HOUSE OF REPRESENTATIVES
TWENTY-NINTH LEGISLATURE, 2018
STATE OF HAWAII

H.B. NO. 1688 H.D. 2

A BILL FOR AN ACT

RELATING TO AGRICULTURE.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

PART I

SECTION 1. Hawaii is fighting a surge in cases of disease in humans caused by *Angiostrongylus cantonensis* a nematode more commonly known as the rat lungworm as it breeds in the pulmonary artery and lungs of rats. It is strongly suspected that people can be infected by eating produce which harbors the infectious larvae or snails or slugs containing infectious larvae and these concerns have caused great harm to local agriculture. Hawaii has had a long and important history with rat lungworm disease. The first two cases reported in the western medical literature occurred at Hawaii state hospital in 1959 when two older male patients died and an autopsy found *Angiostrongylus cantonensis* in their brains.

Two groups in Hawaii, one headed by Dr. Leon Rosen, M.D., M.P.H. from the National Institutes of Health, and the other by Dr. Joseph Alicata, Ph.D., a renowned University of Hawaii at Manoa parasitologist, embarked on an intense period of research

lasting over a decade and culminating in the publication of a book by Dr. Alicata in 1970 summarizing much of the previous decade of research on Angiostrongyliasis, or rat lungworm disease, in Hawaii in the Pacific region.

In addition to describing outbreaks and individual cases in humans, the book also described the life cycle in rodents, especially rats, and snails and slugs in great detail. Rats are the definitive host, the host in which the nematode breeds and produces offspring in the form of first stage (L1) larvae. Those larvae are shed and ingested by snails or slugs and then molt twice to produce an L3 larval form which is infectious for rats, for humans, and many other animals. The Rosen and Alicata groups showed that experimental infection could be induced in many animals including dogs, cats, pigs, calves, several primates, mice, and guinea pigs. In these mammals, the L3 form travelled to the animal's central nervous system and infected and damaged the spinal cord and the brain causing an eosinophilic meningitis and a broader spectrum of disease more accurately described as neuroangiostrongyliasis in the case of humans and, by veterinary convention, neuroangiostrongylosis in non-human animals.

Other groups of non-mammals could also be experimentally infected, including frogs and toads, crustaceans, planarians, lizards, other reptiles, and fish. In most of these animals the infectious L3 larval form was ingested and then stored in the muscles and body tissues where it remained alive and in infectious form. If these paratenic or transport hosts were eaten by humans, infection could then ensue. In the 1950s, a huge outbreak in French Polynesia involving approximately a thousand cases documented by lumbar puncture and thousands of clinically suspected cases, was investigated by the Rosen and Alicata groups and found to be caused by ingesting raw fresh water prawns usually as an uncooked sauce which was served on raw fish. While Dr. Alicata and Dr. Rosen did not observe natural infection in companion animals, such as dogs, cats, and horses, or domesticated agricultural animals, later observations of natural infections in these animals and in a host of wild animals and birds have since been reported.

Natural infection in the wild was also observed in many of these organisms over the years. Much of the research has been done in Australia where many marsupial mammals have been found to be infected. Natural infections have also been reported from

primates in zoos in several countries including the southern United States and Australia. More recently wild mammals, including opossums and armadillos, in the southern United States have been found to be infected with *A. cantonensis*. Infection has been reported in birds in captivity in the United States and in birds in the wild in Australia. Companion animals were first found to be naturally infected in Australia in the 1970s and several series of reports describing natural infections in dogs have come from that country. Cats and dogs have been reported as infected in China. A miniature horse was reported to be naturally infected in Louisiana.

Hawaii is now seeing a number of anecdotally reported and, in some cases well documented, naturally occurring cases in companion animals. On the island of Hawaii, Dr. Lisa Woods, D.V.M, a large animal veterinarian, suspected rat lungworm disease in six horses that died in the Puna region. The brain of one of those horses was sent to University of California at Davis Veterinary School and *A. Cantonensis* was found, confirming the diagnosis.

Many suspected cases in dogs in Hawaii have been reported by individuals and veterinarians but it is not clear if any of those cases have been confirmed by testing or necropsy.

There have been cases suspected in cats. In one recent case on the island of Oahu, a cat was observed eating a snail, developed typical symptoms of rat lungworm disease, and died. It should be noted that in cats and dogs the first symptoms are commonly hind-limb weakness or paralysis followed by brain involvement and then death. While some dogs recover spontaneously, others respond to corticosteroid treatment. The role if any of anti-parasitic medication (anthelminthics) such as ivermectin and albendazole in dogs is not clear.

Aquaponics, the raising of fish or other aquatic animals is a growing industry in Hawaii. Fresh water fish such as tilapia and catfish are raised in artificial pools and ponds. While no natural rat lungworm disease has been reported in fish, there was a report of snails raised aquaponically for commercial use causing a case of rat lungworm in Hawaii several decades ago. A concern is that some of the currently raised freshwater fish is reportedly being eaten raw as sashimi and, given the old report

of the experimental infection of tilapia with *A. cantonensis*, new research may be needed to avoid transmission to humans.

There are several advantages of modern research in Hawaii on these non-human animals.

In the case of companion animals, the desire of the owners to protect their cherished pets must be acknowledged. A recent letter to the editor in a Hawaii paper documented the sadness and outrage of a woman who brought her dog to Hawaii, went through the incredibly rigorous and expensive rabies protocol, only to have that dog contract rat lungworm disease and die after a prolonged and expensive illness with no recognition or appropriate treatment by a local veterinarian. She was outraged that despite her many contacts with the department of agriculture she had never been warned about the possibility of rat lungworm disease.

Informal discussions with legislators and constituents have revealed that very few individuals in Hawaii are aware of the risks to companion animals of contracting rat lungworm disease in Hawaii.

There is strong evidence that if diagnosed early enough rat lungworm disease can be treated safely and effectively with

anthelminthics, which will kill the worms, which are often combined with steroids. The dead worms do cause a marked inflammatory response which can be harmful, but if diagnosed and treated early there is evidence of great benefit.

There is a need to develop better animal models that can be used to develop diagnostic tools and treatment regimens which can be used in humans as well as animals. Animal models will also help to better understand the biology of the disease. There is a need to understand the risk to humans of contracting the disease by eating infected animals.

There is a need to know how to treat our cherished companion animals both for our State's inhabitants and tourists that bring their pets to Hawaii.

Accordingly, the purpose of this Act is to establish a rat lungworm disease in non-human animals study group to evaluate the historic research done in Hawaii, review reports from around the world, gather information from around the State, even anecdotal especially about cases in companion animals, and submit a report of its findings and recommendations to the legislature prior to the convening of the regular session of 2019.

SECTION 2. (a) There is established a rat lungworm disease in non-human animals study group, within the department of agriculture for administrative purposes. The study group shall, with respect to rat lungworm disease:

(1) Evaluate the historic research on rat lungworm disease in Hawaii;

(2) Review reports on rat lungworm disease from any relevant country; and

(3) Gather information within this State, including anecdotal information, especially cases involving companion animals, including cats, dogs, horses, birds, and fish.

(b) The chairperson of the board of agriculture, or the chairperson's designee, shall serve as the chairperson of the rat lungworm disease in non-human animals study group. The study group shall consist of:

(1) At least two members appointed by the president of the University of Hawaii who are involved in active research in rat lungworm disease at the University of Hawaii at Manoa;

(2) At least one member appointed by the dean of the University of Hawaii college of tropical agriculture and human resources;

(3) Two members appointed by the director of health or the director's designee;

(4) Two members appointed by the dean of the Daniel K. Inouye college of pharmacy, who are affiliated with the college of pharmacy;

(5) Two members appointed by the chairperson of the board of agriculture, including a veterinarian;

(6) Up to two members of the senate appointed by the president of the senate;

(7) Up to two members of the house of representatives appointed by the speaker of the house of representatives;

(8) A veterinarian appointed by the board of directors of the Hawaii Veterinary Medical Association; and

(9) Any other members appointed by the chairperson of the study group.

(c) The rat lungworm disease in non-human animals study group shall submit a report of its finding and recommendations,

including proposed legislation, to the legislature no later than twenty days prior to the convening of the regular session of 2019.

(d) Members of the rat lungworm disease in non-human animals study group shall serve without compensation; provided that all necessary expenses, including travel expenses, shall be paid by the department of agriculture. No member shall be made subject to section 84-17, Hawaii Revised Statutes, solely because of the member's participation as a member of the study group. The study group shall be exempt from chapter 92, Hawaii Revised Statutes.

(e) The rat lungworm disease in non-human animals study group shall dissolve on June 30, 2019.

SECTION 3. There is appropriated out of the general revenues of the State of Hawaii the sum of $100,000 or so much thereof as may be necessary for fiscal year 2018-2019 to support the work of and defray the expenses of the rat lungworm disease in non-human animals study group, including the hiring of necessary staff to provide research and prepare the required report to the legislature.

The sum appropriated shall be expended by the department of agriculture.

SECTION 4. This Act shall take effect on July 1, 2150.

H.B. NO. 1688 H.D. 2

Report Title:
Agriculture; Rat Lungworm Disease in Non-Human Animals Study Group; Appropriation

Description:
Establishes and funds the Rat Lungworm Disease in Non-Human Animals Study Group to evaluate, research, and gather information on rat lungworm disease. Requires a report to the Legislature. (HB1688 HD2)

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