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Kazakhstan, Factor 4: Animal Health

Kazakhstan: Keeping Ticks Out Of Animal Blood

Ticks are very common all around the world; people are searching their heads and animals after being outside a lot in the summer. They are known to suck blood, but in Central Asia the topic of ticks becomes serious. A tick-borne virus called Crimean-Congo Hemorrhagic Fever (CCHF) is taking over countries, such as Kazakhstan, causing problems with livestock herders, livestock workers, slaughterhouses, and workers in endemic areas. The only treatment is still a slow recovery, but something needs to keep the ticks away in the first place (HHS 2013). In Kazakhstan, cases of CCHF have been officially recorded, with most cases of human disease being associated with agricultural professions, such as farming, shepherding, and fruit-picking; the typical route of infection was via tick-bite although several cases of contact transmission associated with caring for sick patients have been documented. In total, 704 confirmed human cases of CCHF have been registered in Kazakhstan from 1948-2013, with an overall case fatality rate of 14.8% for cases with a documented outcome. The southern regions of Kazakhstan should be considered endemic for CCHF, with cases reported from these territories on an annual basis. Some technologies allow for studies to be done in known risk areas. The country's extensive pastureland allows Kazakhstan to support high numbers of ruminants, but also a high number of ticks living in these animals. Though there seems to be a high number of ticks present, the structure of meat consumption in Kazakhstan has remained fairly stable: approximately 46 percent of meat consumed is beef (compared with 44 percent for the former USSR), 18 percent is mutton (5 percent in the former USSR), 17 percent pork (33 percent in the former USSR) and 13 percent poultry (compared with 16 percent in the former USSR), 4 percent horse meat (USDA 2012).

Crimean-Congo Hemorrhagic Fever (CCHF) is caused by infection with a tick-borne virus in the family *Bunyaviridae*. *Bunyaviridae* is a family of a virus that are mostly transmitted through contact from animal to animal. The disease was first identified in the Crimea peninsula in 1944 and given the name Crimean hemorrhagic fever. Crimea is by Southern Ukraine, located in Europe, but it was hard to believe the disease would be found countries away in the continent Africa. The disease was also found in 1969 as the cause of illness in the Congo, resulting in the current name of the disease (Wiki 2010).

Ixodid (hard) ticks are the carriers for the CCHF virus. Numerous wild and domestic animals, such as cattle, goats, sheep and hares, serve as hosts for the virus. These are the animals mainly eaten in Kazakhstan. Transmission to humans occurs through contact with infected ticks or animal blood. CCHF can be transmitted from one infected human to another by contact with infectious blood or body fluids. Documented spread of CCHF has also occurred in hospitals or vet offices due to improper sterilization of medical equipment, reuse of injection needles, and contamination of medical supplies (HHS 2013).

Agricultural workers and others working with animals should use insect repellent on exposed skin and clothing. Insect repellants containing DEET are the most effective in warding off ticks. Wearing gloves and other protective clothing is recommended, but must be cleaned before touching another animal's blood. Individuals should also avoid contact with the blood and body fluids of livestock or humans who show symptoms of infection. It is important for healthcare workers to use proper infection control

precautions to prevent occupational exposure. It is easy for other animals to get infected from the tools used in vet offices if they are not cleaned. This is not going to stop the disease from getting in the animal's blood though. We can not apply enough repellants for the ticks not to infect our animals, but we can inject them with a safer longer-lasting form(HHS 2013).

The more animals we infect by not cleaning supplies, the less meat production we have. Animal health is a critical challenge because they take away some resources from people, but also give people a resource. If the human population is going to increase, the animal population has to increase as well. As a whole it's a challenge to increase animal population if diseases are occurring. The disease is said to go away after 14 days, but severe cases can cause stress and death to animals. The more animals who transfer the diseases the more likely it is for more animals to die. General supportive care with treatment of symptoms is the main approach to managing CCHF in people, but once it's in a person, it's a long process to recover. To prevent this from happening totally, we need to keep ticks away from our animals. Animals become infected by the bite of infected ticks and the virus remains in their bloodstream for about one week after infection, allowing the tick-animal-tick cycle to continue when another tick bites. Although many different type of ticks are capable of becoming infected with CCHF virus, ticks of the genus *Hyalomma* have a higher chance.

The mortality rate from CCHF is approximately 30 percent, with most death happening in the second week. In patients who recover, improvement generally begins on the ninth or tenth day after the onset of illness. It is difficult to prevent or control CCHF infection in animals and ticks as the tick-animal-tick cycle usually goes unnoticed and the infection in domestic animals is usually not apparent. Also, the tick vectors are numerous and widespread, so tick control with acaricides (chemicals intended to kill ticks) is said to only be a realistic option for well-managed livestock production facilities. But we can make this happen. For example, following an outbreak at an ostrich abattoir in South Africa, measures were taken to ensure that ostriches remained tick free for 14 days in a quarantine station before slaughter. This decreased the risk for the animal to be infected during its slaughtering and prevented human infection for those in contact with the livestock(HHS 2013).

If you can't notice if the animals are infected you need to understand the symptoms. Animals show few to no symptoms but if you get the virus as an animal worker you will need to make sure any blood is cleaned up and not infected into another animal. According to the CDC, "The onset of CCHF is sudden, with initial signs and symptoms including headache, high fever, back pain, joint pain, stomach pain, and vomiting. Red eyes, a flushed face, a red throat, and petechiae (red spots) on the palate are common. Symptoms may also include yellow eyes, and in severe cases, changes in mood. As the illness progresses, large areas of severe bruising, severe nosebleeds, and uncontrolled bleeding at injection sites can be seen, beginning on about the fourth day of illness and lasting for about two weeks" (NCEZID 2013). There is not a good vaccine for people to heal quickly, but to keep from others working around the blood notify everybody else in the buildings as soon as you notice symptoms.

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Since studies show Deet is not safe for skin, it's not going to work to use it on our animals or to inject it in them. Ticks require humidity to survive and they tend to stay away from places that lack shade. They can be found in mulch, gravel, or even wood chips to use as humidity (RD 2017). The problem is our animals can't take the heat of no shade either. If ticks are going to be in our animals bedding and live near them, it's hard to keep them away. One thing we do know is that ticks hate repellents and luckily there's one that animals can tolerate.

The Lemon Eucalyptus is a Biopesticide Repellent. Oil of lemon eucalyptus comes from the gum eucalyptus tree, but it is p-menthane-3,8-diol (PMD), its synthetic version with pesticidal properties, that is used as an insect repellent. While the term "PMD" is often used interchangeably with lemon eucalyptus oil, know that it is different from the "pure" unrefined oil, which is typically used in making fragrances. The pure oil is not registered with the US Environmental Protection Agency (EPA) as an insect repellent. PMD or the refined version, on the other hand, has a long history of use but only recently became important as a commercial repellent. In 2000, the EPA registered oil of lemon eucalyptus or PMD as a "biopesticide repellent," meaning it is derived from natural materials. Both lemon eucalyptus oil and picaridin are not actual *repellents*, but instead most likely work by masking the environmental cues that mosquitoes use to locate their target. Looking at lemon eucalyptus egg hatch and larval development tests, 30 naturally infected sheep were tested and they discovered that the essential oil therapy injection reduced worm activity by up to 56 percent in just 10 days(HHS 2013).

This is something that can both be injected and is harmless. The Lemon Eucalyptus is a repellent that has not been tested for ticks, but ticks are said to not like any repellants. The oil is very cheap and Kazakhstan farmers could start by spraying this oil across their pastures or just near shade to keep ticks away. If they have had an issue before injecting animals is the same idea as vaccinating them and could last longer in their system. Kazakhstan summer is around 3 months long, when ticks are out. Spraying fields could be done every couple weeks and it would not need to be done year round. Spraying around 6 times a year every summer would be cheaper than getting the CCHF disease in your system or losing animals. If we inject them it would need testing to see how long it's effective, but it could be done with a dead CCHF vaccine possibly once a year. Another theory would be to put the oils in the water they drink, because they have to drink every day and we wouldn't have to catch them. The ticks would smell the oil on them in theory and instantly go away(HHS 2013) One of the best options among all of these to keep the ticks out of the bedding would be to have companies create a bedding dipped in the lemon eucalyptus.

A typical farm family in Kazakhstan is about 3.4 people. These are very small families, because it's hard for farmers to supply to family members. The last thing the farmers would want is to lose a wife or a kid, and they can hardly lose their provider. In the hurting economy, the whole families works together instead of hiring people. They are all going to work around the blood of an animal at some point, such as birthing, cuts, surgeries, etc. If they can keep their animals free from the CCHF disease at a low cost, that would be ideal(The Guardian 2017).

I recommend that we effectively address the CCHF disease in Kazakhstan to improve food security by keeping ticks away from our animals and not just curing the disease as it reaches humans. Researchers have already tried to cure the human side of things, but that is not going to help our meat or cure the whole disease itself. They have not even found effective cures for the humans, so the only option we

have left is to look at the animals. Kazakhstan is one of the biggest countries with this disease and they need to make sure you hold animals for 14 days before slaughter, surgeries, etc., and you have proof of blood without the CCHF disease or people such as vets could face serious danger. In order to ensure people and our meat is less affected, we need to do more research on how to kill the ticks or how to vaccinate the animals with something nontoxic. One way to help is to invest in more disposable tools that you do not have to use from animal to animal, as well as disposable clothes and outfits that you won't have to worry about the blood touching something else or you. Research agencies would be a necessity, but having funding from a national bank would help with any expenses for a good cause. Hospital technology could be needed as well as samples from previous happenings. In order for rural farm and urban families to be involved as key players in implementing these ideas would be to allow the cheapest option of vaccines and pay them to do testing on their animals to see if the oils are working.

If an American citizen was to say that America was their priority before other countries, they need take into consideration that other countries don't just take away from us, they can help us. Dr. Norman Borlaug looked at the world as a whole, not just America. "Food is the moral right of all who are born into this world" is a quote from him. The CCHF could eventually reach America if we don't put a stop to it in Kazakhstan. Even if the disease doesn't come to America, it could kill people in other countries taking away from America's trade. Overproduction could possibly occur and America farmers would begin losing money. We need to help the world as a whole to keep our own counties striving. Global trends shape a nation and affect citizens of that nation. If you transport diseased cattle over seas to another country it could devastate that area and cause an outburst of sickness in other cattle. This will affect the citizens who are receiving the meat and may make non diseased cattle prices higher and help certain citizens.

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