

## **Mastitis Prevention in Nepal**

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Nepal is a small, landlocked country located between India and China. Being a country that only spans over 147,181 square kilometers, it is comparable with the size of the U.S state Arkansas. (Nationsonline.org, K. K. (n.d.)) Even though it's only one sixty-eighth the size of Canada, it's total population numbers approximately 31 million people. The capital and largest city of Nepal is Kathmandu.

Although Nepal is small, it can be found to be multilingual and multi-religious. Sitting on the Northern border of India, it is also known as the Mountain Kingdom. Nepal boasts some of the highest mountains in the world, including Mt. Everest. (Nationsonline.org, K. K. (n.d.)) Due to the Himalayan mountains found in its region, it has become a popular tourist location. Ecologically, Nepal can be divided into three separate zones: lowland, midland and highland. (Nationsonline.org, K. K. (n.d.)) The highland consists of the Himalayan mountains, and it's altitude can be anywhere from 4877 m-8848 m. (Nationsonline.org, K. K. (n.d.)) This region takes up approximately 64 percent of Nepal's landmass. (Nationsonline.org, K. K. (n.d.)) In contrast, the lowland only holds about 17 percent of the countries landmass. (Nationsonline.org, K. K. (n.d.)) The majority of Nepal's landmass is treacherous and inhabitable, making it difficult for the Nepalese people to travel.

The most common religion in Nepal is Hindu. Buddhism is also a common religion found in Nepal, being the religion of the Nepalese ancestors. Religion plays a large role into the culture of the Nepalese people, as many of the people choose to not eat meat due to their beliefs. It is not a religious requirement, but this choice plays a large role in how the agriculture of the country works. Instead of using livestock for meat; cattle, goats and sheep are used for their milk and wool. Having livestock

around which are used for the peripherals they offer means that they are treated and cared for differently than in North America.

The majority of Nepal's population live in poverty and are uneducated. Unable to afford the luxuries we take for granted in North America. The Nepalese people commonly live without free access to running water or electricity. Many of the people depend on the land for the food, farming not for income, but for survival. This means that ensuring their crops and livestock don't die is of the utmost importance. Due to the limitations on the technology available in Nepal, the product being sent needs to be chosen with that in mind. Technology can't be sent that requires a massive amount of electricity to a country that has limited or no access to this resource. There is already proof that even simple education programs about animal hygiene have drastically improved the herd health in Nepal. In a test done by Linda et al, it was found that educating Nepalese women in how to properly clean the teat of the cattle before and after milking greatly improved herd health. (Ng, L et al. 2012) It was found that households that adopted this technique greatly reduced the chance for an intramammary infection. (Ng, L et al. 2012) What was also interesting is that those families would go on to teach neighbors as well, exponentially growing the amount of people practicing this technique. (Ng, L et al. 2012)

The geographical location of these people, whether in the lowlands, midlands or highlands changes how easily they have access to food. In the highlands we can find that 51% percent of the world's hunger issues are in Bangladesh, China, India, Myanmar, Nepal and Pakistan. (Hussain et al. 2016) This is a surprising number as the mountains themselves account for 40% of all resources obtained by water. (Hussain et al. 2016) The severity of the food security is much higher in these locations. This is mainly due to the geographical restraints the highlands provides to the people who chose to live in them. In most cases, highlanders do not have the same access to resources that the lowlanders do. Markets are difficult to come by and travel is extremely difficult. There is a high cost to produce food and even then, natural disaster makes it difficult to ensure the harvest will be successful. (Hussain et al. 2016) The natural resources found in the mountains are also depleting due to their

constant use. (Hussain et al. 2016) This makes natural resources such as water difficult to find, resources that are plentiful in the lowlands. The increasingly changing climate has created many difficulties for the people choosing to live within the mountain range. It has steadily become not only more difficult, but also more dangerous. Isolation from major towns and cities means difficulty reaching any sort of medical attention for the people as well as the livestock should they fall ill. Also, the people are constantly threatened by the potential of an earthquake or rock slide. With food security being a large issue in Nepal, the need to keep livestock healthy is a major concern in these remote locations. Without medical aid, many of the livestock would either die or spread disease throughout the population which depends on the animal for food. Mastitis is one of those diseases which can remain subclinical for so long, the farmers won't know their milk is contaminated before it's too late.

Mastitis is the inflammation of the mammary gland due to an intramammary infection. (Guarin and Ruegg. 2016) The largest concern regarding Mastitis is that it is able to be subclinical or clinical. This means that the infection can easily go undetectable when observing the animal with the naked eye. When the mammary gland becomes inflamed, the bovine's body will start to produce leukocytes and epithelial cells to fight off any infection. (Guarin and Ruegg. 2016) This increased number of cells present in the milk causes a major health concern for the consumers. Mastitis can be caused through multiple different means, from a bacterial infection introduced during the milking phase, to physical trauma. (Guarin and Ruegg. 2016) Treating the injury as quickly and as effectively as possible provides a massive advantage to the farmer. The treatment process for Mastitis is long and requires antibiotics. While the animal is on antibiotics, up to a month long, any of the resources that the farmer was depending on from the animal can no longer be harvested. The farmer is then without this product for a prolonged period of time. This infection causes massive economic losses to farmers as milk quality and quantity decreases dramatically. What the farmers need is a reliable and effective way to test for Mastitis in their herd. Luckily for the people of Nepal, there is such a product.

The product that is being showcased is called the Somaticell SCC Test which is produced by Idexx Laboratories. The test is a way to determine the somatic cell count in a bovine milk. The somaticell count is a way to measure the number of epithelial and leukocyte cells present in the milk at the time of testing. If this count is measured to be high enough, then there is a likely chance that the animal may be experiencing an intramammary infection. When the amount of somatic cells reaches this level, the milk can no longer be sold. This heavily damages the income of the farmers. Many people doubt the accuracy of these tests, however, in an experiment done by Rodrigues et al, it was determined that the Somaticell SCC Test could obtain similar results to that of an electronic counter. (Rodrigues et al. 2009) This discovery confirms that the Somaticell SCC test is able to accurately and effectively determine if there is an intramammary infection present.

To use the product is fairly simple. Upon purchasing, the product comes with detailed instructions on how to use it. The farmer simply adds 2 mLs of the reagent to the test tube provided, then an equivalent 2 mLs of milk is mixed with the reagent using one of the mixing straws. (IDEXX Laboratories. 2014) The tube is then capped and inverted for 30 seconds to allow any liquid to drain. After returning the tube to the up right position, wait for the liquid to settle and then the farmer is able to easily read the results on site. (IDEXX Laboratories. 2014) The interpretation of the test is also extremely simple to do. There are indicator lines which show the number of somatic cells. If the line reaches a certain amount, then the farmer would be able to tell if there is the possibility of Mastitis. Having such a product at the farmers disposal would drastically improve their herd health and help to keep their animals in production for as long as possible.

Introducing this technology will benefit both Nepal and Canada. Mastitis is one of the most common diseases in the dairy cattle industry. When an animal becomes infected, there is a massive economic downfall onto the farmer. The nature of Mastitis being both clinical and subclinical requires advanced testing to be able to detect the presence of subclinical mastitis. Introducing this test which will indicate the presence of mastitis in cattle will allow farmers to efficiently treat the animal and

allow them to continue production as soon as possible. The benefits of being able to diagnose subclinical mastitis are many. The main benefit is that once detected, the farmer can then move on to the treatment phase as soon as possible. If such an infection goes untreated for long enough, the animal may suffer lethal consequences. The Somaticell SCC test kit is a preliminary field test that can be used to ensure herd health. By having this test kit on their farms, dairy farmers will be able to identify the issue before the quality and quantity of the milk being produced starts and they lose a much needed resource to live off of. Farmers would also prevent legal action being taken against them if they were to sell the milk from an infected animal. This is a cheap, effective, and affordable way to test for mastitis in cattle.

This price point for this product is also very reasonable. The price for one Somaticell SCC Test kit is approximately \$27.00 per kit. (NELSON JAMESON INC. 2016) Although this seems as though it may be a lot, this is not for only one test. Inside this kit is one bottle of reagent and then twenty tubes, caps, stir straws and pipettes. (NELSON JAMESON INC. 2016) This brings the price down to only \$1.35 before shipping. (NELSON JAMESON INC. 2016) This is very cost effective for all dairy farmers, whether big or small.

The main target group for the farmers who find themselves in remote locations who wouldn't have access to veterinary care if their cattle became infected with Mastitis. By using this test, farmers would be able to assess their herd health on site and determine if it had been compromised. The price point is also very good for the people of Nepal. As said earlier, having a price point of only \$1.35 per test makes it affordable for anyone in Nepal who might want to use it. Even if only a few test shipments are sent out to Nepal to observe the market, that could then sprout veterinary companies in Nepal that would be able to sell more Agricultural care items.

The main benefit that would be seen is job creation in Canada. Currently, Idexx laboratories has a distribution center located in Burlington, ON. (IDEXX Laboratories. 2016) By shipping from this

center, it would increase the activity at this center and thus create jobs for Canadians located around this area. Excluding this distribution center, there are also five other Idexx Reference Laboratories in Canada, reaching from British Columbia to Quebec. (IDEXX Laboratories. 2016)) These laboratories are responsible for quality assurance. With increased activity in the distribution center, there will also be an increase in job opportunities at these other locations to ensure quality products are being distributed. (IDEXX Laboratories. 2016) The main benefit to Canada will be an increase in job opportunities and an increase of income coming from these laboratories.

There are still many unknowns in regards to the logistics of this idea. This mainly comes into play when discussing the actual transport and then sales of the Somaticell SCC test kit. One major benefit of this product is that it does not require any special transportation methods. It does not require any cooling. It can be easily packaged and transported to Nepal via airplane. This makes it much easier and cost effective as it does not need to be sent on a ship to India, which it will then need to be transported by vehicle to Nepal. It can be sent right from Canada and flown into Nepal. Another unknown is what the total cost would be to ship the product to Nepal. The product itself is not that expensive, but the exporter needs to ensure they aren't losing money with this investment. It is better to ship in bulk and pay once instead of shipping smaller groups and then paying in small increments. The price of shipping would need to be added onto the price the consumer would pay. This would overall increase the price, but hopefully not by too much. If the shipping were to be too expensive from Canada, Idexx laboratories also has branches located in India where the product could be sent from. Shipping from India would most likely be more cost effective and cheaper than shipping from Canada.

Nepal is a beautiful remote country that would benefit greatly from the introduction of this product. They do not have regular access to the technology and services that are in North America. By giving them this test, they would be able to diagnose an issue that has been a constant plague on the dairy industry for so long. With our help, Canada can play a key role in helping Nepal as well as creating employment in Canada.

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