6-1-2007

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Is Chronic Wasting Disease (CWD) in Deer and Elk Affecting Public Health?

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A Thesis
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Public Health
at the
University of Connecticut
2007
Master of Public Health Thesis

Is Chronic Wasting Disease (CWD) in Deer and Elk Affecting public health?

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August 30, 2007
Acknowledgements

I thank my major advisor, Tim Morse, Ph.D., for his continued support and counsel through this long process. Tim demonstrated flexibility, made himself accessible, and provided the framework for accomplishing this thesis. He helped me every step of the way in this process in which I was unfamiliar. I had never designed a questionnaire and had not gone through an Institutional Review Board process before. Tim was instrumental in assisting me in these tasks.

I thank both of my other advisors for this thesis: Joan Segal, MS, MA, and Paul Schur, MPH. Joan was a great help with administrative matters and managed the details that are so important to completing degree requirements. Paul was resilient and provided a lot of technical assistance throughout the project. His expertise in environmental health, public health and the thesis process were invaluable. Paul assisted a great deal with developing the questionnaire.

I thank my family who has been supportive of my vision and goals. In particular, I thank my stepmother Julie for her IT assistance. I thank my mother and father for prodding me to begin the master’s program in the first place and to complete this thesis. They both realize the value of education and wanted me to realize my potential. My sons don’t know it but they provide my drive and inspiration. My early academic advice to them is to never give up and to continue to pursue your goals no matter how difficult it gets or how long it takes to reach them.
Webster defines public health as "the art and science dealing with the protection and improvement of community health by organized community effort and including preventative medicine and sanitary and social science."\textsuperscript{1} Public health can also be defined clinically as the lack of disease in a given human population. However, public health has much broader implications such as the wellbeing of the public at large and quality of life issues, more akin to Webster's definition. Public health is having access to quality health care with excellent outcomes, living in sanitary conditions, and promoting healthy lifestyles of people. The key to public health has always been prevention rather than reaction to health problems. This cornerstone of public health has been proven to be more cost effective than traditional medicine in its reactive role. Preventing disease and promoting health are the goals of public health practitioners.

Traditionally, prevention of disease has been reached not only through advances in medicine but the adherence to sanitary living conditions, a safe water and food supply, warding off chronic diseases through lifestyle behavior change, environmental quality such as limiting air pollutants, ergonomics and occupational health, and epidemiology. Epidemiology, the study of disease in populations, is public health's most important tool. Surveillance is another important tool which can help us determine the extent of a public health threat. Surveillance has been crucial in our understanding of Transmissible Spongiform Encephalopies (TSEs), an insidious threat to public health.

\textsuperscript{1} Merriam Webster's Collegiate Dictionary, 10\textsuperscript{th} Edition, 1998, page 944
Transmissible Spongiform Encephalopies (TSEs) are animal diseases, with the exception of kuru, "Classical" Creutzfeldt Jakob disease (CJD) and variant Creutzfeldt-Jakob disease (vCJD or nvCJD). Kuru is a disease associated with cannibals in Papua New Guinea who ate brains of other humans and it is limited to cannibalistic populations. “Classical” CJD rarely strikes people under the age of 50 and it is a rare, fatal neurological condition. Interestingly though, it is thought that about 5-10% of Alzheimer’s disease patients may actually have CJD. This apparent misdiagnosis would raise the number of cases of "classical" CJD reported. TSEs affect the brain of the host causing abnormal behavior, incoordination, emaciation in the case of Chronic Wasting Disease (CWD) in deer and elk, and eventually death. Scrapie is a TSE associated with sheep and goats and derives its name from the affected sheep who scrape their bodies against fences, trees and other objects because their nerves caused a false itching feeling. Bovine Spongiform Encephalopy (BSE) or Mad Cow Disease, as the name implies, is a disease of cattle.

vCJD is a human disease that is associated with BSE and has been referred to as human BSE. An outbreak of BSE in England resulted in emergence of vCJD in humans. It is thought that consumption of BSE contaminated beef (the meat being contaminated with infected brain and spinal cord) can cause vCJD in the consumer. It is important to note that CJD is different than vCJD, and should be thought of as two separate diseases.

Lawrence Schonberger, MD, MPH, an epidemiologist with the Centers for Disease

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2 Nutrition Action Newsletter, CSPINET, June 2001, page 1  
4 Ibid.
Control and Prevention (CDC) says that “CJD and nvCJD are best thought of as two different diseases” and that “CJD was around long before the emergence of BSE in cattle.” The symptoms are similar but the patterns of brain lesions are distinctly different. Also, the average age of death for a victim of CJD is 68, whereas the average age of death for vCJD is 27.5.

Diseased animals have historically been associated with disease in humans whether via consumption or working with diseased animals in slaughter plants. Diseases such as Brucella and Anthrax in cattle are examples of zoonotic diseases that can be transmitted to humans. A modern example is the avian flu caused by the highly pathogenic H5N1 virus which can be transmitted from an infected bird to humans. In fact, the Department of Health and Human Services is managing a website entitled PandemicFlu.gov which implies that the avian flu will be a pandemic shortly. As the name implies, the Department of Health and Human Services is wholly a public health agency not an animal welfare agency with some public health component like the U.S. Department of Agriculture. Poultry workers and other bird handlers are the most at risk populations currently but there is credible fear that the H5N1 will mutate and be able to transmit from human to human. The headlines in many recent U.S. and world newspapers and magazines demonstrate the fact that this modern animal disease is threatening public health.

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6 Ibid.
7 www.pandemicflu.gov
8 Ibid.
The United States Department of Agriculture (USDA) regulates most meats and meat products produced in the U.S. under the authority of the Federal Meat Inspection Act. The law states which types of meat are to be regulated by the USDA and they include cattle, sheep, goats, horses, mules and reindeer.\(^9\)

Antemortem and postmortem inspection by the USDA inspectors has traditionally been the means to keep diseased animals out of the food supply. Antemortem inspection (before death inspection) is the inspection of live animals before being slaughtered thus recognizing the potential link between animal and human disease. This type of inspection, dating back to 1906, has been used to eradicate diseases such as brucellosis and bovine tuberculosis.\(^10\) To control BSE for example, an animal exhibiting signs of a neurological disorder is condemned. A live animal field test, when available, will further enhance the control of BSE.\(^11\) In fact, consumer groups have relegated this type of inspection to a “poke and sniff” type of inspection.\(^12\) Post mortem inspection is inspection of the carcass after slaughter. It has been used to visually detect fecal contamination and other defects. The general purpose of this inspection as described by the United States Department of Agriculture’s Food Safety and Inspection Service (USDA FSIS) is to “protect the public health by ensuring carcasses and parts that enter commerce are wholesome, not adulterated, and properly marked, labeled, and packaged.”\(^13\)

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\(^9\) [www.usda.gov](http://www.usda.gov)
\(^10\) Livestock Inspection Training, Antemortem Inspection, USDA FSIS, August 3, 2005
\(^11\) Gross and Miller, Journal of Wildlife Management, Chronic Wasting Disease in Mule Deer: Disease Dynamics and Control, November 27, 2000, pages 17-18
\(^12\) Author’s own experience
\(^13\) Livestock Slaughter Inspector Training, Livestock Postmortem Inspection, January 14, 2005
The U.S. Food and Drug Administration (FDA) regulates all other meat not covered in the Federal Meat Inspection Act. Game animals, for example, are regulated by the FDA under the authority of the Federal Food, Drug and Cosmetic Act. Often the USDA and the FDA’s jurisdictions overlap so they work together, such as in the case of a BSE infected cow. The USDA investigates the animal and whether any meat entered the food supply, while the FDA, which regulates animal feed, investigates whether any prohibited material (i.e. brain or spinal cord tissue) was in the animal feed. Many theorists think that feeding cows nervous tissue from other cows caused BSE to proliferate. It is imperative that the FDA and the USDA work together and coordinate their efforts well to ensure that the risk of transmitting BSE is extremely low.

FDA implemented a regulation in 1997 that prohibits the use of most proteins derived from mammals in the manufacture of animal feeds given to ruminants such as cows, sheep and goats. It also requires controls to be put in place to ensure that feed for ruminants does not contain the prohibited mammalian material.\textsuperscript{14} In addition, on October 2005, FDA proposed an additional rule prohibiting high risk material from all feeds and pet foods.

These high risk cattle materials prohibited in all animal feeds in the new proposed rule include: the brains and spinal cords from cattle 30 months of age and older, the brains and spinal cords from cattle of any age not inspected and passed for human consumption, the entire carcass of cattle not inspected and passed for human consumption if the brains and spinal cords have not been removed, tallow that is derived from the materials

\textsuperscript{14} FDA website, http://www.fda.gov/cvm/bsetoc.html
prohibited by this proposed rule if the tallow contains more than 0.15 percent insoluble impurities, and mechanically separated beef that is derived from the materials prohibited by this proposed rule.

The proposed regulation builds on the FDA's 1997 feed regulation which prohibits the use of certain mammalian-origin proteins in ruminant feed (e.g. for cattle and sheep), but allows these materials to be used in feed for non-ruminant species. According to the FDA website, "the removal of high-risk materials from all animal feed -- including pet food -- will protect against the transmission of the agent of BSE that could occur either through cross-contamination of ruminant feed with non-ruminant feed or feed ingredients during feed manufacture and transport, or intentional or unintentional misfeeding of non-ruminant feed to ruminants on the farm."\(^{15}\) The proposed rule has not been passed to date, however.

Currently, a major strategy to combat BSE in cattle is a surveillance program implemented by the USDA’s Animal and Plant Inspection Service (APHIS). The APHIS surveillance program includes the identification of exporting countries that are known to have BSE. The implementation of this part of the program (begun in 1989) results in the exclusion of imported ruminants from affected countries. However, it is known that cattle from the United Kingdom (a BSE affected country) were imported to the U.S. from 1981 to 1989 (prior to the implementation). APHIS has conducted a traceback (another important disease intervention strategy) to locate the animals. Several were found to be alive and were carefully monitored by APHIS to ensure they did not exhibit BSE.

symptoms nor were incorporated into the food chain. Another part of the surveillance effort is the sampling program in this country. Samples are taken from cattle that are exhibiting neurological symptoms, cattle that are condemned at slaughter for neurological reasons (part of the traditional antemortem inspection previously discussed), rabies negative cattle submitted to public health labs and nonambulatory cattle.

On the meat processing side, USDA’s Food Safety and Inspection Service (FSIS) has identified a problem with Advanced Meat Recovery (AMR) systems which extract meat from the spinal column of carcasses. In a survey of beef processing plants, it was discovered that more than 75% of companies were not keeping spinal cord out of their AMR products. The spinal cord tissue is a specified risk material for BSE transmission. In order to address this gap, FSIS issued a directive on August 25, 2003, clarifying that AMR plants need to keep spinal cord material out of their products and spelled out what enforcement will take place if there is noncompliance. Simply stated, the policy dictates that FSIS inspectors will collect a number of verification samples, can take control of violative product, and that USDA will request a recall if violative product has already been shipped out.

The USDA was able to put into practice its traceback system as a result of an incident that began on December 9, 2003. The traceback system in its current form involves a field investigation team visiting the slaughter plant in question, interviewing plant

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17 Ibid
19 Ibid.
management including the USDA inspector that is on-site (which is required by USDA), reviewing records and attempting to determine where the infected animal came from. The traceback also determines where the meat from the animal went so a recall or other action can be initiated. The term “traceback” is not completely accurate because it not only involves tracing the steps backward but also looking forward to where the meat went and ultimately its final disposition. On December 9, 2003, a nonambulatory dairy cow arrived at a slaughter plant in Washington state. Although the cow supposedly did not exhibit neurological symptoms at slaughter, samples were taken in accordance with USDA protocol. According to USDA, since the animal did not exhibit symptoms, the sample was not considered high priority so preliminary results did not come back until December 23rd. At this point, the Secretary of Agriculture announced the “presumptive positive” for BSE. A sample of the animal was sent to the BSE world reference lab in the United Kingdom. The next day, FSIS initiated a Class II recall of meat from the group of 20 animals slaughtered at the Washington state plant on December 9th. The USDA Class II recalls involve a potential health hazard situation in which there is a remote probability of adverse health consequences from eating the food. The USDA traceback investigation determined what happened to the three calves born from the index cow and these animals were quarantined. On Christmas Day, the United Kingdom world reference lab confirmed the BSE diagnosis and the traceback continued. According to USDA, their traceback investigation indicated that the infected cow was probably imported from Canada in 2001. Clearly, this application of USDA’s surveillance and traceback systems demonstrated that improvements are needed in BSE detection and

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20 http://www.usrecallnews.com/recall-class-classes-defined.html
traceback of affected animals. Not having a conclusive result of where the index animal came from is unsatisfactory. The country of Japan thought the same when they discontinued importing beef from the U.S. once news of the infected animal reached that country.22

A new USDA policy that attempts to contain animal diseases such as BSE and CWD is the voluntary National Animal Identification System (NAIS). This voluntary program involves three components: premises registration, animal identification and animal tracing. Since it is currently a voluntary system, farmers and ranchers can participate in one, two, or all three of the components. NAIS is being promoted for all food producing animals. Each state agriculture department is compiling the information which can be shared with USDA. In addition, private industry also can have a database if the farmer or rancher prefers to submit data to them versus the state. The first component, premises registration, is self explanatory. The second component, animal identification, can be done for individual animals or groups/lots of animals and helps manage the herd. The third component, animal tracing, can be used to locate infected animals and manage disease outbreaks.23

In addition to regulatory agencies that deal with CWD and BSE, the industry has a vested interest in avoiding TSEs and their public health implications. Certainly, the meat companies that own the slaughter plants that produce beef want to avoid the bad publicity that accompanies a large recall of beef due to BSE concerns. The economic impact can

22 Ibid
affect beef sales and company stock prices in addition to affecting cattle ranchers who rely on beef companies to purchase their cattle. The elk ranching and hunting industry needs to protect elk and deer for economic reasons as well. These are important industries in many states so the economic impact of CWD on these will be examined in this thesis.

TSEs are mysterious and deadly diseases that affect the brain of the host. The strongest hypothesis as the cause of these diseases is the prion hypothesis. The prion hypothesis was proposed by Stanley Prusiner in 1982. In 1997, Prusiner received the Nobel Prize in Medicine for his work.24 A prion is an infectious agent composed of a misfolded protein. One of our body’s own proteins, referred to as the prion protein (PrP), can alter into an abnormal or rogue form. The rogue protein consists of PrP that has changed its shape and formed large clumps of this misfolded protein. This builds up in the brain and somehow in this process the brain cells are damaged and ultimately die. As the disease spreads in the brain, more and more cells die and the victim subsequently loses more and more of their normal brain function.25 A stated earlier, vCJD, the only prion disease affecting humans (according to current scientific knowledge) is apparently caused by the same strain type as BSE. The species barrier typically protects us from diseases like TSEs but in vCJD, prion infection apparently can cross from cattle to humans.26 This crossover of species has severe public health implications for food safety and also for consumer confidence in the food supply.

24 Food Protection Trends, June 2005, page 468
25 MRC Prion Unit, August 2, 2004, page 3
Chronic Wasting Disease

Chronic Wasting Disease (CWD) is a TSE affecting deer (Odocoileus species) and Rocky Mountain elk (Cervus elaphus nelsoni).\textsuperscript{27} CWD was first identified as a fatal wasting disease in captive mule deer in the late 1960s and was recognized as a TSE in 1978.\textsuperscript{28} CWD was recognized in free range elk in Colorado in 1981. In the 1990s, CWD was recognized in free range deer and elk in northeastern Colorado and southeastern Wyoming where it is now considered endemic. The most current distribution of the disease is shown in the map in appendix 1 and now includes 10 states.

Symptoms of CWD include weight loss over weeks or months, behavioral changes, and excessive salivation. Some infected animals may have a loss of coordination and head tremors. Usually, infected animals die within several months after onset of the disease.\textsuperscript{29}

If CWD affects only deer and elk, this may only be a hunting and ranching problem. However, after the strong evidence of BSE breaking the species barrier and affecting humans in the form of vCJD, there is public concern for CWD to do the same.\textsuperscript{30} Meat consumption is the most likely means of exposure to the CWD prion and researchers have determined that the skeletal muscle of diseased deer contain infectious prions which

\textsuperscript{27} Belay et al., Emerging Infectious Disease, 2004
\textsuperscript{29} Williams ES et al., Chronic wasting disease of deer and elk: a review with recommendations for management. Journal of Wildlife Management, 2002; 66:551-563
\textsuperscript{30} Mortality and Morbidity Weekly Report, Feb 21, 2003, pages 125-127
raises additional concern. It was previously thought that only the central nervous system tissue contained the infectious prions.

The USDA's Animal and Plant Health Inspection Service (APHIS) conducts surveillance in both farmed and wild animal populations, provides assistance to state agencies for quarantine of affected animals and premises, euthanizes animals, and tests affected and exposed animals. APHIS provides indemnity to animal owners for the value of positive and exposed animals. Not surprisingly, APHIS works not only with the states but industry and other federal agencies such as the US Department of the Interior. Importantly, APHIS along with the U.S. Department of the Interior, 50 states and the Native American tribes formed a task force and developed "The Management Plan for Assisting States, Federal Agencies, and Tribes in Managing Chronic Wasting Disease (CWD) in Wild and Captive Cervids." The issue of whether CWD can be transmitted to humans is being explored by regulatory agencies who often work in conjunction with academia. To attempt to understand this possibility, research has been conducted on the general issue of how the CWD prion is transmitted from infected deer or elk to other cervids. Cervids are members of the cervidae family, such as mule deer, elk, moose, and caribou. This is not only a health issue; it’s also of economic importance to preserve healthy herds from an infected animal. Studies have shown that transmission can occur environmentally, through direct contact and often

32 http://www.aphis.usda.gov/vs/nahps/cwd/
33 Ibid.
through seemingly impossible means such as through a fence. Apparently a fence can serve as a vehicle for transmitting the disease to an animal on the other side of the fence, one not captive, by casual contact by the previously uninfected animal. According to Sigurdson et al., transmission through contaminated feed (a major route for BSE) is an unlikely route but the FDA is being cautious and thus has provided draft guidance requesting that the industry not use deer or elk parts in feed.\(^{34}\) The FDA Draft Guidance on “Use of Material From Deer and Elk in Animal Feed” recognizes that since there is no vaccine for the disease, no means to test for it in live animals, there is no treatment for the disease and since transmission is poorly understood, it is advisable that precautions be taken in regard to animal feed consisting of deer and elk parts. FDA recommends that materials from deer and elk considered at a high risk for CWD no longer be entered into the animal feed system. These high risk deer and elk include those from areas declared by State officials to be endemic for CWD and/or be CWD eradication zones and also those that were in a captive herd that “at some time during the 60 month period immediately before the time of slaughter were in a captive herd that contained a CWD-positive animal.”\(^{35}\) FDA often provides guidance because it is quicker than getting regulations passed so the current science can be used by prudent industry persons rather than waiting for a laborious regulatory process to occur. Note that FDA considers material from deer and elk not considered from at a high risk for CWD to be acceptable for use in non-ruminant (i.e. cattle) animal feeds. This material would include any part of the animal including brain and spinal cord parts.


Materials from CWD positive animals may not be used in any animal feed according to Sec. 402(a)(5) of the Federal Food, Drug, and Cosmetic Act. This feed would be considered adulterated under the Act and thus should be recalled or could be seized.

Other researchers demonstrated that environmental sources could contribute to maintaining and prolonging epidemics of CWD even when all the infected animals are removed. They determined that the CWD agent persisted in contaminated environments for greater than 2 years so this could exacerbate an epidemic. Unfortunately, these scientists were unable to fully explain the dynamics of the environment and the host.36

The industry has inadvertently compounded the problem of spreading CWD. Both the demand for elk antlers from the Far East (used in dietary supplements) and the development of game farms for hunting created a “substantial and unregulated trade in breeding stock for elks and deer that moved animals freely between the states and between the U.S. and Canada” according to Robert A. LaBudde, Ph.D., president of Least Cost Formulations, LLC.37 This has led to the spread of CWD and created endemics in places such as Alberta, Saskatchewan, Oklahoma, Minnesota and Wisconsin. Dr. LaBudde claims that since CWD has decimated the export trade of elk antlers, ranchers have released animals into the wild, thus exacerbating the spread of the disease.

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36 Miller et al, Emerging Infectious Diseases, Vol. 10, No. 6, June 2004, “Environmental Sources of Prion Transmission in Mule Deer”, pages 1003-1006
Hunters will often cite the need for hunting to manage wildlife populations but the economic impact of hunting is arguably more important in justifying its role in our society. According to the 1996 National Survey of Fishing, Hunting and Wildlife Associated Recreation, hunting expenditures alone totaled $20.6 billion for that year. Hunting trip related expenses totaled $5.2 billion, hunting equipment related expenditures were $11.3 billion and other expenses such as membership dues and licenses and land fees totaled $4.1 billion. According to the Northeast Hunter Education Manual, hunters contribute almost $67 billion to the U.S. economic output each year and support more than 1 million jobs. Elk ranching is also important to the economy, particularly to major elk ranching states. For example, in Idaho, elk ranching is a $30 million industry. Interestingly, the demand for velvet (the whole antler while it is still covered with soft, velvet-like hair) for use as traditional remedies, not the meat has revived this industry since 1985 although China and Russia dominate the world elk industry. Certainly, economic considerations are among the top priorities when discussing CWD policy implications for both hunting and ranching.

**Educational Materials for Hunters**

The major intervention used to prevent hunters from potentially contaminating themselves or their equipment is education. For example, the Connecticut Department of Environmental Protection has a Conservation Education/Firearms Safety Program that

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39 Northeast Hunter Education Manual, page 10
includes some information on CWD. This course is required for first time hunters age twelve and older. A hunter who has been licensed in any state within 5 years of the date of applying for a CT hunting license does not have to take the course.\textsuperscript{42} The education provided is one page (page 59) of 120 of the Northeast Hunter Education Manual, the education manual used in all of the northeast states.\textsuperscript{43}

**Materials and Methods**

To obtain background information for this thesis, the search engine Google and Google Scholar were used via the internet. Also, information on the Connecticut DEP’s Conservation Education/Firearms Safety Program was gleaned from a telephone inquiry to the coordinator of the program.

A questionnaire was administered to determine the perception and level of concern of state health, state agriculture officials and state hunting permit officials who deal with the issue of CWD (or potentially will deal with CWD). The questionnaire focused on whether CWD been identified as a public health threat or not and the respondent’s perception of this. Information on the affect of CWD, if any, on the respondent’s area in which they work was gathered. A public health threat was defined as whether this animal disease is perceived to be transmittable to humans in the future.

\textsuperscript{42} CT DEP website

\textsuperscript{43} Northeast Hunter Education Manual, 2005, Outdoor Empire Publishing
The sample group was a state health, agriculture and hunting permitting official from each of the 50 states with a total of 150 potential respondents.

Five questions quantified the respondents' level of concern and perception of health threat. Respondents chose from a scale of 1 to 5 how strongly they felt about CWD. E.g., Chronic Wasting Disease in deer and/or elk is likely to emerge or increase in incidence in my geographic area. Six questions asked for free-form responses allowing respondents to explain the basis for their perception. E.g., what resources are being devoted by your agency solely to the prevention and control of CWD in dollars and FTEs?

The study coordinator mailed the questionnaire electronically to each state health department, state agriculture department and hunting permitting department to administer the questionnaire. The coordinator sent the questionnaire to the person most directly involved with diseases and economic impact in each of the departments. For health agencies, the coordinator sent the questionnaire to the State Epidemiologist or equivalent. For agriculture agencies, the investigator sent the questionnaire to the State Veterinarian or equivalent. For the hunting permitting official, the investigator sent the questionnaire to the agency responsible for issuing hunting permits which was typically a state fish and game agency, conservation agency or environmental protection agency. The name and addresses for these state officials was obtained from the FDA’s Division of Federal-State Relation’s directory of state and local officials.44

44 http://www.fda.gov/ora/fed_state/directorytable.htm
The state epidemiologist was chosen to represent the public health model because he is the state’s lead human disease investigator and manager of human disease statistics. The state veterinarian was selected to represent the agricultural field. These individuals are the top public agricultural authority and are responsible not only for managing animal diseases in his state but also for promoting the agriculture industry. The state hunting permit official was chosen to represent hunters and the sport of hunting. The investigator was seeking information not only on how these individuals thought about how CWD was impacting their particular field but also how they thought about other areas that may or may not impact their agency’s mission. For example, it may be interesting to find out what the state veterinarian thought about whether CWD is a public health threat or not versus a top public health official’s opinion on the same issue.

The study coordinator recorded the officials’ responses to the uniform, predetermined questions.

Results

The questionnaire was sent electronically to the respective state veterinarian, state epidemiologist, and state hunting permit official from each state. Ten responses from the state epidemiologists or their equivalent, 7 responses from state veterinarians and 17 responses from the hunting permit officials were compiled. This reflects a 20%, a 14% and a 34% response rate, respectively. The questionnaire is in appendix 2.
CWD in Their State

Two of the 10 state epidemiologists indicated that CWD had been found in deer and/or elk in the geographic area in which they worked. Two of the 7 state veterinarians indicated that CWD had been found in deer and/or elk in the geographic area in which they worked. Four of the 17 state hunting permit officials indicated that CWD had been found in deer and/or elk in the geographic area in which they worked. According to the map of Chronic Wasting Disease in North America (see Appendix 1) and checking the respondent's state of origin, the responses are accurate. However, a hunting permit official from an affected state did not respond in the affirmative to the question so that is not reflected in the calculation.

Ranking their Perspective

The answers to questions 2-5 of the questionnaire are depicted in appendix 3. These questions require respondents to rank their agreement from 1-5 (with 1 being the weakest agreement and 5 being the strongest agreement). In response to the likelihood for CWD to emerge or increase in their area, the mean result was 3.3 for the State Epidemiologists, 2.8 for the State Veterinarians, and 3.1 for the state hunting permit officials. In response to perception of CWD being an economic problem, there was a mean response of 1.6 for the State Epidemiologists, 3 for the State Veterinarians, and 1.6 for the state hunting permit officials. The perception of CWD as a public health problem in the U.S., the mean result for the State Epidemiologists, State Veterinarians and the state hunting permit officials was 2, 1, and 1.5, respectively. Perceptions of CWD being dealt with
Effect on Hunting and Ranching

In response to the question “How has hunting and/or ranching been affected by CWD in the geographic area in which you work?”, a state public health veterinarian working for the state epidemiologist indicated that in his state, there is only a small number of captive herds but ranching is impacted by restrictions on the importation of live cervids (wild or domestic) and their products originating from CWD identified states. He also mentioned that if health risk concerns from consumption of venison increases, hunting may decrease which would impact deer management programs. A state epidemiologist indicated that she did not know how hunting/ranching may be affected, but that she thinks it has little impact since CWD was not found in her state (though hunters from nearby states that have been affected may travel to her state to hunt). Another epidemiologist responded “not at all” for hunting and that ranching may be affected but that is a question for the state agriculture department. Three respondents answered that hunting and/or ranching was not affected, two indicated that they weren’t aware of any impact, one doubted that there was any impact, and one each answered “I don’t know” and “not applicable”.

In response to question 6 (hunting and ranching effects), a state veterinarian responded that in his state, hunting has not been affected but captive cervid ranches have been severely compromised economically because of the cervid movement restrictions in
place. He mentioned that most ranches are no longer in business in his state. Another state veterinarian indicated that legislation had been enacted requiring a CWD Program (note that no CWD has been found in his state) for captive cervids in his state. He mentioned one part of the program is to test all dead cervids in the CWD Program that are 16 months of age or older. Another state veterinarian responded that the embargo on deer and elk movement in 2002 has curtailed the ranching business. One responded “n/a” for question six (6), one respondent indicated “none to my observation” and another responded “no direct affect”. One state veterinarian wrote that hunting had been affected a small amount and elk ranching has been devastated economically.

In response to the same question, six state hunting permit officials stated there was no effect. One of these respondents indicated that CWD had been found in deer and/or elk in the geographic area in which he works (as indicated by a positive response to question 1). One respondent who reported that ranching has been unaffected and that hunting appears to be unaffected also mentioned that very few hunters postpone eating their harvested elk or deer meat until they have received back their test results (this respondent indicated that CWD had been found in deer and/or elk in his geographic area). Two respondents discussed their policy of asking hunters to submit heads voluntarily so that they can be tested for CWD, one of which indicated that compliance has been high. One respondent indicated that ranching is prohibited in the state that he works in but that hunting has not been impacted greatly. He mentions further that hunters appear concerned about CWD but not excessively so. Another respondent indicated that neither has been affected and that “hunters have demonstrated knowledge of the existence of
CWD, have asked our wildlife managers questions, and have responded well to requests for lymph node samples. The respondent also mentioned that the one active game farm has been subject to increased surveillance activities and has begun implementing the NAIS in preparation for the possible implementation of the National CWD herd certification program. Five respondents discussed the development of regulations promulgated to combat the disease. The import restrictions on carcasses and live animals have been blamed on curtailing the ranching business. One respondent indicated that hunting of cervids has been impacted slightly and amounts to "slight inconveniences caused by surveillance and by interstate restrictions on carcass movement".

**Economic Impact and Funding**

Veterinarians

One state public health veterinarian indicated that there is no funding for the state health department for CWD although "considering the potential for transmission to people or domestic animals should CWD be identified in the state, the response would be a multi-agency one". Four state epidemiologists responded that there are no resources devoted solely to CWD in their health departments. Another state epidemiologist responded that 3 of the health department staff helped the agriculture department collect heads during deer hunting season and that she was on the committee to write the CWD response plan in the event it would emerge in her state. Another state epidemiologist had a similar answer in that he was involved in interagency planning and provided the public with information. Another respondent did not answer the question on resources (question #8) but indicated that the state game and fish agency (not the health department) spends a lot
of money every year to do surveillance, testing and research on CWD. One state epidemiologist answered “no impact” economically and that she did not know the amount of resources her agency has devoted solely to CWD. One respondent answered “I don’t know” to the question of resources.

One veterinarian that responded there was “no direct affect” to hunting and ranching indicated that the surveillance activities conducted by the deer and elk ranchers has been a “tremendous financial burden”. She clarifies that the disease itself has not directly impacted these businesses but rather the surveillance activities have created the burden. This individual estimates $16,998 or 38% of one FTE is devoted to monitoring the surveillance activities done by the producers and $2,605 is spent annually for lab expenses. The producers of these animals pay $3,240 annually for testing and since they must hire a veterinarian to do an annual inventory of their animals, 44 producers pay $21,120 annually for this service. The respondent who indicated that hunting has been affected a small amount but that elk ranching has been devastated economically in his response to question 6 indicated that one half of an FTE ($60,000) has been devoted to preventing and controlling CWD. Another state veterinarian responded that approximately 1 FTE is devoted but he was unsure of the dollar amount. Another respondent answered 0 FTEs. A state veterinarian answered “hard to determine accurately” in regard to question 8. Another veterinarian answered “not applicable” to question 7 and “1.5 FTE-$100,000.00” for costs. Lastly, a state veterinarian restated that the disease has had no impact but the restrictions placed on movement of the animals
have caused the negative impact. He also stated that no resources are dedicated solely to CWD.

Hunting Permit Officials

One state hunting permit official indicated that $75,000 a year are devoted solely to the prevention and control of CWD and that 50 FTEs work several days a year collecting samples from hunters’ harvested deer. Another official mentioned that the only cases in his state were from one game farm yet there has been “some serious economic ramifications for alternative livestock owners as a result of a citizens initiative that put a moratorium on the sale of alternative livestock permits and “canned hunts” although CWD was only one of the many considerations that went into that initiative”. He states further that his department contributes $26,000 annually for CWD surveillance but since it is difficult to ascertain the actual resources devoted to combating the disease (including the development of a management plan and research conducted), he estimates that the department spends greater than $100,000 in expenditures and payroll. Another respondent indicated that $50,000 is spent annually on surveillance and that funding has been diverted to CWD prevention from other wildlife programs. One official stated that they had 1 full time FTE and spent an additional $200,000 and about 200 days of staff time on the disease. He stated under question 9 that he felt too many resources were being devoted so they are cutting back. A respondent in an unaffected area wrote that they have 1 full time biologist (funded by USDA APHIS) who administers their captive cervid program and the hunter harvested surveillance program, which results in approximately 2,500 samples a year. Another indicated that a wildlife health specialist
who deals with CWD among other wildlife health issues supervises 2 seasonal employees who are responsible for the CWD program. The seasonal employees work for about 5 months out of the year. This agency spends $20,000 of their own and $75,000-80,000 of USDA APHIS money to pay for testing and monitoring for CWD, which includes collecting almost 2,500 samples a year. One official stated that 1 FTE, 3 PTE and other personnel along with federal surveillance funds are used to run their CWD program. Another official stated that CWD costs his agency approximately $250,000 a year for personnel time and other expenditures. One respondent stated that the meat processors have been hurt economically because they had to adjust their business in CWD areas, that a couple of their big game biologists use some of their time on CWD work, and that the CWD budget was unknown to him. Another official estimated $300,000 in total expenditures, which include 1 FTE and participation by all their field officers, funded by a federal grant and state funding. Some respondents were less specific, stating that grants from APHIS are used to hire technicians, collect data and run the CWD surveillance program. Another respondent stated that his accounting system does not allow one to separate CWD from other wildlife issues (most likely an issue for most officials) and that the USDA APHIS funding helps them pay for testing and to hire part time temporary employees to collect samples. Similarly, another official did not have budget information and stated that several FTEs devote part of their time to CWD prevention but none are solely devoted to CWD. Two respondents simply stated that their surveillance programs are funded through the annual money received from USDA. Another respondent mentioned the general cost of doing surveillance impacts the area economically. One respondent wrote “we do surveillance”.

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Is Enough Being Done?

For the question “Do you feel that enough is being done by state regulatory agencies to combat CWD? 6 state epidemiologists answered “yes” (60%), 1 answered “no”, and 3 stated that they didn’t know. Five state veterinarians indicated “yes” (71%), and 2 responded “no”, whereas 7 state hunting permit officials responded “yes” (41%) and 10 responded “no”.

The Need for New Regulations

For the question, “Do you feel that the adoption of new regulations is needed in your state to combat CWD? If yes, what specifically should be done?” 6 state epidemiologists answered “no” (66% of respondents; this included a respondent who had CWD identified in their area). One state epidemiologist replied “not sure”, one “don’t know”, and one indicated “not at this time” because CWD has not been found in their area. One other state epidemiologist who works in a state in which CWD has been found did not answer. Four of the 7 (57%) state veterinarians answered that new regulations are not needed. One of these four has CWD in their area. Another of the four indicated that they have the most stringent rules in the nation. He further clarified that these rules only apply to farmed cervids and that surveillance is really all one can do to with wild populations. A respondent who has CWD in their responded that new regulations are needed, specifically that they should restrict imports of hunter harvested elk products from
endemic areas in the U.S. and Canada. He also stated that there is a need for more reductions in elk populations.

Seven of the 17 (17%) state permit hunting officials responded that new regulations were not needed, including “not at this time” and “not yet”. One state hunting permit official responded “baiting of deer and recreational feeding should be banned (for disease prevention in general)”. Of those that thought that new regulations were needed, suggestions included:

- Stop all importation of farmed cervids
- Need to evaluate our rules regarding transportation of animal parts from other states (especially in regard to residents hunting out-of-state and harvesting cervids that may be CWD positive)
- Tough federal standards for captive cervid CWD certification programs
- More restrictions on ownership, fencing, tagging and mandatory testing for CWD

One respondent indicated that his state is in the process of updating and creating some regulations in regards to CWD which should be completed in several months, which will make him “feel more comfortable”. Another stated that the state has adopted regulations to address the current CWD situation but if the situation changes, they may need to adopt additional regulations. A respondent who works in an area in which CWD has been found stated that “regulations without public acceptance is a prescription for noncompliance” and at this point, they “do not have either the tools to control CWD or the public desire to “suffer” from more restrictions”. He further states that “the science
cannot show that regulations on things like carcass transport and feeding will control the spread of CWD. Regulations on those practices would merely reduce the potential for the disease to spread. When the disease spreads even when the regulations are in place there is a lose (sic) of public confidence”. Another state hunting official responded “statutory requirements for uniform individual identification of captive cervids should be enacted and enforced. Existing temporary restrictions on importation of live captive cervids would ideally be made permanent. Higher standards of biosecurity should be instituted on captive cervid operations, particularly on shooting preserves”.

**Further Education for Hunters**

All but 2 (66%) of the state epidemiologists thought that further education for hunters was not needed to prevent CWD from becoming a public health threat, though one noted that existing education needs to be continued, one said “not yet” (because it has not yet emerged in the jurisdiction), and one replied “not specifically for CWD” but that there was a need for reinforcement in personal protective equipment use for all diseases. One did not respond.

Three (43%) of state veterinarians said no further education was needed. One answered that their Department of Natural Resources regulates all hunting thus deferring the question to that agency. Another state veterinarian answered “not applicable” because the science suggests that it is species specific. Another stated that education is always good but it won’t affect CWD from becoming a public health threat. He further stated
that it may help minimize the spread because educated hunters may not transport parts to
other sections of the country. Lastly, one state veterinarian answered “Is this a trick
question? CWD is not currently a public health threat. It is an ANIMAL health threat.”

Among state hunting officials, five respondents thought more education was needed.
Comments included that further reduction of movement (presumably of carcasses and
materials) is needed and education on the proper disposal of carcasses is needed. One
official stated that “hunter education is an ongoing, never ending process that we will
continue to do”, another responded “we provide regular news releases to keep (the)
public informed of ongoing test results”, and another “Yes, there is a lot of
misinformation about the disease on the internet”

However, most state hunting official thought more education was not needed because
they believed “it is not a public health threat“. Other responses included: “I don’t
consider it a human threat-we have educated hunters about CWD in (his state)”, “Until
CWD proves to be a risk to human health, this is a moot question”, “since CWD can’t be
transmitted to people, it is not a public health threat”, “not unless a direct link between
CWD and CJD or another human disease is identified”, “No. Currently, there is no
evidence that CWD poses any public health threat at all. Moreover, hunter education
efforts regarding carcass handling, etc., have been in effect here for several years and are
evaluated annually”, “Education is important, but not because anyone thinks it will
become a human health threat. Rather, hunters need to know that CWD is not a danger to
humans, and to understand the impact of the disease on wild cervids and state agency
budgets”, “to my knowledge, CWD has not been shown to have any health effects on humans. Hunters should always use appropriate precautions such as wearing gloves and not eating, smoking or drinking while field dressing their carcasses”; “further education is needed to prevent CWD from being perceived as a public health threat”, and finally “I am not sure I understand the question. The public health threat is related to the ability of the CWD prion agent to cause clinical disease in humans. Currently, there is no evidence that this has occurred. Education of hunters will have no impact on the zoonotic potential of the CWD prions. Or are you talking about perceived public health threat? If so, I would say that our current messages are adequate”.

CWD and its Effect on Public Health

A few respondents responded to the open ended question for additional comments. A state epidemiologist indicated that the department works mostly to educate the public on the difference between CWD and other prion diseases. In that state, there was a cluster of CJD victims and there was a lot of confusion in the media and the public that this was related to deer and elk in the area.

One state veterinarian indicated that “according to state health officials and the federal Centers for Disease Control and Prevention, there is no evidence that CWD can be transmitted to humans”.

Another veterinarian wrote that “many would like to make this a public health issue whether for funding advantage or to further specific, sometimes hidden agendas. It
should be the responsible role of public health agencies to educate (the) public regarding the scientific evidence regarding interspecies transmission (or lack thereof) of CWD”.

A third indicated that “CWD is not a public health concern when considered from the appropriate perspective. It is not known to transmit to people. Some try to compare CWD to Mad Cow or BSE disease but the two are distinctly different. There is no evidence that CWD poses a risk to humans. It has existed in the wildlife since the mid 1980’s and has been found in the wildlife of at least 10 states in the U.S. There are two spongiform encephalopathy diseases found in humans. CJD occurs naturally in about 1 in 1 million people worldwide. vCJD is associated with BSE (Mad Cow disease-not CWD) and only 153 people have died in the last 15 years from that disease. There are persons who oppose private ranching of cervids or hunting of animals who will perpetuate a “perceived” threat of CWD to humans to further their cause by scaring people with untrue and inflammatory information”.

Most state hunting permit responded to this question. Nine respondents basically answered that CWD is not a public health issue. Four of these officials referred to the lack of scientific data linking CWD to human disease. One respondent stated that public health officials, not wildlife biologists should be the source of information on the public health issue. Another respondent indicated that further research needs to be done to determine whether CWD poses any health risks to humans. Similarly, another official stated that “to date no human cases have been found-that does not mean that none will ever be found and that the disease will not mutate to a form that is contagious for
people”. Another official wrote “I don’t think CWD is as terrible disease as we initially thought. I don’t think the disease will destroy wild cervid populations on a large geographic scale. However, I think it can have substantial local impacts. Having said all of this though, there is much about the disease that we don’t know and future research is needed to alleviate public concerns regarding disease transmission, a cure, how long are prions “active” in the environment, and how to control/eradicate the disease from areas where it is present”. One respondent wanted more information “on the apparent clusters of vCJD-like symptoms and deaths that occurred in hunters from WI”.
Discussion and Conclusions

Given the small number of responses, it is impossible to use statistical methods to analyze the data generated from the questionnaire. It is possible, however, to discuss the results qualitatively. In addition, the policy used to combat CWD will be examined in relation to the policy used to thwart BSE. Although they are seemingly different diseases and are being handled differently, there may be some common policies that can be used for both TSEs.

Limitations

Perhaps a pilot testing of the questionnaire on a sample of the survey population should have been conducted to minimize some of the problems encountered. For example, question seven (7) was improperly worded. It asked “If you answered yes to question #3, how has CWD impacted your area economically?” but question #3 was a ranking question not a yes or no question. In addition, the phrase “my geographic area” used for question #2 and “your area” in question #7 should have been replaced with “in the geographic area where I work” which was used for questions #1, 3 and 6 for consistency. A couple of respondents clarified this by answering “if you mean my state” and then responding to the question. Intuitively, the respondents knew that the geographic area being referred to was their state because the questionnaire was sent to state officials who’s jurisdiction is a particular state and three questions referred to “the geographic area where I work”. The phrase “the geographic area where I work” or even better “the state
where I work” is also preferable because some state officials may reside in a state other than the one in which they work in.

In order to achieve a greater response rate, a future questionnaire may need to be mandated as part of federal funding. If federal funds such as those from USDA would only be given to a state if they completed a standardized questionnaire then it is likely that there would be a much greater response.

One may conclude that those officials who work in an area where CWD has been found may have a higher tendency to respond to a questionnaire on the disease. However, only two (2) out of the ten (10) responding state epidemiologists indicated that CWD had been found in their area, one (1) out of seven (7) state veterinarians indicated such and four (4) out of seventeen (17) of the responding hunting permit officials answered in the affirmative. Since there are currently ten (10) states where CWD has emerged, it does not seem that having the disease in one’s state makes one more likely to respond to such a questionnaire.

The higher number of responses to the questionnaire from hunting permit officials than the two other groups (state epidemiologists and state veterinarians) may be a result of a more vested interest and perhaps an overall perception that CWD is a wildlife and economic issue rather than a public health one. Perhaps CWD is impacting the hunting regulators more than the public health or agricultural agencies. Certainly, based on several responses, ranching has been impacted by CWD and hunting to a lesser degree. Also, there appears to be no great fear of contracting CWD among the consuming public
or even those possibly more likely to be affected, the hunters who consume venison. This could affect the seemingly small resources devoted solely to CWD and even the small number of responses to the questionnaire.

The majority of state epidemiologist respondents felt that CWD was likely to emerge or increase in incidence in their geographic area. The state veterinarians and the state hunting permit officials were more diverse in their response to the rating question although there was such a low response rate that it is impossible to discern any trend.

Most of the respondents from all three groups indicated that CWD is not an economic problem in their geographic area as expressed by a general weak rating for question three (3). This is a little surprising because several respondents discussed the economic impact on ranching as part of their response to the questionnaire. One state veterinarian even stated that captive cervid ranches have been severely compromised economically because of the movement restrictions in place. Another discussed that the impact of surveillance has been a “tremendous financial burden”.

The issue of whether CWD will cross the species barrier like BSE is a pertinent question. It is important to note that the survey question did not ask the respondents to ponder whether the possibility exists for CWD to become a public health threat, but rather is it a public health threat now. All of the state veterinarians who responded answered with the weakest possible agreement. Although most of the state epidemiologists responded with a generally weaker agreement, one responded with the strongest agreement possible. The
state hunting permit officials expressed a generally weak agreement but the responses
were varied. One could argue that the state veterinarians answered the way they did
because they are animal disease experts and understand the disease better than the other
two groups or that the state veterinarians are short sighted since they pretty much deal
only with zoonotic diseases. The state epidemiologists that had stronger agreements
could have been speculating rather than basing their answer on the limited science
available. The state hunting officials and epidemiologists may have taken a more
conservative approach in general to ranking the statement. Perhaps the responses of all
three groups is affected by their vested interest in the disease. For example, it may be
advantageous to the state veterinarians that CWD remain strictly an animal disease
because a large part of state agriculture agencies role is to promote the industry. If CWD
was deemed to affect humans, the cervid ranching industry would be greatly affected and
perhaps cease operations entirely.

Most respondents are confident that their respective agency is dealing with CWD
sufficiently, though one had weak agreement.

In general it seems as though ranching has been impacted greatly but hunting has had
little, if any, impact. One respondent stated that she believed hunters were coming from
other affected states that surround hers to hunt. Perhaps hunting, which can impact a
region’s economy by the purchase of permits, supplies, butchering services, dining out,
hotels and campgrounds and other services, has simply shifted to unaffected areas.
However, the majority of respondents stated that there has been no affect on hunting even
in affected regions. In general, most hunters apparently do not seem concerned with CWD based on the responses to this question.

It appears that most agencies have CWD on their radar but do not exclusively devote resources to this one disease. Often, funding is coming from USDA APHIS to conduct surveillance and testing. A few respondents answered with specific dollar amounts used to combat CWD and many did not have a grasp on how much money is being spent. Some respondents mentioned education and interagency planning which costs money. As discussed earlier, hunter education for CWD in the northeast consists of only one page in a one hundred and twenty page manual. However, it should be noted that New York is the only northeastern state that CWD has been found. Perhaps in states where CWD is endemic, there is more education provided.

A majority of state hunting official respondents thought that not enough is being done by state regulatory agencies to combat CWD, while state veterinarians were split almost evenly and most of the state epidemiologists thought that enough was being done. Interestingly, the state epidemiologists were the only group to respond with “I don’t know” (three out of ten total responses). Perhaps this group is less involved with CWD issues than the state veterinarians and state hunting officials and therefore cannot answer for these two other agencies.

Some officials expressed concern over the continued interstate movement of cervids both farmed and those that have been harvested by hunters. Certainly, eliminating their
movement across state and the U.S.-Canadian border coupled with strict enforcement of such, if possible, would prevent the spread of disease. Other respondents thought that the existing regulations are adequate to combat CWD.

There was extensive discussion in relation to whether CWD is a public health threat. Many respondents thought that CWD is not a public health threat although a few did not rule out the possibility of a species barrier crossover to humans as evidenced by the responses to those two questions. Interestingly, one respondent asked if this were a trick question. The study coordinator concedes that this question was poorly written with the assumption that respondents agree that CWD is or could be a public health threat.

Most respondents indicated the need to clarify the existing science to the public and to address the perception that CWD is a public health disease. A couple of respondents indicated that the public health agencies should be addressing this apparent public perception issue. One could argue, however, that the state hunting permit officials have at least as an important role in dispelling any myths as well as the public health department because they issue licenses to hunters who have direct contact with these animals and likely consume the most meat of these species in contrast to the general public who likely consumes less venison. Also, these agencies often require taking a hunter education course prior to issuing a hunting license in most cases. It is also interesting that by and large most respondents dismiss the need to discuss the possibility of a mutation with the public. Perhaps they think that too much information not backed by current data will confuse the public and harm the affected industries, hunting and
ranching of cervids. One state hunting official wanted more information on "the apparent clusters of vCJD-like symptoms and deaths that occurred in hunters from WI". Perhaps this individual is concerned about possible transference from cervid to hunter.

Unfortunately, the issue of whether CWD is a public health threat or not is elusive. The scientific data is still evolving as the disease itself perhaps evolves. The scientific community is in agreement that BSE, an animal disease, can cause vCJD in humans. There are state officials and scientists that will not rule out the potential for CWD to affect humans in the future but they are waiting for data to demonstrate it. It is refreshing that state regulatory officials seek credible evidence before making judgments that could affect their policy decisions. On the other hand, it is interesting that some state officials, particularly the state veterinarians and state hunting permit officials, can be so adamant that CWD is an animal disease and offer no speculation or consider the possibility of a species crossover. As more scientific data becomes available this issue may become more clearly defined.

Although not currently perceived as a public health problem (based on the majority of responses), the issue of the CWD prion being found in the skeletal muscle of cervids should be examined more closely. We need to attempt to understand how the prion is transmitted to the cervid and why it is found in the muscle and not just the central nervous system tissue. In the most basic terms, we need to find out how the agent, the environment and the host relate.
The voluntary NAIS program being promoted by APHIS and the FDA Guidance should become mandatory if the incidence of CWD increases or if CWD is found in other states. Since NAIS is a national model, this policy, if adopted by all states, would create uniformity. It would also be instrumental when USDA assists states when an issue arises or when a CWD infected animal crosses state lines. The traceback system, as evidenced by the traceback conducted when the incidence of BSE was detected in the U.S., is flawed. This is a crucial component of the NAIS program and more focus should be spent on improving tracebacks.

If CWD does transfer to humans a coordinated effort between USDA, FDA, the Centers for Disease Control and Prevention (CDC) and the states would be required. In the states, the epidemiologist who largely has not been involved in CWD issues would be a major contributor to containing the disease. The state veterinarians and the state hunting permit officials would continue to play a major role. Each of these 3 groups would need to communicate with one another to coordinate their response and provide a single message to the public. The CWD management plan for the state should include all these players and delineate their role.
Appendix 1

Appendix 2

**Questionnaire on the Possibility of CWD as a Public Health Threat**

**Initial questions:**

Do you work for a state health department or state agriculture department?

What is your job title?

**Question 1:**
Please answer “Yes” or “No”

**Question 1:**
Chronic Wasting Disease has been found in deer and/or elk in the geographic area where I work.

Yes: ____
No: ____

**Questions 2-5:**

On a scale of 1-5 with 5 being the strongest agreement and 1 being the weakest agreement, how would you rate the following statements:

**Statement 2:**
Chronic Wasting Disease in deer and/or elk is likely to emerge or increase in incidence in my geographic area.

**Statement 3:**
Chronic Wasting Disease is an economic problem in the geographic area where I work.

**Statement 4:**
Chronic Wasting Disease is currently a public health problem in the United States

**Statement 5:**
My agency is dealing with CWD sufficiently.
Questions 6 – 10

Questions 6-10 are free form questions in which you may answer freely in your own words. “I don’t know” is an acceptable answer if true.

Question 6:
How has hunting and/or ranching been affected by CWD in the geographic area in which you work?

Question 7:
If you answered yes to question # 3, how has CWD impacted your area economically?

Question 8:
What resources are being devoted by your agency solely to the prevention and control of CWD in dollars and FTEs?

Question 9:
Do you feel that enough is being done by state regulatory agencies to combat CWD?

Question 10:
Do you feel that the adoption of new regulations is needed in your state to combat CWD? If yes, what specifically should be done?

Question 11:
Is further education for hunters needed to prevent CWD from becoming a public health threat?

Question 12:
This question is a free form question and any response is appreciated.

Do you have any ideas on the issue of CWD and its effect on public health that you would like to discuss? If yes, please comment below:
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