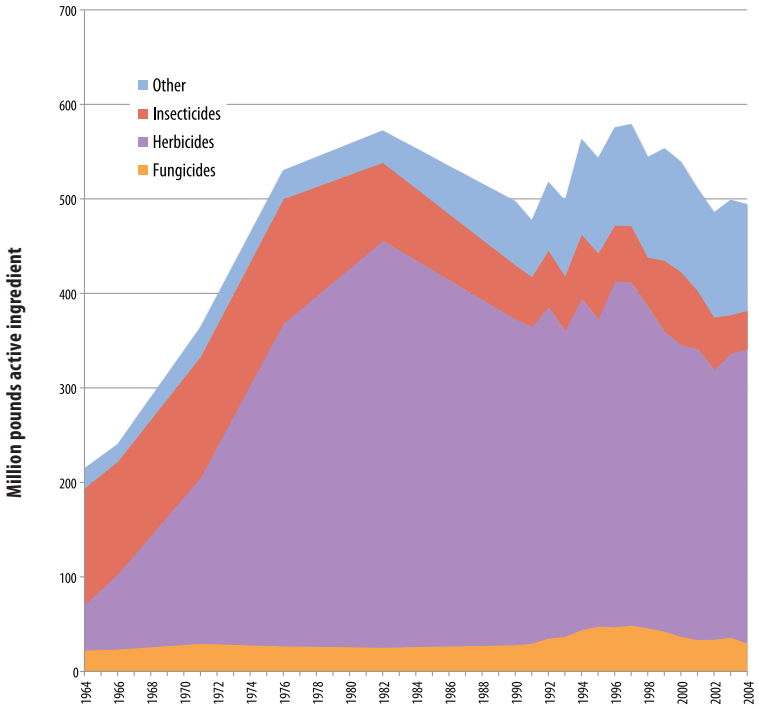
Since the middle of the last century, the overall increase in pesticide use in this country has been steady and dramatic. As documented above, these pesticides are a critical contributor to many of the chronic diseases and disorders now affecting our children.

To address the unique vulnerability of children, concerned communities, public health officials and advocates are beginning to put policies in place at the state and local level that reduce the use of harmful pesticides. In this chapter we provide a brief overview of U.S. pesticide use patterns and trends, and highlight on-the-ground stories of successful efforts to protect children from exposure in their early environments.

Pesticide use now 1.1 billion pounds yearly

Since 1945, use of herbicides, insecticides and other pesticides has grown from less than 200 million to more than 1.1 billion pounds per year, with well over 1,000 chemicals registered and formulated into more than 20,000 pesticide products (see Figure 9). This does not include pesticides used as wood preservatives or specialty biocides (in plastics and paints, for example). If these products are included, the number jumps to more than five billion pounds annually.[154, 155, 156]

Figure 9: Pesticide Use on Major Crops, 1964–2004



Source: "Land and Farm Resources: AREI, 2006 Edition," USDA Economic Research Service

Pesticide use in agriculture

The majority of pesticides are used in agricultural fields, with weed-killing herbicides being the highest by volume. Soil fumigants, which are injected as a gas into soil before planting to kill weeds, insects and fungi, are used at particularly high volumes and have a tendency to drift after application. Use of organophosphate insecticides, which gained widespread use in the 1980s as replacement chemicals for long-lasting organochlorine pesticides (such as DDT, chlordane and aldrin) has gradually declined in recent years.

In part to address growing concerns about organophosphate toxicity, a group of insecticides called pyrethroids were marketed as "safer" and gained widespread use in the 1990s, and use has grown rapidly. According to the American Chemical Society, use of pyrethroids in California (agricultural, structural and landscape maintenance applications) almost tripled from 1992 to 2006.[157] Recent research suggests that pyrethroids may be more harmful to humans than originally believed, acting as developmental neurotoxicants, endocrine disruptors and carcinogens.[158, *]

Another class of pesticides now in widespread and rapidly rising use is neonicotinoids. Most neonicotinoids show much lower toxicity in mammals than insects, but emerging science demonstrates that many may also have neurodevelopmental effects, and some are considered likely carcinogens by EPA.[159] These pesticides are considered 'systemic,' which means they are often applied at the root (as seed coating or drench) and are then taken up through the plant's vascular system. Systemic pesticides on food cannot be washed off.

Neonicotinoid pesticides have been linked with honey bee colony collapse disorder and bee kills, and several products have been banned in European countries for this reason. One neonicotinoid, imidacloprid, is now one of the most widely used insecticides in the world.[160]

* Ten years' worth of adverse-reaction reports (filed by manufacturers) show that pyrethrins and pyrethroids together accounted for more than 26 percent of all fatal, "major," and "moderate" human pesticide poisoning incidents in the U.S. in 2007, up from 15 percent in 1998. See http://apps.cdpr.ca.gov/calpiq/calpiq_input.cfm to see the primary data; for data analysis, see http://www.iwatchnews.org/environment/health-and-safety/perils-new-pesticides.

Pesticide use at home

While 80 percent of all pesticides are applied in agricultural fields, use in homes, gardens, playgrounds, schools, hospitals and other buildings is also significant—and as noted above, such uses pose a particular risk to children's health.

In 2007, an estimated 78 million pounds of pesticides (measured by active ingredient) were applied in homes and gardens across the country, with the herbicides 2,4-D and glyphosate (RoundUp) topping the list.[161] The household pesticide product industry has an estimated annual net worth of $1.4 billion; according to EPA, more than 78 million households—roughly 74 percent of all households in the U.S.—report using pesticides at home (see Table 5).[162]

Many home-use insecticides contain pyrethroids, and the chemicals are used extensively in homes where the potential for exposure to children is very high. Researchers from Emory University and the CDC found that even children fed an exclusively organic diet had pyrethroid metabolites in their systems after their parents had used pyrethroid insecticides in their homes.[163]

Neonicotinoid products are widely used in pet products to control fleas and ticks—another use which poses particularly high exposure risks for children.[164]

Safer pest control at schools & daycare centers

More than 3,000 pesticide products are currently approved for use in schools;[165] yet current national pesticide rules do not address the use of pesticides in and around schools or daycare centers. The federal School Environmental Protection Act (SEPA) was first introduced in November 1999 in an attempt to address this oversight—and it continues to be debated in Congress today.

In the non-profit sector, the national Children's Environmental Health Network (CEHN) moved to fill this gap by creating the Eco-Healthy Child Care (EHCC) program to provide tools that facilities need to create environmentally healthy spaces for children. Today, the program endorses over 1600 "Eco-Healthy" daycare facilities across the country and provides this list to parents online.*

To protect children's health, several states have put policies in place prohibiting the use of pesticides on playing fields and playgrounds.

Meanwhile, several states are moving forward with policies designed to protect children from pesticides in these early environments.

- In 2005 Connecticut lawmakers prohibited use of pesticides on K–8 lawns and playing fields; in 2009, the law was extended to daycare center grounds. Through this policy, schools have successfully implemented organic turf programs in various municipalities.[166]
- New York followed suit in 2010, signing the Child Safe Playing Fields Act into law to ban the cosmetic use of pesticides on playgrounds and sports fields at schools (including high schools) and daycare centers.[167]

Table 4: Pesticide Usage in All Market Sectors, 2007

Pesticide Class	Active Ingredient
Herbicides	531 million lbs
Insecticides	93 million lbs
Fungicides	70 million lbs
Fumigants/Nematicides	133 million lbs
Other	30 million lbs
Total	*857 million lbs*

Herbicides are the most commonly used type of pesticide in the U.S., with 531 million pounds of active ingredient applied in 2007. Source: *Pesticide Industry Sales & Usage, 2006 and 2007 Market Estimates*, U.S. EPA, Washington, DC Feb 2011. See www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf.

Table 5: Households Using Pesticides

Pesticide Type	# Households
Insecticides	59 million
Fungicides	14 million
Herbicides	41 million
Repellents	53 million
Disinfectants	59 million
Any pesticides	78 million

According to EPA, more than 78 million households—roughly 74 percent of all households in the U.S.—use pesticides at home. Source: EPA estimates based on the 1992 EPA National Home and Garden Survey and 2000 U.S. Census Bureau population estimates (www.quickfacts.census.gov/qfd/states).

* See http://www.cehn.org/ehcc for more information about this program.

At What Cost?

Economic impacts of health harms

The impact on families of caring for—and sometimes losing—a child in ill health cannot be reflected in monetary terms. Nor can the incalculable costs of lowered IQ, lost opportunities and social alienation that can accompany developmental effects. But actual costs of providing medical care for a child with a chronic condition or illness can be calculated, and according to public health officials, health care costs for childhood diseases are significant. Here are some examples:

ADHD: Researchers estimate annual ADHD health care costs in the U.S. to be between $36 and $52 billion (in 2005 dollars).*

Autism: One analyst at the Harvard School of Public Health estimates that it costs $3.2 million to care for an autistic person over their lifetime.†

Cancer: The total costs per case of childhood cancer—from treatment, to laboratory costs to lost parental wages—is an estimated $623,000 per year.‡ This translates into a society-wide cost of roughly $6.5 billion annually for the 10,400 newly diagnosed cases each year.

Asthma: Families nationwide pay a combined total of $14.7 billion dollars a year on medical care costs of asthma.§, ¶ The combined direct and indirect costs of asthma to the U.S. economy were an estimated $19.7 billion in 2007.**

Society-wide costs also include higher educational costs for public school systems to meet the needs of children with neurodevelopmental disorders, missed school days (and thus less well-educated students) caused by asthma, and the general productivity losses due to time parents and caregivers take off from work to care for an ill child.

The numbers above do not take into consideration the loss to individuals, families and society as a whole of children not reaching their full physical or intellectual potential. The overall impact of lost creativity, productivity, problem-solving skills and civic engagement, along with higher rates of social alienation and disruption, cannot be overstated.

* Pelham W., E.M. Foster and J.A Robb. "The Economic Impact of Attention Deficit/Hyperactivity Disorder in Children and Adolescents" *Journal of Pediatric Psychology.* 2007. See http://jpepsy.oxfordjournals.org/content/32/6/711.full.pdf+html.

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‡ Landrigan, P. J., C.B. Schechter, J.M. Lipton, M.C. Fahs and J. Schwartz. "Environmental pollutants and disease in American children: estimates of morbidity, mortality, and costs for lead poisoning, asthma, cancer, and developmental disabilities." *Environ. Health Perspect.* 2002; 110, 721–728.

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- Many school districts in California have significantly reduced pesticide use after a 2000 state law required pesticide reporting and provided incentives for adoption of IPM. School districts in Los Angeles, San Francisco, Santa Barbara and Palo Alto have made particular progress.[168]
- In 2001, California legislators passed a law (AB 947) allowing county agricultural commissioners to restrict pesticide spraying near sensitive sites, including schools and daycare facilities. Under this provision, communities in Tulare County won new rules in 2008 requiring a quarter mile buffer zone banning the aerial application of restricted-use pesticides around schools when they are in session or due to be in session within 24 hours, occupied farm labor camps and residential areas.[169] Kern, Stanislaus, Merced and Fresno counties enacted similar rules in subsequent years.

Pesticide-free school lunches

Currently, neither state nor national policies are in place to reduce pesticide residues in school lunches. But many communities across the country are leading the way to provide children with nutritious school lunches including fresh (sometimes locally produced) fruits and vegetables free from pesticides.

- In Washington state, the Olympia School District has implemented an Organic Choices Salad Bar (25 percent of the produce is purchased directly from local farms and 50 percent of the salad bar is organic), and the Orcas Island Farm-to-Cafeteria Program integrates produce from local, organic farmers and a school garden, and hosts student chef competitions.
- In Minnesota, the White Earth Land Recovery Project added a farm-to-school component in the 2007–2008 school year to their Mino-miijim (Good Food) Program to help reach their goal of food sovereignty on the reservation and promote access to fresh, local and organic ingredients.[170]
- Berkeley, California's Edible Schoolyard (ESY) Project began as a one-acre "interactive classroom" providing primarily organic, fresh fruits and vegetables for student's meals at King Middle School. It has grown into an online initiative building and sharing a food curriculum, and it has inspired similar programs across the country.[171]

Many of these programs are part of the National Farm to School Network (NFSN), which connects K–12 schools across the country with local farms in an attempt to serve healthy meals at school lunch tables while supporting local, often organic, farmers.[172]

Parks & playgrounds without pesticides

Communities across the country are choosing to manage public parks and playgrounds without harmful pesticides. In the Pacific Northwest, 17 cities are phasing out pesticide use with the creation of 85 pesticide-free parks and playgrounds, building momentum for strong policies at the local level despite legislative hurdles (see sidebar on following page).[173]

Farm-to-school programs across the country are providing children with fresh, pesticide-free fruits and vegetables in school cafeterias.

Seattle in particular has emerged as a pioneer of pesticide-free cities, dramatically reducing its pesticide use in parks by an estimated 80 percent since the 1970s. In 1999, they adopted a pesticide reduction strategy for all city departments and designated 14 pesticide-free parks.[174] The program is now expanding to 22 parks and 50 acres distributed throughout the city.[175]

On the other side of the country, New Jersey legislators unanimously voted in 2011 to pass "The Child Safe Playing Field Act" prohibiting pesticide use on all municipal, county and state playgrounds and playing fields, as well as daycare and school grounds.[176]

Many other communities across the country are following this trend. From a pilot program in Lawrence, Kansas to innovative communities throughout Oregon, California and Colorado, cities are creating pesticide-free parks and playgrounds for children to safely enjoy.

The Pre-emption Law Hurdle & Canada's Local Pesticide Bans

As of 2010, 40 states had pre-emption laws specifically prohibiting municipalities from passing local pesticide ordinances that are stricter than state policy. These laws, which are strongly supported by the pesticide industry, limit the ability of city or county governments to ban or restrict pesticide use.

Such pre-emption laws do not exist in Canada. Over the past 20 years, dozens of Canadian cities have used their local authority to outlaw the application of home and garden pesticides for "cosmetic" purposes such as lawn care.

In 1991, the municipal council of Hudson, Canada, enacted the first ban on cosmetic uses. Similar local bans were adopted across the country, and today more than 170 Canadian cities and towns have passed full or partial bans on pesticide use, and the provinces of Quebec, Nova Scotia and Ontario have enacted comprehensive cosmetic pesticide bans. According to Canadian community activists, more than 22 million Canadians (65% of the population) are now protected from exposure to cosmetic pesticides.*

* Pesticide Free B.C. "Pesticide Bylaw Communities Across Canada." See http://www.pesticidefreebc.org/index.php?option=com_content&view=category&layout=blog&id=53&Itemid=72. Viewed July 2012.

6 Investing in a Healthier Future

A solid start for our children must be a national priority

Those who argue that societies cannot afford to make immediate investments in reducing environmental pollution fail to appreciate that there are some forms of harm that cannot be repaired. — Deborah Axelrod, Devra Lee Davis & Lovell A. Jones

As a nation, we value the wellbeing of our children. In addition to our natural urge to protect what we love, we know that at a societal level their success is key to a vibrant, secure future. Poll after poll shows more than 80 percent of Americans consider healthy children a top priority.[177] We must line up our practice and policies with these values.

Our current use of over a billion pounds of pesticides every year puts their wellbeing at risk and, as the science demonstrates, can derail brain and body development and rob them of their full potential.

If there were no other way to control pests, it would be one kind of choice: weighing one set of needed benefits against known and evolving harms. But given the fact that there are many proven ways to control pests without use of harmful chemicals, the choice is quite clear. It is time to have policies in place that better protect our children (see sidebar).

The National Research Council recommended swift action to protect children from pesticides nearly 20 years ago, and it has been 50 years since Rachel Carson sounded the initial alarm about the health harms pesticides can cause. What is standing in the way?

Pesticide industry well served by current policies

Our current system of industrial agriculture and pest control relies on chemical inputs sold by a handful of corporations. These multinational corporations wield tremendous control over the system, from setting research agendas[178] to financing, crop selection and inputs throughout the production and distribution chain.

Not surprisingly, these same corporations also hold significant sway in the policy arena, investing millions of dollars every year to influence voters, lawmakers and regulators at both the state and federal level to protect the market for pesticides.[179]

The result is agriculture, food and pest control systems that serve the interests of these corporations well. It does not, however, serve farmers, who have lost day-to-day control of their operations and are putting themselves and their families in harm's way. Farmworker interests are not served, as workers are continuously exposed to chemicals known to harm human health.

And the health of children across the country is compromised by exposure to pesticides used to control pests in agriculture and where they live, learn and play.

In short, the system is broken.

Prioritizing children's health requires real change

The best way to protect children from the harms of pesticides is to dramatically reduce the volume used nationwide. This would not only limit children's exposure during their most vulnerable years, it would also lower pesticide levels in the bodies of men and women of childbearing age—protecting current and future generations in one fell swoop. Those pesticides most harmful to children should be first on the list.

This is not a small change, and not a recommendation made lightly. Yet the science tells us the problem is serious and urgent, and that viable and safer alternatives are available. If we stay on our current path, our children will not reach their full potential as we continue to compromise their health.

U.S. Pesticide Rules

Overdue for overhaul?

A little over 100 years ago, Congress enacted our first national pesticide law. The 1910 Insecticide Act put labeling guidelines in place to protect farmers from "hucksters" selling ineffective, misbranded or adulterated pesticide products.

To this day, we control pesticides through a system of registration and labeling. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), passed by Congress in 1947, is our primary national pesticide law. It has been updated several times in the last 65 years as the health and environmental effects of pesticides came into light, most significantly in 1972 and again in 1996.

It remains, however, a system of registration and labeling, and as such has significant shortcomings. Our current pesticide rules:

- Do not allow for quick response to emerging science;
- Do not assess risk based on real-world exposures;
- Rely heavily on corporate safety data that is not peer-reviewed; and
- Do not encourage the safest form of pest control.

In addition, enforcement of any guidelines or restrictions specified on product labels is relegated to state governments that rarely have adequate resources for the job. Overall, our current rules do not provide adequate tools to protect children from the harms of pesticide exposure.

Informed household food choices can help protect families and grow the market for food that is produced without harmful pesticides—encouraging more farmers to make this shift. And reducing household use of pesticides can provide immediate and long lasting benefits to children's health.* But the burden of protecting children from dangerous chemicals cannot rest solely with individual families. Policy change is required.

Recommendations: Effective policies urgently needed

To protect our children from the health harms of pesticides, policymakers must have much more effective tools. We believe such tools are most urgently needed as decisions are made about these three questions:

- Which pesticides are used in agriculture?
- Which pesticides are used in places children live, learn and play?
- How are farmers supported as they reduce reliance on pesticides?

We recommend the following policy changes in these three arenas:

1. Prevent the pesticide industry from selling agricultural products that can harm children's health

Given the wide-ranging susceptibility of children to pesticide exposures, plus the potential impacts on children from extremely low doses of toxic chemicals, the current approach to assessing and controlling risks of agricultural pesticides does not adequately protect our children.

Decisionmakers must have tools to remove an agricultural pesticide from the market quickly or deny a newly proposed pesticide market access when science suggests it can harm children's developing minds or bodies and there is evidence that children are likely to be exposed. Specifically, we recommend that rulemakers should:

- *Take swift action on existing pesticides:* If studies find a pesticide to be a neurodevelopmental or reproductive toxicant, endocrine disruptor or human carcinogen—*and* it has been measured in humans, in schools or homes, or as residues on food or in drinking water—EPA should target the pesticide for rapid phaseout, triggering USDA resources to assist rapid farmer transitions to safer pest control methods.†
- *Block harmful new pesticides:* EPA should not approve any new pesticide that scientific studies suggest is a neurodevelopmental or reproductive toxicant, endocrine disruptor or human carcinogen—including short-term "conditional" registrations.
- *Prevent harmful low-level exposures:* EPA should act on existing evidence that exposures to endocrine disrupting pesticides pose a particular danger to developing children; the long-delayed endocrine disruptor screening program (EDSP) should be swiftly implemented. At the current rate, it will be 2017 before the first set of *only 58 chemicals* are screened.

The best way to protect children from the harms of pesticides is to dramatically reduce the volume used nationwide.

The insecticide chlorpyrifos provides a clear example of the startling flaws in our regulatory system. Over 10 million pounds of the pesticide are still applied in agricultural

When Is There Enough Evidence to Act?

Scientific studies often identify a "link" or "association" between exposure to a particular pesticide and a specific health harm—but individual studies rarely demonstrate definitive causation. Epidemiological studies often lack statistical power, and case control and animal studies may miss key variables such as exposure timing.

A "weight of the evidence" approach recognizes that a body of scientific work will contain conflicting studies, but holds that when a number of well designed, robust studies come to similar conclusions, the findings should be considered valid.*

When such findings involve widespread, significant and irreversible health harms to our children, the bar for taking action should not be high. When credible evidence of harm emerges, a pesticide product should immediately be taken off the market until its manufacturer can prove its safety. Put simply, it is time the burden of proof shifted to the pesticide corporations, rather than regulators—and the public—as it currently stands.

* In addition to choosing non-toxic approaches to pest control (see PAN's Homes, Pets & Gardens online resource at http://www.panna.org/your-health/home-pets-garden), see also the National Pesticide Information Center's page on Pesticides and Children for suggestions on reducing children's exposure in the home: http://npic.orst.edu/health/child.html.

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Investing in farmers who grow food without relying on chemicals that harm children's health must be a national priority.

fields every year, more than a decade after household uses were withdrawn because of *clear dangers to children's developing brains.*[*] Yet children across the country continue to be exposed—in rural schools and communities, and by eating foods that have been treated with the neurotoxic chemical.

2. Protect children where they live, learn & play

Policymakers need strong tools to protect children from exposure to pesticides where they live, learn and play. Such protections will help keep developing bodies and minds healthy during the years they are most vulnerable to harm from chemical exposures.

We recommend rapid implementation of the following measures:

- *Kid-safe homes, daycares & schools:* EPA should withdraw approval of existing pesticide products and not approve new pesticides for use in homes, daycare centers or schools when scientific evidence indicates the chemicals are possible neurodevelopment or reproductive toxicants, endocrine disruptors or human carcinogens.
- *Safer parks & playgrounds:* State and local officials should enact policies requiring that all public playgrounds, playing fields and parks be managed without using pesticides that studies show are harmful to children's health.
- *Protective buffer zones:* State legislators should establish—or give local governments authority to establish—protective pesticide-free buffer zones around schools, daycare centers and residential neighborhoods in agricultural areas.
- *Healthier school lunches:* Local school districts, state agencies and USDA's Farm-to-school program should provide schools with incentives to procure fresh, local fruits and vegetables that have been grown without pesticides that studies show are harmful to children's health.

3. Invest in farmers stepping off the pesticide treadmill

Investing in farmers who grow food without relying on chemicals that harm children's health must be a national priority. Specifically:

- *Corral resources for farmers:* Federal and state officials should mobilize and coordinate existing resources to help farmers adopt well-known, effective pest management strategies that reduce reliance on pesticides. USDA, EPA and many state agencies and universities have important programs—research, outreach and education—with this stated aim that could be ramped up in complementary ways.
- *Increase investment in innovative farming:* Congress should authorize significant funding for programs supporting farmers' adoption of sustainable practices that reduce use of harmful pesticides. Existing programs receive a small fraction of the funding supplied to programs serving conventional growers.
- *Set use reduction goals:* EPA and USDA should set specific and aggressive national pesticide use reduction goals, focusing first on pesticides studies show to be harmful to children.[†] To track progress toward this goal, farmers should work with applicators and pest control advisors to report their pesticide use to a nationally searchable database.[‡]
- *Source for children's health:* Food distributors should require that their suppliers limit use of pesticides that harm children's health.

Effective agroecological methods exist for production of all major crops—but these approaches are often knowledge-intensive, requiring significant training as well as real changes in farm operation.[§] Growers need direct support to make the shift away from pesticide reliance, including provision of hands-on field training and technical advice from independent experts as well as incentives to invest in agroecological practices.

These proposals are all commonsense measures in the face of clear evidence that our children's wellbeing is at risk. It's time to muster the political will and prioritize the health of our children, grandchildren and future generations.

* Chlorpyrifos was phased out for household use after studies clearly indicated that exposed children had smaller head circumference, a known indicator of reduced cognitive function.

† See Appendix B.

‡ Pesticide use reporting is already in place in California; lessons learned from implementation of this program (established in 1990) should inform and enable rapid adoption of a federal use reporting system.

§ Agroecological practices are based on the application of intricate place-based knowledge of soil/plant/animal interactions designed to prevent or minimize pest problems. Farmers are successfully using such practices in virtually every crop now grown in the U.S.

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Appendix A

More Science: Key study descriptions

Our intention in undertaking this review was not to conduct a comprehensive evaluation of the evidence. The body of scientific literature exploring how pesticides affect children's health is wide, deep and decades long.

Our goal is to provide a snapshot of recent findings, coming fast and furious in the just the past few years, that—taken together—provide compelling reason for concern about the impact of pesticides on our children's health.

In the report itself we highlight a few of the key findings for each health effect, focusing on studies that were particularly compelling, and/or represented other studies we reviewed with similar findings. We simplified descriptions of each study to provide a basic sense of how the research was conducted and what researchers found. Here in Appendix A we provide a bit more detail on some of the key studies described above, as well as additional studies. Study descriptions are organized by health effect, and alphabetically by author within each category.

Brain & nervous system harms (reduced cognitive function, autism, ADHD)

Bouchard M.F., D.C. Bellinger, R.O. Wright and M.G. Weisskopf."Attention-deficit/hyperactivity disorder and urinary metabolites of organophosphate pesticides." *Pediatrics* 2010. 125(6): e1270–e1277.

This study examines the association between urinary concentrations of organophosphate metabolites and ADHD in children eight to 15 years of age. Researchers analyzed cross-sectional data from the National Health and Nutrition Examination Survey for 1139 children representative of the U.S. population. Urinary DMAP metabolite levels (which are an indicator of exposure to OP pesticides), an ADHD assessment, and household surveys were used in the analysis. The data support the hypothesis that organophosphate exposure, at levels common among U.S. children, may contribute to ADHD prevalence.

Eskenazi B., K. Huen, A. Marks, K.G.Harley, A. Bradman, D.B. Barr, et al. "PON1 and Neurodevelopment in Children from the CHAMACOS Study Exposed to Organophosphate Pesticides in Utero." *Environ Health Perspect.* Aug 2010 118: 1775-1781. See http://dx.doi.org/10.1289/ehp.1002234.

The enzyme paraoxonase 1 (PON1) detoxifies metabolites of some organophosphate (OP) pesticides, andPON1 genetic polymorphisms influence enzyme activity and quantity. The study authors investigated whether PON1 genotypes and enzyme activity levels in mothers and their children were linked to neurodevelopmental changes, and whether PON1 levels and genotypes had an effect on the association of *in utero* exposure to OP pesticides (as assessed by maternal urinary concentrations of dialkyl phosphate metabolites, a marker of OP pesticide exposure) and neurodevelopment and behavior. The researchers found that of the 353 two-year-olds assessed, children with a certain variation of PON1 (the $PON1_{-108T}$ allele) scored more poorly on the Mental Development Index and somewhat lower on the Psychomotor Development Index. The authors concluded that while the variations of PON1 were associated with outcomes in child neurobehavioral development, additional research is needed to confirm whether it modifies the relation with *in utero* exposure to OP pesticides.

Pessah I.N., P.J. Lein. "Evidence for environmental susceptibility in autism" in: *Autism,* (Zimmerman AW, ed). Totowa, NJ: Humana Press 2008 409–428.

The authors aim to illustrate how research into the pathophysiology and genetics of autism may inform the identification of environmental susceptibility factors that promote adverse outcomes in brain development. They highlight three examples of gene-environment interactions that are likely to contribute to autism risk, including: (1) pesticides that interfere with the neurotransmitter acetylcholine; (2) pesticides that interfere with γ-aminobutyric acid (GABA) neurotransmission; and (3) persistent organic pollutants that directly

A Study by Any Other Name…

Epidemiological study: A study of distribution or patterns in health trends or characteristics and their causes or influences in specific populations. Includes both case-control and all types of cohort studies.

Case-control study: Compares a "case" group (e.g., U.S. children ages 0–14 with cancer) with a group serving as a control (e.g., cancer-free U.S. children ages 0–14).

Cohort study: Profiles a specific population where shared exposure may be assumed, such as occupational exposure to pesticides among farmworkers.

Prospective cohort study: Follows a group that is slightly different in some respects. (i.e., studying a cohort of pesticide applicators who use varying protective methods while working with pesticides.)

Longitudinal cohort study: Tracks a specific group over time. For example, a UC Berkeley study on the central California coast has followed a specific group of children from conception through adolescence.

Meta-analysis: Pulls together several studies on the same topic and does further statistical analysis on the basic findings.

Review: Examines the "state of the science" and often provides evaluation of conflicting pieces of data. Review authors give their view on what is currently happening in the field.

alter calcium ion (Ca^{2+}) signaling pathways and Ca^{2+}-dependent effectors. If both genetic factors and environmental ones converge to interrupt the same neurotransmitter or signaling systems at critical times during development, adverse effects can be amplified.

Rauh V.A., F.P. Perera, M.K. Horton, R.M. Whyatt, R. Bansal, X. Hao X, et al. "Brain anomalies in children exposed prenatally to a common organophosphate pesticide." *Proc Natl Acad Sci* 2012 109(20):7871-6.

This study investigated associations between prenatal exposure to chlorpyrifos and brain morphology (examining brain structure). With a sample of 40 children—who experienced low prenatal exposure to tobacco smoke and polycyclic aromatic hydrocarbons—20 subjects with high chlorpyrifos exposure were compared to 20 low-exposure subjects. The data revealed a significant association between prenatal exposure to chlorpyrifos, at standard use levels, and structural changes in the developing human brain. High exposure was associated with the enlargement of several areas of the brain and in preliminary analyses, the reversal of sex differences or a lack of expected sex differences.

Shafer, T.J., D.A. Meyer and K.M. Crofton. "Developmental Neurotoxicity of Pyrethroid Insecticides: Critical Review and Future Research Needs." *Environmental Health Perspectives* 113, no. 2 Oct 2004: 123–136 .

A review of pyrethroid insecticides and the data related to potential developmental neurotoxic effects of pyrethroids, with recommendations for improving study design and statistical analyses. The review discusses the various effects on voltage-sensitive sodium channels, which are a primary target of pyrethroids.

Childhood cancers

Carozza S.E., B. Li, K. Elgethun and R. Whitworth."Risk of childhood cancers associated with residence in agriculturally intense areas in the United States." *Environ Health Persp* 2008 116(4): 559–565.

Researchers from the U.S. evaluated whether children under the age of 15 who live in a county associated with greater agriculture production—and hence, exposure to pesticide drift—experienced different risk rates for developing cancer. Using incidence data for U.S. children provided by the North American Association of Central Cancer Registries, researchers were able to compare county-level, sex- and age-specific rates of childhood cancer with agricultural census data containing county acreage, percent cropland, and percent acres for specific crops. The data revealed statistically significant increase in risk for many types of childhood cancers for residents living in those counties with a moderate to high level of agricultural activity. Risk for different cancers varied by type of crop; for example, there was increased risk of non-Hodgkin lymphoma and thyroid cancer associated with residence at diagnosis in counties that produced corn or oats.

Infante-Rivard C, S. Weichenthal. Pesticides and childhood cancer: an update of Zahm and Ward's 1998 review. *J Toxicol Environ Health B Crit Rev* 2007 10(1): 81–99.

Infante-Rivard and Weichenthal reviewed the epidemiological and ecological studies published since the 1998 Zahm and Ward review. The authors found that15 case-control studies, four cohort studies, and two ecological studies have been published since this review, and 15 of these 21 studies reported a statistically significant increase in risk of childhood cancer among children whose parents were experienced occupational pesticide exposure. These studies found that the risk of all childhood cancers increased with the frequency of maternal exposure to herbicides and plant insecticides. Furthermore, maternal and paternal exposure to insecticides and herbicides up to five years before having a child increased risk of all childhood brain tumors, astroglial tumors, non-Hodgkin's lymphoma, primitive neuroectodermal tumors, and other glial tumors. Parental occupation in agriculture is also associated with an increased risk of Ewing's sarcoma. The authors conclude that evidence supports an association between at least some pesticide exposure and childhood cancer.

Kristensen, P., A. Andersen, L.M. Irgens, A.S. Bye and L. Sundheim. "Cancer in Offspring of Parents Engaged in Agricultural Activities in Norway: Incidence and Risk Factors in the Farm Environment." *International Journal of Cancer. Journal International Du Cancer.* Jan 1996 65 (1): 39–50.

A cohort study in Norway of 323,359 children born between 1952–1991 reported that children 0-14 years had a nearly doubled risk for brain tumors and a more than tripled risk for neuroepithelial tumors except for astrocytomas associated with pesticide purchase. These associations were stronger when sub-groups, such as growing up on the farm, were considered. Offspring born April–June showed a clustering of neuroepithelial brain tumors, suggesting that paternal exposure during periods of increased pesticide application, from 0–3 months before conception, may have been a factor.

Meinert, R., J. Schuz, U. Kaletsch and J. Michaelis. "Leukemia and Non-Hodgkins Lymphona in Childhood and Exposure to Pesticides: Results of a Register-based Case-Control Study in Germany." *Am Journal of Epidemiology* 2000. 151 (7): 639-646.

A case-control study conducted in Germany from 1993-1997 found parental occupational exposure to be related to childhood cancer regardless of period of exposure and type of cancer, which the authors point out might be due to different recall of past exposures between parents of cases and parents of controls. Residential insecticide use was associated with childhood lymphoma, both professional exterminator and parental usage were significantly associated with increased risk.

Nielsen S.S., R. McKean-Cowdin, F.M. Farin, E.A. Holly, S. Preston-Martin and B.A. Mueller. "Childhood brain tumors, residential insecticide exposure, and pesticide metabolism genes." *Environ Health Persp* 2009 118(1): 144-149.

Researchers in California and Washington found evidence of increased risk of childhood brain tumors (CBT) associated with certain genetic polymorphisms when kids were exposed to insecticides. Strong interactions between genotype and insecticide exposure during childhood was observed. Among exposed children, CBT risk increased per $PON1_{-108T}$ allele, whereas among children never exposed, CBT was not increased. Nielsen et al. concluded childhood exposure to organophosphorus pesticides coupled with a reduced ability to detoxify these pesticides, may be associated with CBT.

van Wijngaarden E, P.A. Stewart, A.F. Olshan, D.A. Savitz and G.R. Bunin. "Parental occupational exposure to pesticides and childhood brain cancer." *Am J Epidemiol* 2003. 157(11): 989–997.

Researchers from the U.S. evaluated parental exposure to pesticides at home or on the job in relation to the occurrence of brain cancer in children. The sample consisted of children diagnosed with cancer and matching controls from four U.S. states. Interviews were performed with the biological mothers of the subjects to assess the residential and occupational exposure to pesticides in the two years before the child was born. The data revealed a significant risk of astrocytoma associated with residential use and exposure to herbicides. Combining parental exposures to herbicides form both residential and occupational sources, the elevated risk remained significant.

Birth defects

Brender, J.D., M. Felkner, L. Suarez, M.A. Canfield and J.P. Henry. "Maternal Pesticide Exposure and Neural Tube Defects in Mexican Americans." *Annals of Epidemiology*. 2010 20(1): 16–22.

Researchers investigated the relationship between maternal pesticide exposures and neural tube defects (NTDs) in offspring comparing to groups of Mexican American women (184 in case group, 225 for comparison). After adjusting for differences in maternal education levels, smoking, and folate intake during pregnancy, women who reported using pesticides in their homes or yards were twice as likely to have children with NTDs than women not reporting exposures (95% confidence interval [CI], 1.2–3.1) Case-women were also more likely to live within ¼ mile of agricultural fields. As possible sources of pesticide exposure increased, risk of NTDs also increased. Associations were stronger for risk of anencephaly than for spina bifida.

Garry V.F., M.E. Harkins, L.L. Erickson, L.K. Long-Simpson, S.E. Holland and B.L. Burroughs. "Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota, USA." *Environ Health Persp* 2002. 110(3): 441–449.

A cross-sectional study performed in the Red River Valley of Minnesota examined the reproductive health outcomes in 695 farm families (analyzed data from 1,532 children) from parent-reported birth defects. Researchers determined conceptions in the spring time led to significantly more children born with birth defects, compared to children conceived in any other season. Their data suggests environmental agents present in the spring, like herbicides, have an adverse effect on the birth defect rate. Furthermore, the data revealed an association between fungicide exposure and the determination of child sex—affecting the survival rate of the male fetus (female to male birth ration is 1.25 to 1).

Gaspari L., F. Paris, C. Jandel, N. Kalfa, M. Orsini, J.P. Daures and C. Sultan. "Prenatal environmental risk factors for genital malformations in a population of 1442 french male newborns: a nested case-control study." *Hum Reprod* 2011. 26(11): 3155–3162.

Researchers from France analyzed a physician's examinations and parental interviews for 1442 full-term newborn males in southern France to identify risk factors for male external genital malformations, with a focus on parental occupational exposure to endocrine disrupting chemicals, such as organochlorine pesticides. Infants were examined for cryptochidism, hypospadias, and micropenis, while a questionnaire asked parents about the pregnancy, personal characteristics, lifestyle, and occupational exposure to EDCs. In total, 39 cases of genital malformation were reported (2.70%). A significant relationship was observed between newborn cryptochidism, hypospadias or micropenis and parental occupational exposure to pesticides with the odds of genital malformation increasing 4.41-fold. These data supports the hypothesis that prenatal contamination by pesticides may be a potential risk factor for newborn male external genital malformation.

Rocheleau, C.M, P.A. Romitti and L.K. Dennis. "Pesticides and Hypospadias: a Meta-analysis." *Journal of Pediatric Urology*. Feb 2009 5(1): 17–24.

A meta-analysis of studies done in 7 different countries (Canada, Denmark, Italy, Netherlands, Norway, Spain, US) indicated a 36% increased risk of hypospadia with maternal occupational exposure and a 19% increased risk of hypospadias with paternal occupational exposure.

Winchester PD, Huskins J, Ying J. 2009. Agrichemicals in surface water and birth defects in the United States. *Acta Paediatr* 98(4): 664–669.

Researchers from Indiana and Ohio compared water data from the USGS National Water Quality Assessment (NAWQA)—measuring the levels of nitrates, atrazine, and other pesticides in surface water—and Centers for Disease Control data detailing monthly pregnancy and birth outcome outcomes. The data reveal that between 1996 and 2002 women in the US were significantly more likely to give birth to a child with birth defects if conception had occurred in the months of April through July. NAWQA surface water samples indicate that concentrations of atrazine, nitrates, and other pesticides were also higher in the months of April through July. This correlation was statistically significant, demonstrating elevated concentrations of agrichemicals in surface water coincided with a higher risk of birth defects among live births for children conceived between April and July.

Early puberty

Aksglaede L., K. Sorensen, J.H. Petersen, N.E. Skakkebaek and A. Juul. "Recent decline in age at breast development: the Copenhagen puberty study." *Pediatrics* 2009. 123(5): e932-939.

Researchers from Denmark collected data from 2095 females aged 5.6 to 20 years in two Copenhagen cohorts (1991–1993 and 2006–2008) to examine differences in breast development. Using the most accurate method of palpation, Aksglaede et al. found the onset of puberty—defined as the mean estimated age at the attainment of glandular breast tissue—occurred significantly earlier in the 2006 cohort. The ages at which menarche and pubic hair development occurred also slightly decreased in the 2006 cohort. As a result of these timing changes in early and later markers of puberty, the length of puberty appears to have increased. The authors interpreted these observations as indicative of gonadotropin-independent estrogenic actions at the level of breast development, rather than an earlier activation of the pituitary-gonadal axis. These changes in timing could not be explained by alterations in reproductive hormones and BMI, suggesting other factors involved need to be explored.

Gladen B., N. Ragan and W. Rogan. "Pubertal growth and development and prenatal and lactational exposure to polychlorinated biphenyls and Dichlorodiphenyl Dichloroethene." *Pediatrics* 2000. 136(4): 490-496.

Researchers from the National Institute of Environmental Health Sciences explored the relationship between prenatal and early-life exposure to PCBs and DDE on children. This is one of a very few studies examining environmental contaminants and male puberty onset. Using 594 children from the North Carolina Infant Feeding Study cohort, they found no effect on the ages at which puberty began. However, the height and weight (adjusted for height) of boys at puberty increased with transplacental exposure to DDE.

Massart F., P. Seppia, D. Pardi, S. Lucchesi, C. Meossi, L. Gagliardi et al. "High incidence of central precocious puberty in a bounded geographic area of northwest Tuscany: an estrogen disrupter epidemic?" *Gynecol Endocrinol* 2005. 20(2): 92–98.

Researchers in Italy preformed an analysis of central precocious puberty (CPP) distribution in northwest Tuscany (NWT). The overall incidence rate of sexual precocity is estimated at 10–20 per 100, a rate similar to that found in four of the cities in the NWT sample; however 47 percent of the CPP cases found in NWT were in the Viareggio area, a rate of 161 per 100,000. This area hosts a high density of navy yards and greenhouses—consequently it is at higher risk of chemical estrogen pollution. As this population represented only 13.73 percent of the total population of NWT, living in this area significantly increased the risk of CPP. The definite geographic distribution of CPP in this suggests that environmental involvement/pollution may be a major determinant of CPP development.

Nebesio T and O. Hirsh Pescovitz. " Historical perspectives." *Endocrinologist* 2005. 15(1):44-48.

Nebesio and Pescovitz reviewed reports alleging endocrine disruptors blamed for altering the age of normal puberty, including an examination of studies implicating pesticides and accidental environmental exposures. Studies reviewed include two seminal studies on early puberty in girls: Vasiliu et al.'s (2004) examination of the Michigan anglers cohort daughters and Krzstevska-Konstantinova et al.'s (2001) examination of precocious puberty in native and non-native Belgian girls. Nebesio and Hirsch Pescovitz (2005) also review Boneh et al. (1989), who examined cases of girls with precocious sexual development from Jerusalem over a 10-year time period and found strong evidence for a seasonal increase in incidences of early sex development observed (from April–June). Seasonal pesticide usage was a potential cause, but the reasons for this were unknown.

Steingraber S. 2007. *The falling age of puberty in U.S. girls: what we know, what we need to know.* The Breast Cancer Fund.

In this report Steingraber suggests that pubertal onset and menarche are two sexual maturation processes that appear to be becoming uncoupled, therefore increasing the length of puberty in girls. The author cites environmental contaminants as the cause in light of recent evidence suggesting even minimal exposure to an endocrine disruptor on sex hormones can have a profound consequence in childhood.

Obesity & diabetes

Baillie-Hamilton, P.F. "Chemical toxins: a hypothesis to explain the global obesity epidemic." *J Altern Complement Med* 2002 8(2): 185–192.

Hamilton puts forth a new hypothesis to explain the global obesity epidemic: chemical toxins. Overeating and inactivity do not fully explain the current trend in obesity. Baillie-Hamilton calls for an examination of environmental causes rather than genetic factors. The sympathetic nervous system is perhaps the key weight-controlling system, and is targeted by many of the commonest synthetic chemicals. Numerous widely used synthetic chemicals induce weight gain, including pesticides (specifically organochlorines and organophosphates). They do so by disrupting major weight controlling hormones, altering levels and sensitivity to neurotransmitters, interfering with metabolic processes, and causing widespread damage to body tissues. These interferences change appetite, food efficiency, and the metabolism of fats, proteins, and carbohydrates.

Janesick, A. and B. Blumberg. "Endocrine Disrupting Chemicals and the Developmental Programming of Adipogenesis and Obesity." *Birth Defects Research Part C: Embryo Today*: Reviews 2011. 93, no. 1: 34–50.

This review article explores possible explanations for the variation in individual propensity to gain weight and accrue body mass, even at identical levels of caloric input. The authors review evidence from clinical, epidemiological, and biological studies showing that obesity is largely programmed early in life, including prenatally. They examine the environmental obesogen hypothesis, which holds that "prenatal or early life exposure to certain endocrine disrupting chemicals can predispose exposed individuals to increased fat mass and obesity. Obesogen exposure can alter the epigenome of multipotent stromal stem cells, biasing them toward the adipocyte lineage at the expense of bone." Individuals exposed to obesogens early in life or prenatally might thus experience changes in their stem cell compartment, which in turn influences adipogenic fate

Lee D.H., I.K. Lee, K. Song, M. Steffes, W. Toscano, B.A. Baker and D.R. Jacobs."A strong dose-response relation between serum concentrations of persistent organic pollutants and diabetes: results from the National Health and Examination Survey 1999-2002." *Diabetes Care* 2006 29(7): 1638–1644.

Researchers performed a cross-sectional examination of the association between serum concentrations of six POPs (selected because they were detectable in greater than 80 percent of participants) and diabetes prevalence. After adjustments were made for confounding variables (age, sex, race and ethnicity, poverty income ratio, BMI and waist circumference) diabetes prevalence was strongly positively associated with lipid adjustment serum concentrations of all six POPs tested for in the sample of 2,016 adult participants from the National Health and Nutrition Examination Survey 1999–2002. Furthermore, the association between POPs and diabetes was much stronger among obese subjects compared to lean subjects.

Lee, D.H., M.W. Steffes, A. Sjödin, R.S. Jones, L.L. Needham, D.R. Jacobs. "Low dose organochlorine pesticides and polychlorinated biphenyls predict obesity,

dyslipidemia, and insulin resistance among people free of diabetes." *PLoS One* 2011 6(1): e15977.

In a follow up study to their 2010 study of low-dose persistent organic pollutant (POP) exposure and prediction of type 2 diabetes, Lee et al. conducted a nested case-control study to explore the relationship between serum concentrations of POPs and adiposity, dyslipidemia, and insulin resistance among people confirmed to be diabetes free (assessing study subjects on 5 occasions over 20 years). Researchers concluded that simultaneous exposure to various OC pesticides and PCBs in the general population may contribute to the development of obesity, dyslipidemia, and insulin resistance—common precursors of type 2 diabetes and cardiovascular diseases—among those without diabetes. POPs exposure may also contribute to excess adiposity and other dysmetabolic conditions. Ten POPs were found to predict future higher triglycerides and 14 POPs predicted lower HDL-cholesterol. Among organochorine pesticides, p,p'-DDE most consistently predicted higher BMI, triglycerides and HOMA-IR, as well as a lower HDL-cholesterol at year 20.

Newbold R.R., E. Padilla-Banks, R.J. Snyder, T.M. Phillips and W.M. Jefferson. "Developmental exposure to endocrine disruptors and the obesity epidemic." Reprod Toxicol 2007. 23(3): 290–296.

Research from the US has shown an association between exposure to environmental endocrine disrupting chemicals with the development of obesity. Researchers utilize an animal model of developmental exposure to diethylstilbestrol (DES)—a potent perinatal endocrine disruptor with estrogenic activity—to study the mechanisms involved in programming an organism for obesity. Their data supports the idea that brief exposure early in life to environmental endocrine disrupting chemicals, especially those with estrogenic activity, like DES. These chemicals may contribute to overweight and obesity as well as other obesity-associated diseases (type 2 diabetes and cardiovascular disease). This research complicates the current understanding of obesity and necessitates a consideration of more complex factors, including environmental chemicals.

Asthma

Hernández A.F., T. Parrón and R. Alarcón. "Pesticides and asthma." *Curr Opin Allergy Clin Immunol* 2011 11(2): 90–96.

Hernández et al. performed a review of clinical and epidemiological studies that link exposure to pesticides, asthma attacks, and an increased risk of developing asthma. These authors concluded that while many pesticides are sensitizers or irritants, their potential to sensitize is limited. However, more importantly, pesticides may increase the risk of developing asthma, exacerbate a previous asthmatic condition or even trigger asthma attacks by increasing bronchial hyper-responsiveness.

Salam MT, Y.F. Li, B. Langholz, F.D. Gilliland."Early-life environmental risk factors for asthma: findings from the Children's Health Study." *Environ Health Perspect* 2003 112(6): 760–765.

Researchers from the University of Southern California selected 4,244 subjects from the Children's Health Study conducted in 12 southern California communities to measure the relationship between childhood environmental exposures and asthma risk. Matching those subjects diagnosed with asthma before age five with asthma-free counterparts that acted as controls (matched for age, sex, community of residence, and in utero exposure to maternal smoking), the authors concluded that environmental exposures during the first year of life are associated with an increase in the risk for early-onset persistent asthma, a subtype of asthma associated with long-term morbidity. Compared to never-exposed children, children exposed to herbicides within the first year of life had a 4.6-fold increased risk of asthma and children exposed to pesticides had a 2.4-fold increase in risk—considered together children exposed to any pesticide or herbicide in the first year of life experience a 2.53-fold higher risk of asthma compared to children who were never exposed to either of those.

Salameh P.R., I. Baldim, P. Brochard, C. Raherison, B.A. Saleh and R. Salamon. "Respiratory symptoms in children and exposure to pesticides." *Eur Respir J* 2003 22(3): 507–512.

Public health researchers from Lebanese University in Lebanon and Victor Segalen Bordeaux II University in France conducted a cross-sectional study to evaluate if exposure to pesticides resulted in chronic effects on the respiratory health of Lebanese children. From 19 public schools, 3,291 randomly selected school children—aged five to 16 years—revealed exposure (residential, paraoccupational, and domestic) to pesticides was significantly associated with respiratory disease (1.82-fold higher) and chronic respiratory symptoms such as chronic phlegm, chronic wheezing, and wheezing at any point (the only exception was chronic cough). Twelve percent of the sample reported a chronic respiratory disease and of those, 84 reported a medically confirmed asthma diagnosis (2.6 percent of the sample).

Sunyer J, M. Torrent, R. Garcia-Esteban, N. Ribas-Fitó, D. Carrizo, I. Romieu et al. "Early exposure to Dichlorodiphenyldichloroethylene, breastfeeding and asthma at age six." *Clin Exp Allergy* 2006 36(10): 1236–1241.

Researchers from Spain and the United Kingdom conducted a longitudinal study from a sample of 468 Minorcan children (Balearic Island in the northwest Mediterranean sea with no local pollution sources) to examine the association between prenatal exposure to DDE and other organochlorine compounds and asthma. Asthma was defined as the presence of a wheeze, persistent wheezing, or parental report of doctor-diagnosed asthma at age four. All children were born with quantifiable levels of DDE and PCB compounds. Wheezing at age four was reported for 11.6 percent of all children. Wheezing at four years of age increased with DDE concentration, particularly at the highest quartile, which was also found for persistent wheezing. This association was maintained even after adjusting for potential confounding variables. These results corroborated the association established between DDE and asthma in German school children conducted by Karmaus et al. in 2001.

Appendix B: Top Pesticides Used in Agriculture & at Home

Key
? – Insufficient data
ND – No data available
I – Insecticide
H – Herbicide
F – Fungicide
PGR – Plant growth regulator
FUM – Fumigant

Table B-1: Most Commonly Used Pesticide Active Ingredients - Agriculture Listed by volume of use[1]

Pesticide & use level range (millions of lbs active ingredient)	PAN HHP[2]	Type	High[3] acute toxicity	Carcin-ogen	Acute neuro-toxicant (ChE inhibitor)	Devel. or reprod. toxicant	Endocrine disruptor	Primary crops	Food residues[4]
Glyphosate (180-185)		H				?	?	Hay/pasture, soybeans, corn	ND
Atrazine (73-78)	Y	H		Y		?	suspected	Corn, sugarcane	Spinach, wheat, onions, lettuce, water
Metam-sodium (50-55)	Y	FUM	Y	Y		Y	suspected	Potatoes, carrots, tomatoes, onions, peanuts	ND
Metolachlor, (S) (30-35)	Y	H		possible		?	suspected	Tomatoes, beans, corn, cotton	Oats, celery, water, corn
Acetochlor (28-33)	Y	H		Y		?	suspected	Corn, popcorn	Water
Dichlorpropene (27-32)		FUM	Y	Y		?	?	Strawberries, sweet potatoes, tree nuts	
2,4-D (25-29)	Y	H		possible		?	suspected	Grasses, wheat, citrus fruits, tree nuts	Potatoes, water
Methyl bromide (11-15)	Y	FUM	Y			Y	suspected	Tomatoes, strawberries, almonds, peppers, watermelon, cucumbers	ND
Chloropicrin (9-11)	Y	FUM	Y	?		?	?	Tobacco, tomatoes, strawberries, bell peppers	ND
Pendimethalin (7-9)	Y	H		possible		?	suspected	Soybeans, corn, cotton, peanuts	Carrots, collard greens, kale
Ethephon (7-9)		PGR			Y	?	?	Cotton, walnuts, grapes, tomatoes	ND
Chlorothalonil (7-9)	Y	F	Y	Y		?	?	Tomatoes, watermelons, onions	Cranberries, celery, green beans
Metam Potassium (7-9)		FUM	Y	Y		Y	?	Lettuce, potatoes	ND
Chlorpyrifos (7-9)	Y	I			Y	?	suspected	Tree nuts, apples, alfalfa, broccoli, citrus, grapes, sweet corn	Apples, bell peppers, cranberries, kale, grapes, peaches
Copper Hydroxide (6-8)		F				?	?	Tree nuts, grapes, peaches	ND
Simazine (5-7)	Y	H				Y	suspected	Corn, citrus, grapes, tree nuts	Blueberries, kale, water, oranges
Trifluralin (5-7)	Y	H		possible		?	suspected	Soybeans, cotton, green beans, broccoli, tomatoes	Carrots, spinach, wheat, soybeans, broccoli
Propanil (4-6)	Y	H		possible		?	suspected	Rice, oats, barley, wheat	Wheat
Mancozeb (4-6)	Y	F		Y		Y	suspected	Apples, tomatoes, onions, watermelon	ND
Acephate (2-4)	Y	I		possible	Y	?	suspected	Cotton, tobacco, cranberries, mint	Green beans, bell peppers
Diuron[5] (2-4)	Y	H		Y		Y	suspected	Oranges	Asparagus, oranges, water, potatoes
MCPA (2-4)	Y	H	Y	possible		?	?	Flax, barley, wheat, rice	water
Paraquat (2-4)	Y	H	Y			?	suspected	Corn, soybeans, cotton, apples	ND
Dimethenamid (2-4)	Y	H		possible		?	?	Corn, soybeans, sugarbeets	Soybeans, water

Table B-2: Most Commonly Used Pesticide Active Ingredients – Home & Garden

Listed by volume of use

Pesticide & use level range (millions of lbs active ingredient)	PAN HHP	Type	High acute toxicity	Carcinogen	Acute neurotoxicant (ChE inhibitor)	Devel. or reprod. toxicant	Endocrine disruptor
2,4-D (8-11)	Y	H		possible		?	suspected
Glyphosate (5-8)		H				?	?
Carbaryl (4-6)	Y	I		Y	Y	Y	suspected
Mecoprop-P (MCPP) (4-6)	Y	H		possible		?	?
Pendimethalin (3-5)	Y	H		possible		?	suspected
Pyrethroids[6] (2-4)	Y	I	Y	Y		Y	suspected
Malathion (2-4)	Y	I	Y	possible	Y	Y	suspected
Dicamba (1-3)		H				Y	?
Malathion (2-4)	Y	I	Y	possible	Y	Y	suspected
Trifluralin (1-3)	Y	H		possible		?	suspected
Pelargonic Acid (< 1)		H/F		?		?	?

Notes

1 See Table 3.6 and 3.7 in *Pesticide Industry Sales & Usage, 2006 and 2007 Market Estimates,* U.S. EPA, Washington, DC Feb 2011. See www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf. Aldicarb was removed from the list as registration was withdrawn in 2010.

2 PAN International has compiled and published a list of Highly Hazardous Pesticides (HHPs) that are harmful to human health and the environment, and targeted for global reduction and elimination. See www.panna.org/issues/publication/pan-international-list-highly-hazardous-pesticides.

3 PAN's online pesticide database provides an explanation of these categories and additional toxicity, use and regulatory information for these and other pesticides. See www.pesticideinfo.org.

4 Based on USDA's Pesticide Data Program, as listed on www.whatsonmyfood.org.

5 Noted health effects not applicable for products with < 7% diuron, and applied to foliage.

6 Health hazards of specific pyrethroids vary, the effects indicated here represent those with most hazardous potential effects.

Appendix C

Online Resources & Tools

This compilation highlights a number of key online resources available through government agencies and public interest groups. It is not intended to be comprehensive.

Pesticide use data

California pesticide use reporting: *calpip.cdpr.ca.gov*

EPA Pesticide Industry Sales & Usage: *www.epa.gov/opp00001/pestsales*

USDA National Agricultural Statistics Service: *www.nass.usda.gov*

Pesticide health harms

Agency for Toxic Substances & Disease Registry, ToxFAQs: *www.atsdr.cdc.gov/az/c.html*

Collaborative on Health & the Environment, Toxicant & Disease Database: *www.healthandenvironment.org/tddb*

EPA Pesticides & Human Health Issues: *www.epa.gov/opp00001/health/human.htm*

EPA Recognition & Management of Pesticide Poisonings: *npic.orst.edu/rmpp.htm*

Ontario College of Family Physicians, Systematic Review of Pesticide Human Health Effects: *www.ocfp.on.ca/docs/pesticides-paper/pesticides-paper.pdf*

PAN International Highly Hazardous Pesticides: *www.panna.org/issues/publication/pan-international-list-highly-hazardous-pesticides*

PAN's pesticide database: *www.pesticideinfo.org*

Physicians for Social Responsibility, Pesticides & Human Health: A Resource For Health Care Professionals: *www.psr-la.org/resources/reports-training-materials/#Pesticides*

The Endocrine Disruption Exchange (TEDX): *www.endocrinedisruption.com/pesticides.introduction.php*

Pesticides & children's health

Beyond Pesticides, Learning/Developmental Disorders resource page: *www.beyondpesticides.org/health/learningdevelopmental.htm*

Center for Environmental Research & Children's Health: *cerch.org/research-programs/chamacos*

EPA Pesticides & Children: *www.epa.gov/opp00001/health/children.htm*

National Academy of Sciences: *www.nap.edu/catalog.php?record_id=2126*

PAN's Children's health page: *www.panna.org/children*

Pesticide food residues

FDA Total Diet Study: *www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/TotalDietStudy/default.htm*

Whats On My Food? database (also includes health effect data): *www.whatsonmyfood.org*

USDA Pesticide Data Program: *www.ams.usda.gov/AMSv1.0/pdp*

Childhood disease & disorders

American Academy of Pediatrics: *www.aap.org*

CDC Child Health Statistics: *www.cdc.gov/nchs/fastats/children.htm*

Children's environmental health

Children's Environmental Health Network: *www.cehn.org*—A national multidisciplinary organization whose mission is to protect the developing child from environmental health hazards and promote a healthier environment.

Children's Environmental Health Project: *www.cape.ca/children*—A project of the Canadian Association of Physicians for the Environment, CEHP is intended to introduce clinicians (and their patients) to children's environmental health issues. Information on the health effects from environmental exposures is presented in a systems approach.

Healthy Child, Healthy World: *healthychild.org*—Protecting children's health and wellbeing from harmful environmental exposures through education and prevention strategies.

Healthy Kids: *www.healthy-kids.info—Provides resources and programs to help educators, health p*rofessionals, community officials, organizations, policy makers and parents work together to ensure schools are safe for children's healthy development.

Learning & Developmental Disabilities Initiative: *www.healthandenvironment.org/initiatives/learning*—An international partnership fostering collaboration among LDD organizations, researchers, health professionals and environmental health groups to address concerns about the impact environmental pollutants may have on children's neurological health.

Making our Milk Safe (MOMS): *www.safemilk.org*—A national grassroots movement of mothers working to create a healthier, safer environment for children, MOMS engages in education, advocacy and corporate campaigns.

Pediatric Environmental Health Specialty Units: *www.aoec.org/PEHSU.htm*—ATSDR and EPA support this network to provide education for health professionals, public health officials and others about the topic of children's environmental health.

Physicians for Social Responsibility: *www.psr.org/resources/pediatric-toolkit.html*—PSR has developed a pediatric environmental health toolkit that combines easy-to-use reference guides for health providers and user-friendly health education materials on preventing exposures to toxic chemicals and other substances that affect infant and child health. The toolkit is endorsed by the American Academy of Pediatrics.

Safer Chemicals, Healthy Families: *www.saferchemicals.org*—A coalition pressing for reform of national chemicals policy. SCHF represents more than 11 million individuals including parents, health professionals, advocates for people with learning and developmental disabilities, reproductive health advocates, environmentalists and businesses.

The Children's Environmental Health Institute: *cehi.org*—Works to identify, validate and develop solutions to address adverse health effects to children occurring as a consequence of exposure to hazardous environmental substances.

Pesticide Action Network
NORTH AMERICA

Pesticide Action Network North America
1611 Telegraph Ave, Suite 1200
Oakland CA 94612-2130
510.788.9020

HAWAII PEST CONTROL ASSOCIATION

Century Square – 1188 Bishop St., Ste. 1003*Honolulu, HI 96813-3304
Telephone (808) 533-6404 • Fax (808) 533-2739

February 12, 2015

Testimony To: Senate Committee on Health
Senator Josh Green, Chair

Senate Committee on Energy and Environment
Senator Mike Gabbard, Chair

Senate Committee on Education
Senator Michelle N. Kidani, Chair

Presented By: Tim Lyons, CAE
Executive Director

Subject: S.B. 800 - Relating to the Health Impact of Pesticides.

Chair Green, Chair Gabbard, Chair Kidani and Members of the Joint Committees:

I am Tim Lyons, Executive Director of the Hawaii Pest Control Association and we only have a minor request regarding these bills. That is, there appears to be some exclusionary language under 321A definitions, "outdoor application" however the rest of the bill continues to use such language as "any entity" shall be subject to the section, buffer zones and other language that could inadvertently draw us back in. We would respectfully request a separate subsection that would provide for clear exclusionary language from the entire section.

Thank you for this opportunity to testify.

From: mailinglist@capitol.hawaii.gov
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Cc: anthuriumz@hotmail.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Saturday, February 07, 2015 6:01:21 PM

SB800
Submitted on: 2/7/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
wynnie hee	Individual	Support	No

Comments:

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SB800
Submitted on: 2/8/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Miles Greenberg	Individual	Support	No

Comments: Honorable Chair Green, Vice Chair Wakai and Health Committee members, Please support state wide buffer zones for pesticides around schools. Even the conservative American Association of Pediatrics states that school children are particularly susceptible to pesticide exposure/drift. This is a good start to protect the keiki's. Adults are also subject to pesticide toxicity and buffer zones need to be considered for the sake of us all! Thank you for your SUPPORT of SB 800

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Date: Monday, February 09, 2015 9:10:47 PM

SB800
Submitted on: 2/9/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Wailua Brandman	Individual	Support	No

Comments: STRONG SUPPORT

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SB800
Submitted on: 2/9/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Monica Campo	Individual	Comments Only	No

Comments: My profession is directly related to the schools on the island of Kaua'i. I feel it is part of my obligation to protect the health and safety of children, especially at school. Please pass this Bill, so that children are sheltered from unnecessary exposure. Thank you

Please note that testimony submitted less than 24 hours prior to the hearing, improperly identified, or directed to the incorrect office, may not be posted online or distributed to the committee prior to the convening of the public hearing.

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Cc: carol@hartfeltkauai.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Monday, February 09, 2015 10:58:21 AM

SB800
Submitted on: 2/9/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Carol Hart	Individual	Comments Only	No

Comments: Aloha. It is essential to establish buffer zones around our communities, schools, hospitals, waterways, roadways and beaches. I live in Kekaha on Kaua'i and have, over the past years, developed a sensitivity to the chemicals that can and do drift onto our house and property. The sad thing is that there are three elementary schools that are closer to the fields than my house! There are many studies that prove that many of the chemicals used in the seed industry, which sprays an average of 260 days per year, are VERY detrimental to mammals and aquatic life, especially young children, including in vitro. We have made every attempt at protecting ourselves through local legislation to require buffer zones and disclosure of what is being sprayed, and the courts continually find for the corporations. Who, by the way, have shown that they could care less about the health of our communities and our keiki. Please pass SB800 and all related legislation that aims to put some regulation on pesticides and herbicides. Mahalo.

Please note that testimony submitted less than 24 hours prior to the hearing, improperly identified, or directed to the incorrect office, may not be posted online or distributed to the committee prior to the convening of the public hearing.

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Cc: suzannakinsey@gmail.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Sunday, February 08, 2015 11:54:07 PM

SB800
Submitted on: 2/8/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Sue Kinsey	Individual	Support	No

Comments:

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Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Sunday, February 08, 2015 11:30:50 PM

SB800
Submitted on: 2/8/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Leimomi Dierks	Individual	Support	No

Comments:

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From: mailinglist@capitol.hawaii.gov
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Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Sunday, February 08, 2015 11:16:29 PM

SB800
Submitted on: 2/8/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Karen Murray	Individual	Support	No

Comments: Please support this Bill 800, and in doing so, support the health of our children as they pass through their most formative years. If children are doing their job of exploring the world around them, we must insure that their world is not rendered toxic through our actions. The students are already exposed to a number of chemicals used to clean in and around the school on a daily basis. We should take into account not only the effects of the individual chemicals, but also their cumulative and synergistic effects.

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From: mailinglist@capitol.hawaii.gov
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Cc: foodsovereigntynow@gmail.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Sunday, February 08, 2015 10:07:06 PM

SB800
Submitted on: 2/8/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Mitsuko Hayakawa	Individual	Support	No

Comments: As a mother, I am in strong support of buffer zones around schools. All too often I see pesticide spraying near schools during school drop-off and pick-up times. There should be clear guidelines to protect our children from exposure.

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TESTIMONY IN SUPPORT OF SB800
Hawaii State Senate
Thursday, February 12, 2015
State Conference Room 414 at 3:40p
Submitted by Lynn B. Wilson, PhD

Chair & Committee Members of the Senate Committees on Health, Energy & Environment, and Education

Dear Senators:

I am a cultural anthropologist who has invested over 20 years in supporting the health and well being of young children and their families in Hawaii by partnering with public and private agencies including the Hawaii State Department of Health, UH JABSOM Department of Pediatrics, American Academy of Pediatrics/Hawaii Chapter, community health centers, and early childhood organizations in the areas of health, early learning, family engagement and support. I have also co-founded small businesses with Sharon Taba, MEd, Webfish Pacific, LLC & Same Small Boat Productions, LLC, that have received federal, state, and foundation support to develop projects supporting young children and their families.

I am writing to urge you to support **SB800: Relating to the Health Impact of Pesticides**, introduced by Senators Green and Ruderman.

This proposed law aims to protect communities across the state by establishing buffer zones around schools. Importantly, this bill does not prohibit governing bodies at the county level from regulating pesticide disclosure, notification, and use from regulating pesticides in a more stringent manner.

Research clearly demonstrates that even low exposures to environmental toxins, such as pesticides (including fumigants, herbicides, pesticides, etc.), put healthy brain development in fetuses and young children at tremendous risk. Please see attached policy statements from the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists.

In Hawaii, where agrichemical companies are using increasing amounts of pesticides and increasingly using multiple pesticides, acute and chronic exposure can be due to pesticide drift, particulate dust, water we drink and the water we swim in, jeopardizing the health of pregnant women and young children as well as the environment itself.

Therefore, it is critical to establish and enforce effective buffer zones around schools, and I request the committees to expand the reach of this bill to include licensed child care facilities. Hawaii has approximately 16,000 births a year, meaning that over 80,000 young children are ages birth to five and younger than children in schools. Many of these young children are enrolled in licensed childcare facilities whose health

and optimal development could also benefit from the buffer zones established in this law.

Thank you for this opportunity to ask your support of **SB800.** It's a critical time to pay attention to the "upstream" solutions that will play such a prominent role in positively influencing the health and well-being of Hawaii's communities, families and young children for generations to come.

With Respect & Aloha,

Lynn B. Wilson, PhD
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American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

FROM THE AMERICAN ACADEMY OF PEDIATRICS

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

POLICY STATEMENT

Pesticide Exposure in Children

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORDS

pesticides, toxicity, children, pest control, integrated pest management

ABBREVIATIONS

EPA—Environmental Protection Agency
IPM—integrated pest management

www.pediatrics.org/cgi/doi/10.1542/peds.2012-2757

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

abstract

FREE

This statement presents the position of the American Academy of Pediatrics on pesticides. Pesticides are a collective term for chemicals intended to kill unwanted insects, plants, molds, and rodents. Children encounter pesticides daily and have unique susceptibilities to their potential toxicity. Acute poisoning risks are clear, and understanding of chronic health implications from both acute and chronic exposure are emerging. Epidemiologic evidence demonstrates associations between early life exposure to pesticides and pediatric cancers, decreased cognitive function, and behavioral problems. Related animal toxicology studies provide supportive biological plausibility for these findings. Recognizing and reducing problematic exposures will require attention to current inadequacies in medical training, public health tracking, and regulatory action on pesticides. Ongoing research describing toxicologic vulnerabilities and exposure factors across the life span are needed to inform regulatory needs and appropriate interventions. Policies that promote integrated pest management, comprehensive pesticide labeling, and marketing practices that incorporate child health considerations will enhance safe use. *Pediatrics* 2012;130:e1757–e1763

INTRODUCTION

Pesticides represent a large group of products designed to kill or harm living organisms from insects to rodents to unwanted plants or animals (eg, rodents), making them inherently toxic (Table 1). Beyond acute poisoning, the influences of low-level exposures on child health are of increasing concern. This policy statement presents the position of the American Academy of Pediatrics on exposure to these products. It was developed in conjunction with a technical report that provides a thorough review of topics presented here: steps that pediatricians should take to identify pesticide poisoning, evaluate patients for pesticide-related illness, provide appropriate treatment, and prevent unnecessary exposure and poisoning.[1] Recommendations for a regulatory agenda are provided as well, recognizing the role of federal agencies in ensuring the safety of children while balancing the positive attributes of pesticides. Repellents reviewed previously (eg, N,N-diethyl-meta-toluamide, commonly known as DEET; picaridin) are not discussed.[2]

SOURCES AND MECHANISMS OF EXPOSURE

Children encounter pesticides daily in air, food, dust, and soil and on surfaces through home and public lawn or garden application, household insecticide use, application to pets, and agricultural product

TABLE 1 Categories of Pesticides and Major Classes

Pesticide category	Major Classes	Examples
Insecticides	Organophosphates	Malathion, methyl parathion, acephate
	Carbamates	Aldicarb, carbaryl, methomyl, propoxur
	Pyrethroids/pyrethrins	Cypermethrin, fenvalerate, permethrin
	Organochlorines	Lindane
	Neonicotinoids	Imidacloprid
	N-phenylpyrazoles	Fipronil
Herbicides	Phosphonates	Glyphosate
	Chlorophenoxy herbicides	2,4-D, mecoprop
	Dipyridyl herbicides	Diquat, paraquat
	Nonselective	Sodium chlorate
Rodenticides	Anticoagulants	Warfarin, brodifacoum
	Convulsants	Strychnine
	Metabolic poison	Sodium fluoroacetate
	Inorganic compounds	Aluminum phosphide
Fungicides	Thiocarbamates	Metam-sodium
	Triazoles	Fluconazole, myclobutanil, triadimefon
	Strobilurins	Pyraclostrobin, picoxystrobin
Fumigants	Halogenated organic	Methyl bromide, Chloropicrin
	Organic	Carbon disulfide, Hydrogen cyanide, Naphthalene
	Inorganic	Phosphine
Miscellaneous	Arsenicals	Lead arsenate, chromated copper arsenate, arsenic trioxide
	Pyridine	4-aminopyridine

residues.[3–9] For many children, diet may be the most influential source, as illustrated by an intervention study that placed children on an organic diet (produced without pesticide) and observed drastic and immediate decrease in urinary excretion of pesticide metabolites.[10] In agricultural settings, pesticide spray drift is important for residences near treated crops or by take-home exposure on clothing and footwear of agricultural workers.[9,11,12] Teen workers may have occupational exposures on the farm or in lawn care.[13–15] Heavy use of pesticides may also occur in urban pest control.[16]

Most serious acute poisoning occurs after unintentional ingestion, although poisoning may also follow inhalational exposure (particularly from fumigants) or significant dermal exposure.[17]

ACUTE PESTICIDE TOXICITY

Clinical Signs and Symptoms

High-dose pesticide exposure may result in immediate, devastating, even lethal consequences. Table 2 summarizes features of clinical toxicity for the major pesticides classes. It highlights the similarities of common classes of pesticides (eg, organophosphates, carbamates, and pyrethroids) and underscores the importance of discriminating among them because treatment modalities differ. Having an index of suspicion based on familiarity with toxic mechanisms and taking an environmental history provides the opportunity for discerning a pesticide's role in clinical decision-making.[18] Pediatric care providers have a poor track record for recognition of acute pesticide poisoning.[19–21] This reflects their self-reported lack of medical education and self-efficacy on the topic.[22–26] More in-depth review of acute toxicity and management can be found in the accompanying technical report or recommended resources in Table 3.

The local or regional poison control center plays an important role as a resource for any suspected pesticide poisoning.

There is no current reliable way to determine the incidence of pesticide exposure and illness in US children. Existing data systems, such as the American Association of Poison Control Centers' National Poison Data System or the National Institute for Occupational Safety and Health's Sentinel Event Notification System for Occupational Risks,[27,28] capture limited information about acute poisoning and trends over time.

There is also no national systematic reporting on the use of pesticides by consumers or licensed professionals. The last national survey of consumer pesticide use in homes and gardens was in 1993 (Research Triangle Institute study).[29]

Improved physician education, accessible and reliable biomarkers, and better diagnostic testing methods to readily identify suspected pesticide illness would significantly improve reporting and surveillance. Such tools would be equally important in improving clinical decision-making and reassuring families if pesticides can be eliminated from the differential diagnosis.

The Pesticide Label

The pesticide label contains information for understanding and preventing acute health consequences: the active ingredient; signal words identifying acute toxicity potential; US Environmental Protection Agency (EPA) registration number; directions for use, including protective equipment recommendations, storage, and disposal; and manufacturer's contact information.[30] Basic first aid advice is provided, and some labels contain a "note for physicians" with specific relevant medical information. The label does not specify the pesticide class or "other"/"inert" ingredients that may have significant toxicity and can account for up to 99% of the product.

Chronic toxicity information is not included, and labels are predominantly available in English. There is significant use of illegal pesticides (especially in immigrant communities), off-label use, and overuse, underscoring the importance of education, monitoring, and enforcement.[31]

TABLE 2 Common Pesticides: Signs, Symptoms, and Management Considerations[a]

Class	Acute Signs and Symptoms	Clinical Considerations
Organophosphate and N-methyl carbamate insecticides	• Headache, nausea, vomiting, abdominal pain, and dizziness • Hypersecretion: sweating, salivation, lacrimation, rhinorrhea, diarrhea, and bronchorrhea • Muscle fasciculation and weakness, and respiratory symptoms (bronchospasm, cough, wheezing, and respiratory depression) • Bradycardia, although early on, tachycardia may be present • Miosis • Central nervous system: respiratory depression, lethargy, coma, and seizures	• Obtain red blood cell and plasma cholinesterase levels • Atropine is primary antidote • Pralidoxime is also an antidote for organophosphate and acts as a cholinesterase reactivator • Because carbamates generally produce a reversible cholinesterase inhibition, pralidoxime is not indicated in these poisonings
Pyrethroid insecticides	• Similar findings found in organophosphates including the hypersecretion, muscle fasciculation, respiratory symptoms, and seizures • Headache, fatigue, vomiting, diarrhea, and irritability • Dermal: skin irritation and paresthesia	• At times have been mistaken for acute organophosphate or carbamate poisoning • Symptomatic treatment • Treatment with high doses of atropine may yield significant adverse results • Vitamin E oil for dermal symptoms
Neonicotinoid insecticides	• Disorientation, severe agitation, drowsiness, dizziness, weakness, and in some situations, loss of consciousness • Vomiting, sore throat, abdominal pain • Ulcerations in upper gastrointestinal tract	• Supportive care • Consider sedation for severe agitation • No available antidote • No available diagnostic test
Fipronil (N-phenylpyrazole insecticides)	• Nausea and vomiting • Aphthous ulcers • Altered mental status and coma • Seizures	• Supportive care • No available antidote • No available diagnostic test
Lindane (organochlorine insecticide)	• Central nervous system: mental status changes and seizures • Paresthesia, tremor, ataxia and hyperreflexia	• Control acute seizures with lorazepam • Lindane blood level available as send out
Glyphosate (phosphonate herbicides)	• Nausea and vomiting • Aspiration pneumonia type syndrome • Hypotension, altered mental status, and oliguria in severe cases • Pulmonary effects may in fact be secondary to organic solvent	• Supportive care • Pulmonary effects may be secondary to organic solvent
Chlorophenoxy herbicides	• Skin and mucous membrane irritation • Vomiting, diarrhea, headache, confusion • Metabolic acidosis is the hallmark • Renal failure, hyperkalemia, and hypocalcemia • Probable carcinogen	• Consider urine alkalinization with sodium bicarbonate in IV fluids
Rodenticides (long-acting anticoagulants)	• Bleeding: gums, nose, and other mucous membrane sites • Bruising	• Consider PT (international normalized ratio) • Observation may be appropriate for some clinical scenarios in which it is not clear a child even ingested the agent • Vitamin K indicated for active bleeding (IV vitamin K) or for elevated PT (oral vitamin K)

IV, intravenous; PT, prothrombin time.

[a] Expanded version of this table is available in the accompanying technical report.[1]

CHRONIC EFFECTS

Dosing experiments in animals clearly demonstrate the acute and chronic toxicity potential of multiple pesticides. Many pesticide chemicals are classified by the US EPA as carcinogens. The past decade has seen an expansion of the epidemiologic evidence base supporting adverse effects after acute and chronic pesticide exposure in children. This includes increasingly sophisticated studies addressing combined exposures and genetic susceptibility.[1]

Chronic toxicity end points identified in epidemiologic studies include adverse birth outcomes including preterm birth, low birth weight, and congenital

TABLE 3 Pesticide and Child Health Resources for the Pediatrician

Topic/Resource	Additional Information	Contact Information
Management of acute pesticide poisoning		
Recognition and Management of Pesticide Poisonings	Print: fifth (1999) is available in Spanish, English; 6th edition available 2013	http://www.epa.gov/pesticides/safety/healthcare/handbook/handbook.htm
Regional Poison Control Centers		1 (800) 222-1222
Chronic exposure information and specialty consultation		
The National Pesticide Medical Monitoring Program (NPMMP)	Cooperative agreement between Oregon State University and the US EPA. NPMMP provides informational assistance by E-mail in the assessment of human exposure to pesticides	npmmp@oregonstate.edu or by fax at (541) 737-9047
Pediatric Environmental Health Specialty Units (PEHSUs)	Coordinated by the Association of Occupational and Environmental Clinics to provide regional academically based free consultation for health care providers	www.aoec.org/PEHSU.htm; toll-free telephone number (888) 347-AOEC (extension 2632)
Resources for safer approaches to pest control		
US EPA	Consumer information documents	www.epa.gov/oppfead1/Publications/Cit_Guide/citguide.pdf
Citizens Guide to Pest Control and Pesticide Safety	• Household pest control • Alternatives to chemical pesticides • How to choose pesticides • How to use, store, and dispose of them safely • How to prevent pesticide poisoning • How to choose a pest-control company	
Controlling pests	Recommended safest approaches and examples of programs	www.epa.gov/pesticides/controlling/index.htm
The University of California Integrative Pest Management Program	Information on IPM approaches for common home and garden pests	www.ipm.ucdavis.edu
Other resources		
National research programs addressing children's health and pesticides	• NIEHS/EPA Centers for Children's Environmental Health & Disease Prevention Research	www.niehs.nih.gov/research/supported/centers/prevention
	• The National Children's Study	www.nationalchildrensstudy.gov/Pages/default.aspx
US EPA	Pesticide product labels	www.epa.gov/pesticides/regulating/labels/product-labels.htm#projects
The National Library of Medicine "Tox Town"	Section on pesticides that includes a comprehensive and well-organized list of web link resources on pesticides	http://toxtown.nlm.nih.gov/text_version/chemicals.php?id=23

anomalies, pediatric cancers, neurobehavioral and cognitive deficits, and asthma. These are reviewed in the accompanying technical report. The evidence base is most robust for associations to pediatric cancer and adverse neurodevelopment. Multiple case-control studies and evidence reviews support a role for insecticides in risk of brain tumors and acute lymphocytic leukemia. Prospective contemporary birth cohort studies in the United States link early-life exposure to organophosphate insecticides with reductions in IQ and abnormal behaviors associated with attention-deficit/hyperactivity disorder and autism. The need to better understand the health implications of ongoing pesticide use practices on child health has benefited from these observational epidemiologic data.[32]

EXPOSURE PREVENTION APPROACHES

The concerning and expanding evidence base of chronic health consequences of pesticide exposure underscores the importance of efforts aimed at decreasing exposure.

Integrated pest management (IPM) is an established but undersupported approach to pest control designed to minimize and, in some cases, replace the use of pesticide chemicals while achieving acceptable control of pest populations.[33] IPM programs and knowledge have been implemented in agriculture and to address weeds and pest control in residential settings and schools, commercial structures, lawn and turf, and community gardens. Reliable resources are available from the US EPA and University of California—Davis (Table 3). Other local policy approaches in use are posting warning signs of pesticide use, restricting spray zone buffers at schools, or restricting specific types of pesticide products in schools. Pediatricians can

play a role in promotion of development of model programs and practices in the communities and schools of their patients.

RECOMMENDATIONS

Three overarching principles can be identified: (1) pesticide exposures are common and cause both acute and chronic effects; (2) pediatricians need to be knowledgeable in pesticide identification, counseling, and management; and (3) governmental actions to improve pesticide safety are needed. Whenever new public policy is developed or existing policy is revised, the wide range of consequences of pesticide use on children and their families should be considered. The American Academy of Pediatrics, through its chapters, committees, councils, sections, and staff, can provide information and support for public policy advocacy efforts. See http://www.aap.org/advocacy.html for additional information or contact chapter leadership.

Recommendations to Pediatricians

1. Acute exposures: become familiar with the clinical signs and symptoms of acute intoxication from the major types of pesticides. Be able to translate clinical knowledge about pesticide hazards into an appropriate exposure history for pesticide poisoning.
2. Chronic exposures: become familiar with the subclinical effects of chronic exposures and routes of exposures from the major types of pesticides.
3. Resource identification: know locally available resources for acute toxicity management and chronic low-dose exposure (see Table 3).
4. Pesticide labeling knowledge: Understand the usefulness and limitations of pesticide chemical information on pesticide product labels.
5. Counseling: Ask parents about pesticide use in or around the home to help determine the need for providing targeted anticipatory guidance. Recommend use of minimal-risk products, safe storage practices, and application of IPM (least toxic methods), whenever possible.
6. Advocacy: work with schools and governmental agencies to advocate for application of least toxic pesticides by using IPM principles. Promote community right-to-know procedures when pesticide spraying occurs in public areas.

Recommendations to Government

1. Marketing: ensure that pesticide products as marketed are not attractive to children.
2. Labeling: include chemical ingredient identity on the label and/or the manufacturer's Web site for all product constituents, including inert ingredients, carriers, and solvents. Include a label section specific to "Risks to children," which informs users whether there is evidence that the active or inert ingredients have any known chronic or developmental health concerns for children. Enforce labeling practices that ensure users have adequate information on product contents, acute and chronic toxicity potential, and emergency information. Consider printing or making available labels in Spanish in addition to English.
3. Exposure reduction: set goal to reduce exposure overall. Promote application methods and practices that minimize children's exposure, such as using bait stations and gels, advising against overuse of pediculicides. Promote education regarding proper storage of product.
4. Reporting: make pesticide-related suspected poisoning universally reportable and support a systematic central repository of such incidents to optimize national surveillance.
5. Exportation: aid in identification of least toxic alternatives to pesticide use internationally, and unless safer alternatives are not available or are impossible to implement, ban export of products that are banned or restricted for toxicity concerns in the United States.
6. Safety: continue to evaluate pesticide safety. Enforce community right-to-know procedures when pesticide spraying occurs in public areas. Develop, strengthen, and enforce standards of removal of concerning products for home or child product use. Require development of a human biomarker, such as a urinary or blood measure, that can be used to identify exposure and/or early health implications with new pesticide chemical registration or reregistration of existing products. Developmental toxicity, including endocrine disruption, should be a priority when evaluating new chemicals for licensing or reregistration of existing products.
7. Advance less toxic pesticide alternatives: increase economic incentives for growers who adopt IPM, including less toxic pesticides. Support research to expand and improve IPM in agriculture and nonagricultural pest control.
8. Research: support toxicologic and epidemiologic research to better identify and understand health risks associated with children's exposure to pesticides. Consider supporting another national study of pesticide use in the home and garden setting of US households as a targeted initiative or through cooperation with existing research opportunities (eg, National Children's Study, NHANES).
9. Health provider education and support: support educational efforts to increase the capacity of pediatric health care providers to diagnose and manage acute pesticide

poisoning and reduce pesticide exposure and potential chronic pesticide effects in children. Provide support to systems such as Poison Control Centers to provide timely, expert advice on exposures. Require the development of diagnostic tests to assist providers with diagnosing (and ruling out) pesticide poisoning.

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ERRATA

Spooner. We Are Still Waiting for Fully Supportive Electronic Health Records in Pediatrics. *Pediatrics*. 2012;130(6):e1674–e1676.

An error occurred in this article by Spooner, titled "We Are Still Waiting for Fully Supportive Electronic Health Records in Pediatrics" published in the December 2012 issue of *Pediatrics* (2012;130[6]:e1674–e1676; originally published online November 19, 2012; doi:10.1542/peds.2012-2724). On page e1674, on line 33, this reads: "The alarming result from the survey was that only 3% of AAP Fellows reported that they had a system that provided all of the items listed by Leu and colleagues." This should have read: "The alarming result from the survey was that only 9.6% of AAP Fellows reported that they had or planned to adopt within 12 months a system that provided all of the five "pediatric-supportive" items listed by Leu and colleagues."

doi:10.1542/peds.2013-0134

Auger et al. Medical Home Quality and Readmission Risk for Children Hospitalized With Asthma Exacerbations. *Pediatrics*. 2013;131(1):64–70

An error occurred in this article by Auger et al, titled "Medical Home Quality and Readmission Risk for Children Hospitalized With Asthma Exacerbations" published in the January 2013 issue of *Pediatrics* (2013;131[1]:64–70; doi:10.1542/2012-1055). On page 69, in Table 2 under the heading Adjusted HR, on the line Medicaid, this reads: "0.28 (0.51–1.34)." This should have read: "0.82 (0.51–1.34)."

doi:10.1542/peds.2013-0187

Council on Environmental Health. Policy Statement: Pesticide Exposure in Children. *Pediatrics*. 2012;130(6):e1757–e1763

A couple of errors occurred in this AAP Policy Statement titled "Pesticide Exposure in Children" published in the December 2012 issue of *Pediatrics* (2012;130[6]:e1757–e1763; originally published online November 26, 2012; doi:10.1542/peds.2012-2757). In Table 2, in the second and third columns where glyphosate is discussed, the words "organic solvent" should be replaced with the word "surfactant." On page e1758, in the first paragraph of the left-hand column, immediately beneath Table 1, the first full sentence should be amended to read: "For many children, diet may be the most influential source, as illustrated by an intervention study that placed children on an organic diet (produced without most conventional pesticides) and observed drastic and immediate decrease in urinary excretion of organophosphate pesticide metabolites."

doi:10.1542/peds.2013-0576

Robert JR, Karr CJ; Council on Environmental Health. Technical Report: Pesticide Exposure in Children. *Pediatrics*. 2012;130(6):e1765–e1788

Several inaccuracies occurred in this AAP Technical Report titled "Pesticide Exposure in Children" published in the December 2012 issue of *Pediatrics* (2012;130[6]:e1765–e1788; originally published online November 26, 2012; doi:10.1542/peds.2012-2758). On page e1773 and in Tables 1 and 2 where the phosphonate herbicide glyphosate is discussed, changes should be noted. In the first paragraph of the first column on page e1773 about acute glyphosate poisoning, the word "intentional" should be substituted for the word "unintentional." In this same paragraph as well as in Tables 1 and 2, the word "surfactant" should replace the words "hydrocarbon solvent" and "organic solvent, respectively." The

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Pesticide Exposure in Children

COUNCIL ON ENVIRONMENTAL HEALTH

Pediatrics; originally published online November 26, 2012;
DOI: 10.1542/peds.2012-2757

Pesticide Exposure in Children

COUNCIL ON ENVIRONMENTAL HEALTH

Pediatrics; originally published online November 26, 2012;
DOI: 10.1542/peds.2012-2757

The American College of Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

COMMITTEE OPINION

Number 575 • October 2013

The American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women

American Society for Reproductive Medicine Practice Committee

The University of California, San Francisco Program on Reproductive Health and the Environment

This Committee Opinion was developed by the American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women and the American Society for Reproductive Medicine Practice Committee with the assistance of the University of California, San Francisco (UCSF) Program on Reproductive Health and the Environment. The Program on Reproductive Health and the Environment endorses this document. This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. This information should not be construed as dictating an exclusive course of treatment or procedure to be followed.

Exposure to Toxic Environmental Agents

ABSTRACT: Reducing exposure to toxic environmental agents is a critical area of intervention for obstetricians, gynecologists, and other reproductive health care professionals. Patient exposure to toxic environmental chemicals and other stressors is ubiquitous, and preconception and prenatal exposure to toxic environmental agents can have a profound and lasting effect on reproductive health across the life course. Prenatal exposure to certain chemicals has been documented to increase the risk of cancer in childhood; adult male exposure to pesticides is linked to altered semen quality, sterility, and prostate cancer; and postnatal exposure to some pesticides can interfere with all developmental stages of reproductive function in adult females, including puberty, menstruation and ovulation, fertility and fecundity, and menopause. Many environmental factors harmful to reproductive health disproportionately affect vulnerable and underserved populations, which leaves some populations, including underserved women, more vulnerable to adverse reproductive health effects than other populations. The evidence that links exposure to toxic environmental agents and adverse reproductive and developmental health outcomes is sufficiently robust, and the American College of Obstetricians and Gynecologists and the American Society for Reproductive Medicine join leading scientists and other clinical practitioners in calling for timely action to identify and reduce exposure to toxic environmental agents while addressing the consequences of such exposure.

Reproductive Environmental Health

Robust scientific evidence has emerged over the past 15 years, demonstrating that preconception and prenatal exposure to toxic environmental agents can have a profound and lasting effect on reproductive health across the life course (1–3). Exposure to toxic environmental agents also is implicated in increases in adverse reproductive health outcomes that emerged since World War II; these changes have occurred at a rapid rate that cannot be explained by changes in genetics alone, which occur at a slower pace. For additional information, a detailed review is available at www.acog.org/goto/underserved.

Exposure to environmental chemicals and metals in air, water, soil, food, and consumer products is ubiquitous. An analysis of National Health and Nutrition Examination Survey data from 2003–2004 found that virtually every pregnant woman in the United States is exposed to at least 43 different chemicals (4). Chemicals in pregnant women can cross the placenta, and in some cases, such as with methyl mercury, can accumulate in the fetus, resulting in higher fetal exposure than maternal exposure (5–7). Prenatal exposure to environmental chemicals is linked to various adverse health consequences, and patient exposure at any point in time can lead to harmful reproductive health outcomes. For example, prenatal exposure to certain pesticides has been documented to increase the risk of cancer in childhood; adult male exposure to pesticides is linked to altered semen quality, sterility, and prostate cancer; and postnatal exposure to some pesticides can

interfere with all developmental stages of reproductive function in adult females, including puberty, menstruation and ovulation, fertility and fecundity, and menopause (8). A group of chemicals called endocrine disrupting chemicals has been shown to interfere with the role of certain hormones, homeostasis, and developmental processes (9). They represent a heterogeneous group of agents used in pesticides, plastics, industrial chemicals, and fuels. One study shows that the endocrine disrupting chemical bisphenol-A works in a fashion that is comparable to diethylstilbestrol at the cell and developmental level (10). Likewise, research has clearly shown that many industrial chemicals can affect thyroid function (9, 11). Because of deficiencies in the current regulatory structure, unlike pharmaceuticals, most environmental chemicals have entered the marketplace without comprehensive and standardized information regarding their reproductive or other long-term toxic effects (12).

Vulnerable Populations and Environmental Disparities

Although exposure to toxic environmental agents is ubiquitous among all patient populations, many environmental factors harmful to reproductive health also disproportionately affect vulnerable and underserved populations and are subsumed in issues of environmental justice. In the United States, minority populations are more likely to live in the counties with the highest levels of outdoor air pollution (13) and to be exposed to a variety of indoor pollutants, including lead, allergens, and pesticides than white populations (14). In turn, the effects of exposure to environmental chemicals can be exacerbated by injustice, poverty, neighborhood quality, housing quality, psychosocial stress, and nutritional status (14, 15).

Women with occupational exposure to toxic chemicals also are highly vulnerable to adverse reproductive health outcomes (16). For example, levels of organophosphate pesticides and phthalates measured in occupationally exposed populations are far greater than levels measured in the general population (17, 18). Furthermore, low-wage immigrant populations disproportionately work in occupations associated with a hazardous workplace environment (19, 20).

As underscored by a groundbreaking 2009 report by the National Academy of Sciences, the effects of low-dose exposure to an environmental contaminant may be quite different based on vulnerabilities, such as the underlying health status of the population and the presence of additional or "background" environmental exposure (21). Recognition of environmental disparities is essential for developing and implementing successful and efficient strategies for prevention.

Prevention

The evidence that links exposure to toxic environmental agents and adverse reproductive and developmental health outcomes is sufficiently robust, and the American College of Obstetricians and Gynecologists (the College) and the American Society for Reproductive Medicine (ASRM) join numerous other health professional organizations in calling for timely action to identify and reduce exposure to toxic environmental agents while addressing the consequences of such exposure (1, 22, 23). Reproductive care providers can be effective in preventing prenatal exposure to environmental threats to health because they are uniquely poised to intervene before and during pregnancy, which is a critical window of human development. An important outcome of pregnancy is no longer just a healthy newborn but a human biologically predisposed to be healthy from birth to old age (3, 24).

Providing Anticipatory Guidance

It is important for health care providers to become knowledgeable about toxic environmental agents that are endemic to their specific geographic areas. Intervention as early as possible during the preconception period is advised to alert patients regarding avoidance of toxic exposure and to ensure beneficial environmental exposure, eg, fresh fruit and vegetables, unprocessed food, outdoor activities, and a safe and nurturing physical and social environment. By the first prenatal care visit, exposure to toxic environmental agents and disruptions of organogenesis may have already occurred. Obtaining a patient history during a preconception visit and the first prenatal visit to identify specific types of exposure that may be harmful to a developing fetus is a key step and also should include queries of the maternal and paternal workplaces. A list of key chemical categories, sources of exposure, and clinical implications are provided in the online companion document to this Committee Opinion (www.acog.org/goto/underserved). Examples of an exposure history are available at http://prhe.ucsf.edu/prhe/clinical_resources.html. Once this exposure inventory has been completed, information should be given regarding the avoidance of exposure to toxic agents at home, in the community, and at work with possible referrals to occupational medicine programs or United States Pediatric Environmental Health Specialty Units if a serious exposure is found (25).

Reproductive care professionals do not need to be experts in environmental health science to provide useful information to patients and refer patients to appropriate specialists when a hazardous exposure is identified. Existing clinical experience and expertise in communicating risks of treatment are largely transferable to environmental health. Physician contact time with a patient does not need to be the primary point of intervention; information and resources about environmental hazards can be successfully incorporated into a childbirth class curriculum or provided in written materials to help parents make optimal choices for themselves and their children (26).

Reporting identified hazards is critical to prevention. For example, the reproductive toxicity of a common solvent used in many consumer products was first

described in a case report of a stillbirth (27). Physicians in the United States are required to report illnesses or injuries that may be work related, and reporting requirements vary by state. No authoritative national list of physician-reporting requirements by state exists. Resources for information about how to report occupational and environmental illnesses include local and state health agencies and the Association of Occupational and Environmental Clinics (http://www.aoec.org/about.htm). Illnesses include acute and chronic conditions, such as a skin disease (eg, contact dermatitis), respiratory disorder (eg, occupational asthma), or poisoning (eg, lead poisoning or pesticide intoxication) (28).

Patient-centered actions can reduce body burdens of toxic chemicals (ie, the total amount of chemicals present in the human body at any one time) (29–32). For example, research results document that when children's diets change from conventional to organic, the levels of pesticides in their bodies decrease (29, 30). Likewise, study results document that avoiding canned food and other dietary sources of bisphenol A can reduce measured levels of the chemical in children and adult family members (31), and that short-term changes in dietary behavior may significantly decrease exposure to phthalates (32).

Clinicians should encourage women in the preconception period and women who are pregnant or lactating to eat fruit, vegetables, beans, legumes, and whole grains every day, to avoid fast food and other processed foods whenever possible, and to limit foods high in animal fat, while providing information about how certain types of food affect health and how individuals can make changes. Also, patients should be advised that some large fish, such as shark, swordfish, king mackerel, and tilefish, are known to contain high levels of methylmercury, which is known to be teratogenic. As such, women in the preconception period and women who are pregnant or lactating should avoid these fish. To gain the benefits of consuming fish, while avoiding the risks of methylmercury consumption, pregnant women should be encouraged to enjoy a variety of other types of fish, including up to 12 ounces a week (two average meals) of a variety of fish and shellfish that are low in mercury. Five of the most commonly eaten seafood items that are low in mercury are shrimp, canned light tuna, salmon, pollock, and catfish. White (albacore) tuna has more mercury than canned light tuna and should be limited to no more than 6 ounces per week. Pregnant women and breastfeeding women should also check local advisories regarding the safety of fish caught in local lakes, rivers, and coastal areas. If no advice is available, they should consume no more than 6 ounces per week (one average meal) of fish caught in local waters and no other fish during that week (33).

Primary Prevention: The Role of Reproductive Care Professionals Beyond the Clinical Setting

Ultimately, evidence-based recommendations for preventing harmful environmental exposure must involve policy change (34). Action at the individual level can reduce exposure to some toxic chemicals (29, 31, 32) and informed consumer-purchasing patterns can send a signal to the marketplace to help drive societal change (35). However, individuals alone can do little about exposure to toxic environmental agents, such as from air and water pollution, and exposure perpetuated by poverty. The incorporation of the authoritative voice of health care professionals in policy arenas is critical to translating emerging scientific findings into prevention-oriented action on a large scale. Accordingly, many medical associations have taken steps in that direction (23).

For example, in 2009, the Endocrine Society called for improved public policy to identify and regulate endocrine disrupting chemicals and recommended that "until such time as conclusive scientific evidence exists to either prove or disprove harmful effects of substances, a precautionary approach should be taken in the formulation of EDC [endocrine disrupting chemical] policy" (36). Consistent with the clinical imperative to "do no harm," the precautionary principle states, "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically" (37).

The College and the ASRM join these associations and call on their members to advocate for policies to identify and reduce exposure to environmental toxic agents while addressing the consequences of such exposure. Advancing policies and practices in support of a healthy food system should be pursued as a primary prevention strategy to ensure the health of pregnancies, children, and future generations. The College and ASRM urge the U.S. Environmental Protection Agency and other federal and state agencies to take all necessary actions when reviewing substances to guarantee health and safety. In addition, the College and ASRM fully support rigorous scientific investigation into the causes and prevention of birth defects, including linkages between environmental hazards and adverse reproductive and developmental health outcomes. Timely and effective steps must be taken to ensure the safety of all mothers and infants from toxic environmental agents. Because data are lacking on the safety of most chemicals, careful consideration of the risks posed must be given while the potential immediate and long-term health and genetic risks are evaluated. A chemical should never be released if a concern exists regarding its effect on health.

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From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: akamaimom@gmail.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Sunday, February 08, 2015 2:24:03 PM

SB800
Submitted on: 2/8/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Felicia Cowden	Individual	Support	No

Comments: Please support SB800. Creating buffer zones near schools from restricted use pesticides is a minimum of protection that needs to be provided. Thousands of people on Kauai requested this with our ordinance 960 which was mostly fought by the chemical companies themselves. The industry has now sued the county of Kauai for the right to spray poison near our schools. This is a clear demonstration that they are not willing to respect the concerns of the community nor recognize the right of the local government to set safety guidelines. Please help with the passage of this bill so the people can have the protection that has been remarkably demanded across five islands. The state has not shown the political will to reign in the excesses of this industry. This bill sets a minimum standard of protecting our most vulnerable citizens. Children have little choice about school attendance. This is a place where they should be kept safe. Mahalo for supporting the counties with the creation of this bill.

From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: shannonkona@gmail.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Tuesday, February 10, 2015 10:07:09 AM

SB800
Submitted on: 2/10/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Shannon Rudolph	Individual	Support	No

Comments: Strongly support. Mahalo Nui Loa Senators Green & Ruderman, for taking the overuse of pesticides in Hawai`i seriously.

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Date: Wednesday, February 11, 2015 8:44:03 AM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Ian York	Individual	Support	No

Comments: Given the studies completed showing an increased developmental risks from pesticide exposure, a buffer zone is essential in providing some measure of protection for children and schools. This buffer distance should be as large as is possible given the tenancy for pesticides to drift with measurable health effects found up to a mile away. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4181917/

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Date: Tuesday, February 10, 2015 11:17:44 PM

SB800
Submitted on: 2/10/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
pat gegen	Individual	Support	No

Comments: Good intent with a significant buffer (1 mile). What happens if a child feels ill and it is suspected to be pesticides (like what happened at Waimea School on Kauai), do they have to disclose what chemical they were spraying. Also - a child is in school for 7 hours a day 180 days per year - if they live within 50 feet of a test field they could be getting drift from pesticides much more often than they ever would at school - what is protecting them at their home?

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Cc: gordines@kauaiflowers.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Tuesday, February 10, 2015 6:42:52 PM

SB800
Submitted on: 2/10/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
John R. Gordines	Individual	Oppose	No

Comments: This has already been established!

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Cc: joannaction@yahoo.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Tuesday, February 10, 2015 5:43:52 PM

SB800
Submitted on: 2/10/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Joanna Wheelers	Individual	Support	No

Comments: Please make it possible for the children of Hawaii to be able to go to school and be safe as it is a terrible thing that the most dangerous chemical corporations in the World are using Paradise to test horrific poisons,let alone to do it next to our keiki. The international polluters that have taken over the ag land that should be feeding Hawaii care about nothing but about their bottom line and they have caused environmental disasters around the planet. Pesticides are linked to not only death but all sort of chronic deceases. It is our duty to protect the children.Please do the right thing, please protect our children and make buffer areas possible. Ideally those poison tests stop taking place in Hawaii for good.Much mahalo and aloha.

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From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: ipoc.m.chang@hotmail.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Tuesday, February 10, 2015 3:43:57 PM

SB800
Submitted on: 2/10/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Corine Chang	Individual	Support	No

Comments: I am in support of SB800 that restricts pesticides around schools.

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From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: elle.cochran@mauicounty.us
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Tuesday, February 10, 2015 2:42:58 PM

SB800
Submitted on: 2/10/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Elle Cochran	Maui County Council Member	Support	No

Comments: I Support SB 800

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February 11, 2015

Testimony from Jeff Case, Senior Director Government Affairs, CropLife America

In opposition to SB 793, SB 797, SB 800, SB 801, SB 1037

Thursday, Feb. 12, 3 p.m. – Senate Committees on Health, Ag, Water/Land and Education

Aloha Chairs and Committee Members:

CropLife America represents the manufactures and registrants of pesticide products that are used for agriculture production. We recognize the need for these valuable crop protection products to be used in a manner that is protective to schools, children and sensitive environmental areas. But we are opposed to the series of bills - SB 793, SB 797, SB 800, SB 801 and SB 1037.

These bills will not provide any additional public or environmental safety than already exists in the use requirements, many precautions and setbacks identified on the product use labels which are enforceable by state and federal law. We dispute the idea that there are wide-spread problems with pesticide applications in the state, and the need for these extensive and unprecedented measures.

These bills have been develop and promoted by national anti-pesticide /agriculture organizations like Center for Food Safety and EarthJustice. The goal of these national well- funded groups is to make growing genetically modified crops in Hawaii as difficult as possible and has less to do with concerns about their use of pesticides.

These groups have misled the public and lawmakers by suggesting that 33 states which have already passed similar laws. Very few states have laws that contain ANY of the provisions that are in these bills. Integrated Pest Management (IPM) requirements in schools and on school property has nothing to do with the application of pesticides on agriculture lands.

Appropriately – schools have the responsibility of keeping students healthy and safe by ensuring pesticides are used appropriately. The recent incidents at schools in Waipahu, Ewa Beach and Hawaii Kai did NOT involve farmers, but were the result of improper use by neighbors.

We support SB 734 because we believe that a strong state pesticide regulatory program is essential to assuring the public that these valuable pesticide products are used properly. SB 734 strengthens the Hawaii Department of Agriculture's capacity to regulate pesticides in the state. If lawmakers are sincere about addressing public safety, support the pesticide branch of the Dept. of Ag.

Thank for your consideration.

I am writing to oppose SB 800which proposes to establish buffer zones around schools that restrict pesticide use for any entity or person. There are no documented cases of a pesticide application causing adverse health affects at Hawaii's schools. My two children attended Waialua High School on the North shore of Oahu for a total of eight years, from 2002-2012. As a parent actively involved in the school's education and athletic activities, I can tell you that nobody (student or staff) complained of any pesticide from a seed farm close to the school.

My co-workers were raised in the mid-west. They have shown me photos of their elementary and high schools surrounded on all four sides by corn field. They had zero complaints or health issues from the farms spraying pesticides near their schools.

This bill is nothing more than a tactic by anti-GMO activists to push their agenda. What they don't realize is that they are hurting regular, small kine local famers.

Please vote NO.

Dee Montgomery-Brock, Mililani, HI

From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: elif.beall@gmail.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Wednesday, February 11, 2015 11:15:14 AM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Elif Beall	Individual	Support	No

Comments:

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HAWAII Farmers & Ranchers UNITED

Founding Association Members

Hawaii Papaya Industry Association (*HPIA*)

Hawaii Cattlemen's Council

Big Island Banana Growers

Hamakua, Hilo & Kohala Farm Bureau Counties

Hawaii Floriculture & Nursery Association

We Grow 93% of Hawaii Island Agriculture Crops

~ 625,000 acres of land in production ~ $194 Million in Revenue ~

TESTIMONY BEFORE THE
SENATE COMMITTEE ON HEALTH, AGRICULTURE, ENERGY & ENVIROMENT

FEBRUARY 12, 2015 at 3:00PM in Capitol Room 414

TESTIMONY ON SB 793, SB 797, SB 800, SB 801, SB 1037

Aloha Chair(s) and Committee Members,

My Name is Lorie Farrell, I am the Project Director for Hawaii Farmers and Ranchers United, Mahalo for allowing us to testify on this matter.

Farmers are land stewards and we understand firsthand the need for crop protection methods and pesticides; we live in our communities and our children attend local schools; We are members of our communities. Farmers and agriculture is not the enemy, we feed and sustain Hawaii.

ACTIVISTS GROUPS HAVE TARGETED FARMERS WITH ANTI-PESTICIDE LEGISLATION
NO FACTS = NO FARMERS = NO FOOD

WE OPPOSE SB 793, SB 797, SB 800, SB 801, SB 1037

- All pesticide and product use labels already address public and environmental safety through mandated requirements, precautions and setback, all of which are already enforceable by state and federal law. Pesticides undergo years of study and tests based on scientific research to reduce risk and ensure health and safety for everyone and the environment. The average time frame to obtain a pesticide label is 12 years and a cost of $150 to 250 million dollars; this is due to the strict guidelines required by the EPA.

Obtain more information on the Process here.

-- ***We Feed Hawaii*** --

- These bills have been developed and promoted by national anti-pesticide /agriculture organizations like Center for Food Safety and PANNA. The intent of these national well- funded groups is to make make growing genetically modified crops in Hawaii as difficult as possible, and has less to do with concerns about their use of pesticides. The unintended consequences of which is Hawaii's farmers and ranchers are being squeezed of their hope and were forced to defend ourselves on multiple levels.

- These groups have misled the public and lawmaker sby saying similar laws have been adopted across the country, in "33 states". This is false! Very few states have laws that contain ANY of the provisions that are in these bills. Integrated Pest Management (IPM) requirements in schools and on school property has nothing to do with the application of pesticides on agricultural lands.
- Appropriately – schools have the responsibility of ensuring the health of students by ensuring pesticides are used appropriately. The recent incidents at schools in Waipahu, Ewa Beach and Hawaii Kai did NOT involve farmers, but were the result of improper use by neighbors.

- We support SB 734 because we believe that a strong state pesticide regulatory program is essential to assuring the public that these valuable pesticide products are used properly. SB 734 strengthens the Hawaii Department of Agriculture's capacity to regulate pesticides in the state. If lawmakers are sincere about addressing public safety, support the pesticide branch of the Dept. of Ag.

Good public policy must and should be based on facts. To accurately assess the merits of any bill and value to public health and safety, the facts must be taken into consideration. This can be an excellent opportunity to not only understand the actual risks posed by the use of pesticides, but to also educate the public on those risks. We respectfully oppose these measures.

Thank you…

From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: lho@hawaiipublicpolicy.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Wednesday, February 11, 2015 2:02:40 PM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Adolph Helm	Dow Agrosciences	Oppose	No

Comments:

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MONSANTO CO.
94-520 KUNIA ROAD
KUNIA, HAWAII 96759

TESTIMONY BEFORE THE
SENATE COMMITTEE ON HEALTH/
SENATE COMMITTEE ON ENERGY & ENVIRONMENT/
SENATE COMMITTEE ON EDUCATION

FEBRUARY 12, 2015

TESTIMONY ON
SB 800
RELATING TO THE HEALTH IMPACT OF PESTICIDES

Chair Green, Gabbard, Kidani and committee members:

My name is Alan Takemoto, Community Affairs Manager for Monsanto Hawaii.

Thank you for allowing us to comment on SB 800. Pesticides when used properly are vital and beneficial tools for all aspects of our environment and the economy. Homeowners, farmers, businesses, government agencies and other environmental organizations use pesticides to protect the environment by controlling invasive species, control weeds, insects, plant diseases, and to prevent or control the spread of diseases in our every day lives. Monsanto and its employees and their families are very attentive to the health and well being of the communities where we work and live. Our employees and their families also attend the nearby schools, childcare facilities, hospitals, and community centers from which everyone benefits.

Safety for all is Monsanto's number one priority. All of Monsanto's employees who work with pesticides receive extensive training. We strive daily to ensure a safe working environment for our employees and guests. We are very aware of our surroundings and take every measure to ensure our neighbors are not impacted by our operations. Monsanto is also committed to being a responsible steward of the land. We utilize soil and water conservation practices in all of our farm operations. We diligently comply with federal and state laws that govern responsible pesticide use and in many cases have taken additional stewardship measures. Many farmers, including Monsanto, use an integrated pest management program that use all aspects of pest and disease control that don't necessarily require the use of pesticides, but also incorporates other techniques and natural occurrences.

Good public policy must and should be based on facts. We encourage the committee to examine the basic facts on pesticide use in Hawaii. The Hawaii State Department of Agriculture has the data on who uses pesticides, where they are being used and how they are being applied. To accurately assess the merits of any bill and value to public health and safety, these facts must be considered. This can be an excellent opportunity to not only understand the actual risks posed by the use of pesticides, but to also educate the public on those risks and the value pesticides bring to our communities. We respectfully oppose this measure. Thank you.

ALEXANDER & BALDWIN, INC.

822 Bishop Street
Honolulu, Hawaii 96813
P.O. Box 3440
Honolulu, HI 96801-3440
www.alexanderbaldwin.com
Tel (808) 525-6611
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SB 800
RELATING TO THE HEALTH IMPACT OF PESTICIDES

PAUL T. OSHIRO
MANAGER – GOVERNMENT RELATIONS
ALEXANDER & BALDWIN, INC.

FEBRUARY 12, 2015

Chair Green, Chair Gabbard, Chair Kidani, and Members of the Senate Committees on Health, Energy & Environment, and Education:

I am Paul Oshiro, testifying on behalf of Alexander & Baldwin, Inc. (A&B) and its agricultural company Hawaiian Commercial & Sugar Company on SB 800, A BILL FOR AN ACT RELATING TO THE HEALTH IMPACT OF PESTICIDES. We respectfully oppose this bill.

Pesticide use in Hawaii is extensively regulated by both the Federal Environmental Protection Agency and the State Department of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Hawaii Pesticide Law (Chapter 149A, HRS). Depending upon the pesticide and its intended use, the EPA and the State impose mandatory conditions and requirements that are science based and designed to protect the pesticide applicator, the general public, and the environment. These requirements may include, but are not limited to, maximum application rates, using only specified application methods and equipment, application only under specified weather conditions, prohibition of any pesticide drift to neighboring properties that causes health or environmental harm, and, in the case of restricted use

pesticides, allowing use only by or under the direct supervision of certified pesticide applicators.

Pesticide labels contain specific instructions such as what the pesticide may be used on, how much of the pesticide may be used, how often the pesticide can be used, and worker protection requirements. Federal Law states that the pesticide label is the law, and that use of the pesticide that is not in conformance with the label is a violation of Federal Law and may result in fines and/or imprisonment.

This bill includes provisions to impose new regulations and restrictions on the use of all pesticides by any entity or person that purchases or utilizes more than an unspecified amount of restricted use pesticides. Pesticide buffer zones are established for these entities and persons that restrict the outdoor application of all pesticides within an unspecified distance from schools. A provision is also included to stipulate that nothing in this bill shall be construed to prohibit or preempt the Counties from regulating pesticide disclosure, notification, and use in a manner that is equivalent to or more restrictive than this bill.

In the agricultural industry, pesticides are commonly utilized to protect crops from insect damage, disease, and weed infestation. Pesticides are an integral and essential component in many farming operations. The restriction and prohibition in the use of pesticides on agricultural crop lands will, in many instances, preclude the use of these lands for agricultural crop production.

By mandating the imposition of pesticide buffer zones, this bill may effectively prevent the continued use of lands presently in active agricultural production. The removal of lands presently in active agricultural production is likely to have a direct

negative impact on the total crop output of the agricultural operation. A reduction in total crop output may pose significant challenges in the overall sustainability and viability of the agricultural operation.

The proposed pesticide buffer zones, which are applicable to entities and persons that purchase or utilize in excess of an unspecified amount of restricted use pesticides, may essentially allow other entities and persons who use the same restricted use or general use pesticides to be exempt from the provisions in this bill. Entities or persons applying significant quantities of restricted or general use pesticides per acre in the vicinity of schools may be excluded from the restrictive provisions in this bill if they do not purchase or use restricted use pesticides above the unspecified aggregate threshold in this bill. Conversely, entities and persons who apply the same pesticides would be subject to the bill's restrictions if their aggregate restricted use pesticide use is in excess of the unspecified aggregate threshold. We also note that despite the establishment of buffer zones, schools may retain the option of utilizing restricted use pesticides on school grounds without additional restrictions.

This bill also includes a provision stipulating that nothing shall be construed to prohibit or preempt the Counties from regulating pesticide disclosure, notification, and use in a manner that is equivalent to or more restrictive than this bill. We respectfully oppose this provision as it is likely to result in pesticide oversight and regulations that differ throughout the State of Hawaii. With pesticide use heavily regulated at both the Federal and State levels of government, we believe that the imposition of any additional pesticide regulations should be science based and thoroughly researched and vetted prior to implementation. We believe that the Federal and State entities presently

overseeing pesticide regulation in Hawaii have the technical knowledge and expertise to implement additional pesticide regulations, when warranted and necessary, to protect and safeguard employees, the general public, and our environment.

Based on the foregoing, we respectfully request that this bill be held in Committee. Thank you for the opportunity to testify.

From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: gottlieb@hawaii.rr.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Wednesday, February 11, 2015 2:38:51 PM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Alan Gottlieb	Hawaii Cattlemen's Council	Oppose	No

Comments: Farmers and Ranchers strongly believe in the health and safety of their families, employees and the community. Farmers & Ranchers are the true environmentalists, stewarding over 25% of the State's land mass. We don't talk about helping the environment… we do it every day. Pesticide use is already regulated by the EPA and the Hawaii Dept of Agriculture, based on years of testing. Labeling requirements are based on good science, not on arbitrary buffers and activist sentiment. There seems to be an attack these days on the 1% of our population, the farmers and ranchers, who grow the food for everyone else. No one wants to use or over-use pesticides, but do use them when it is necessary. The little fire ant invading Hawaii is a great example. Do we want to fight it with available resources, or let those lovely critters take over our islands, biting everything in their path, raining down out of trees on our residents and visitor industry? Please oppose this anti-farming bill.

Good Beginnings Alliance
Voices For Hawai'i's Children

February 12, 2015

TO: Sen. Josh Green, Chair
Sen. Glenn Wakai, Vice Chair
Members of the Senate Committee on Health

Sen. Mike Gabbard, Chair
Sen. Josh Green, Vice Chair
Members of the Senate Committee on Energy and Environment

Sen. Michelle N. Kidani, Chair
Sen. Breene Harimoto, Vice Chair
Members of the Senate Committee on Education

FROM: Deborah Zysman, Executive Director

RE: **Support for SB 800**: RELATING TO HEALTH IMPACT OF PESTICIDES

Good Beginnings Alliance (GBA) **supports SB 800**, which establishes reasonable pesticide buffer zones for sensitive areas. However, we urge lawmakers to include both mandatory disclosure of pesticide use with any buffer zone designation as minimum requirements passed out this session.

Good Beginnings Alliance is Hawaii's leading policy and advocacy non-profit organization on children's health, education and safety. We build a united voice to educate and advocate for Hawaii's children.

We are concerned that many children in Hawaii have no choice but to live, play and attend childcare, preschool and/or school in close proximity to areas where restricted use pesticides are used.

The American Academy of Pediatrics (AAP) issued a policy statement in 2012 titled "Pesticide Exposure in Children." The full policy statement can be found at:
http://pediatrics.aappublications.org/content/130/6/e1757

The main findings of the AAP are that:

- Children are uniquely vulnerable to the toxicity of pesticide exposure and have both acute and chronic health issues associated with exposure
- **Prenatal and early childhood exposure to pesticides is associated with pediatric cancers, decreased cognitive function and behavioral problems.**
- Government should consider measures to minimize children's exposure.

Good Beginnings Alliance
Voices For Hawai'i's Children

Given the high risks associated with prenatal and early childhood pesticide exposure, extreme caution should be taken to protect our children.

Establishing buffer zones for sensitive areas are reasonable measures to protect children's health and well-being.

For these reasons, we respectfully urge committee members to pass this bill.

850 Richards Street #201, Honolulu, HI 96813 | Telephone: (808) 531-5502
www.goodbeginnings.org

Hawai'i Farm to School and School Garden Hui

Coordinated through The Kohala Center

TESTIMONY
Senate Committee on Health
Senate Committee on Energy and Environment
Senate Committee on Education
February 12, 2015, 3:30 p.m.

SB800: RELATING TO THE HEALTH IMPACT OF PESTICIDES

Chair Green, Chair Gabbard, Chair Kidani, and Members of the Committees,

The Hawai'i Farm to School and School Garden Hui **supports** SB800, which establishes buffer zones around schools that restrict pesticide use for any entity or person.

Formed in 2010, the Hawai'i Farm to School and School Garden Hui is a grassroots network of six island-level school garden and farm to school networks, along with representatives of the Hawai'i Departments of Education and Health, whose mission is to strengthen Hawai'i's statewide farm to school and school garden movement.

The impact of pesticides on children's health is of serious concern. In October 2012, the Pesticide Action Network North America published a report entitled, "A Generation in Jeopardy: How pesticides are undermining our children's health and intelligence," which reviews dozens of scientific studies that examine the impact of pesticides on children's health. **The report's findings include links between pesticide exposure and:**

- **Harm to the structure and functioning of the brain and nervous system, including attention deficit/hyperactivity disorder (ADHD), autism, widespread declines in IQ and other measures of cognitive function;**
- **Certain childhood cancers, birth defects, and early puberty;**
- **Childhood asthma, obesity, and diabetes.**

Importantly, the report refutes the claim that "safe" levels of pesticides can be determined, due to the fact that there are dramatic differences in the sensitivity of individuals to chemical exposure.

The report also reminds us that the President's Cancer Panel has stated that "we have been 'grossly underestimating' the contribution of environmental contamination to disease, and the policies meant to protect us have fallen far short."

Thank you for being part of this critical movement to enact laws that ensure a healthy future for our keiki.

Mahalo for the opportunity to testify.

Sincerely,

Lydi Morgan Bernal
Coordinator
Hawai'i Farm to School and School Garden Hui
schoolgardenhui@kohalacenter.org
www.hawaiischoolgardenhui.org

From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: irisiwami@yahoo.com
Subject: Submitted testimony for SB800 on Feb 12, 2015 15:30PM
Date: Wednesday, February 11, 2015 3:08:53 PM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Iris Iwami	Individual	Oppose	No

Comments: If the concern is health of children in schools, this should not be restricted to only certain pesticide users. Also, pesticide issues should be handled with the Department of Agriculture.

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From: mailinglist@capitol.hawaii.gov
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Cc: cindy.goldstein@pioneer.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Wednesday, February 11, 2015 3:14:35 PM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Cindy Goldstein	DuPont Pioneer	Oppose	No

Comments:

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From: mailinglist@capitol.hawaii.gov
To: HTHTestimony
Cc: mark.phillipson@syngenta.com
Subject: *Submitted testimony for SB800 on Feb 12, 2015 15:30PM*
Date: Wednesday, February 11, 2015 3:25:20 PM

SB800
Submitted on: 2/11/2015
Testimony for HTH/ENE/EDU on Feb 12, 2015 15:30PM in Conference Room 414

Submitted By	Organization	Testifier Position	Present at Hearing
Mark Phillipson	Syngenta Hawaii	Oppose	No

Comments:

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