The Beneficial Uses of Penicillin for Animals in Nepal

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Section 1: Product Information

Alexander Fleming is a known Scottish pharmacologist, researcher and biologist who discovered the antibiotic known as penicillin. Penicillin was an antibiotic discovered in the year of 1928 and has proven to be very useful (Markel *et al* 2011). This is the time where antibiotics were introduced to the world and research on it had started to begin (Markel *et al* 2011). It was significantly used after World War ll when it was officially manufactured (Markel *et al* 2011). Penicillin is hugely produced in the United States of America but it has become more popular in many other countries around the world including Canada. This medication is beneficial for humans to treat any type of infection more specifically pneumonia, rheumatic fever and gonorrhea. Penicillin G is the antibiotic that is used on animals to treat their infections and viral diseases. Illnesses that can form due to pathogenic diseases within the animal consist of *E.coli, Actinobacillus, Vibrio* and variety of others. It can aid with the interior part of the body, such as the lungs, heart, mule tissues, skin and any other organ or body part. Also the antibiotic can prevent viruses or any bacterial diseases from developing with the human or animals body. Antibiotics are made up of bacteria and different fungi, penicillin is produced from both white and blue mould of penicillium (Doren *et al* 1978). This bacteria and fungi based antibiotics help with destroying unfamiliar viruses and diseases that form within the body from the knowledge of moulds having the ability to destroy particular bacteria's (Doren *et al 1978).* This is very beneficial for both humans and animals to maintain a healthy body and stop from a new bacterial disease from spreading within the species or another species. This product is manufactured in pharmaceutical companies by professional knowledgeable biologists and researchers (Mestrovic

et al 2016). Researchers and biologists had to understand how to manufacture the penicillin into a helpful medicine. The blue and white penicillium mould produces the penicillin naturally (Mestrovic *et al* 2016). Since scientist are able to produce the antibiotic in their factories where the drug is manufactured in massive fermentation tanks with the help of additional ingredients, one of them being sugar. This will aid with the overall growth of the antibiotic; the penicillin is then isolated from the mold itself. Lastly, the drug is then purified to be used as an anti-bacterial medicine. Also this drug can go through a manufacturing process consisting of three different phases; which is, starting the culture, fermentation, isolation along with purification, and lastly the refining process (Mestrovic *et al 2016)*. Starting the culture includes the isolation of the product in the research lab where biologists learn how to produce more of the product and how to begin the process of producing a larger amount of the product (Mestrovic *et al* 2016). Then Fermentation is where the fermentation tank is used to mix the penicillin with other necessary biology based products which help produce the penicillin to be used for animals (Mestrovic *et al* 2016). Isolation and purification includes where certain soluble compounds are separated from one another and purified (Mestrovic *et al* 2016). The water soluble products are separated from the oil-soluble product which is the penicillin (Mestrovic *et al* 2016). Lastly the refining stage where the product is put into different forms where it can be taken as a capsule, which is a powder form or by a syringe which is a liquid form (Mestrovic *et al* 2016). Penicillin G for animals does come in different sizes that acquire different costs. Bottle sizes are 100 mL, 200 mL and 500 mL, they are cased in packages of 48 or 12 bottles when shipped to different countries around the globe. They can be injected in a variety of different species such as lamb, chickens, pigs, cattle, sheep and many more. The dosage amount varies depending on the size of the animals that is being given the antibiotic. The amount increases with body size, 1 to 10

kilograms only 0.25 milliliters are injected into the animal whereas a 100 to 200 kilogram animal will be injected with 2 to 4 millimeters of penicillin G. This also ensures that once the product is bought it will last the buyer a long period of time before they need to purchase more of the antibacterial medicine. To manufacture together a penicillin plant costs around fifty to fifty-two million US dollars. This includes equipment, utilities, labor and conversions, costs for labor range around 22,500 dollars. The product does have health related side effects towards animals as it can cause loss of appetite or diarrhea. The drug can be stored in three different ways, at room temperature in a capsule bottle. Secondly, the liquid solution is refrigerated in a bottle and must injected into the animal when it is between the temperature 2-8 degrees Celsius. The drug becomes useful after 14 days in the refrigerator where it can rest and the solution is able to mix when it is in liquid form. Lastly, when it is injected into the animal after it has been refrigerated for at least seven days and about twenty-four hours in order to be effective. Constraints that this product has are that it may harm certain animals with different side effects that the antibiotic isn't usually used on (Doren V. C. *et al* 1978). As some animals may react differently to the drug such as amphibians or reptiles and many others, this product is mainly used on farm animals. Penicillin production is beneficial for Canada as it continues to help build Canada's economy due to the increased amount of money brought into the country by pharmaceutical companies, researchers and biologists. This will also aid in gathering more pharmaceutical companies and manufactures of penicillin drug to want to get involved in exporting this medicine to other countries which will help Canada's economy even more. Also it is a beneficial product for Canada as it provides farmers with healthier livestock that can prevent them from carrying or developing any bacterial diseases that could spread and potentially harm consumers. Penicillin G continues to benefit animals, as penicillin is naturally produced from penicillium. This shows

that it is environmentally sustainable for Canada. Other ingredients are added to the antibiotic where it can be used as a medicine for treating infections but it has been around for centuries and has only given a positive outcome (Tatem A. J. *et al* 2011). Manufacturing antibiotics and medication can be harmful to the environment as some are disposed into the sewers (Tatem A. J. *et al* 2011). This could lead to the presence of disposed antibiotics or medications in ground water and potentially drinking water if not completely eliminated in the sewage systems (Tatem A. J. *et al* 2011).

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Section 2: Export Potential to Nepal

Penicillin can be transported via airplane or ship as long as it remains at room temperature, if exposed to hot climates the drug may not be as effective when used on the animals in Nepal. It will be packed in cartons of 100, 200 or 500 mL bottles. Once the product arrives to the country it should be refrigerated in the markets and once a farmer buys the penicillin antibiotic they should keep it refrigerated as well before injecting it into the animals. When the product arrives in Nepal by a ship or airplane it will be unloaded into trucks which will carry the cartons to markets located in Nepal. These markets are located in the capital of Nepal, which is Kathmandu where the product can be bought. The prices of the penicillin g vary with size of the bottle; it ranges from 7.99 to 19.95 in Canadian dollars. Farmers and other citizens of Nepal can then purchase the penicillin from the markets. They must purchase a syringe and a needle separately and different needles must be used on each animal after injection. Then the farmers must transport the bought product to the terai region of Nepal, this is where the livestock is handled, fed, breeded and overall taken care of. Teva Canada is a large corporation located in many different areas around Ontario and the country itself (Teva Canada *et al* 2016). Where they manufacture a large variety of antibiotics and medicines in both capsule form or liquid form which then get transported around the country restocking grocery stores and other small pharmaceutical stores (Teva Canada *et al* 2016). Teva Canada is known to produce products that are high quality pharmaceutical medications including antibiotics which are given a reasonable price that consumers can afford (Teva Canada *et al* 2016). Recently in Ontario, more specifically at the Toronto the Stouffville Centre of Excellence which is built for the use of solid dose products has grown and improved (Teva Canada *et al* 2016). It takes up about 126,000 square-foot of area making it the biggest pharmaceutical centre in all of North America (Teva Canada *et*

al 2016). The number of employees working at the center range around 300 that overall come up with 400 formulations that are somehow altered in a way that they can distinguish from one another are produced (Teva Canada *et al* 2016). Teva Canada has a penicillin plant located in Markham, Ontario which is known to be the fifth biggest in Canada and around the globe (Teva Canada *et al* 2016). This penicillin plant not only produces the product but also packages, stores and distributes the product in numerous different dosage forms (Teva Canada *et al* 2016). This plant consists of about 250 employees and is as large as 67,000 square-foot (Teva Canada *et al* 2016). Teva Canada has a center located in Toronto where it's main purpose is to package their products and in the Stouffville branch the products are then distributed all around Canada and around the globe (Teva Canada *et al* 2016). This large company has continued to grow over the past few years and has only gotten more successful. The cost for this medication is reasonable because it is not too expensive for the Nepalese community. As antibiotics and medication are given an affordable price for all individuals, which Teva Canada, the pharmaceutical company provides. The product ranges from 7.99 to 19.95 in Canadian dollars and has continued to bring in profit for the Canadian economy exporting it to different places around the globe. Nepal becoming involved in one of the countries in which Canada will be in business with due to exporting penicillin g will only increase the overall profitability in which Canada is receiving. Nepal will benefit from penicillin G because the country is already suffering from food insecurity thus the use of this will help prevent their livestock from developing or carrying bacterial diseases. This will also be useful for the working animals that aid with the maneuver of machines during agricultural seasons. This is because if these working animals such as cattle get tears or scratches in the bottom of their feet this antibiotic can aid with the healing and prevent of diseases from forming. Even though the citizens of Nepal are Hindu and because of their religion

do not consume, majority of the population follows this. Therefore, the penicillin g will continue to be beneficial for farmers to heal working animals that aid with harvesting and other farm jobs hard for the farmer themselves to complete alone. Exporting this product to Nepal will benefit the country because it will stimulate the economy because of the markets selling the antibiotic. It can also be used on local animals that the Nepalese have in their homes to prevent them from developing any unwanted illnesses. For the individuals that do consumes meat this product is good to inject into the livestock being slaughtered and sold in markets. The bacteria will be stopped from spreading to the market and potentially harming the consumer. Penicillin G won't have any overall impact on the land areas of Nepal where agriculture is not occurring. This does not mean that the antibiotic wont impact where harvesting, and plant growing is occurring throughout Nepal. When animals consume antibiotics it is realised out of their system through their manure. Manure is known to be used as a fertilizer for plants and agricultural purposes. Which is how the penicillin g can be absorbed by the soil resulting in it potentially reaching their ground water. Thus there is potentially risk to Nepal's environment but it is likely to not have a very strong impact on consumers. Also this medical drug can be beneficial for Nepal's environment as it can help build resistance of animals from developing and spreading diseases, as both parasitic and viral diseases have become more common due to increased animal production. Thus the use of penicillin G can reduce the environment, especially the terai area of Nepal where livestock is kept from carrying any pathogenic diseases. A potential Nepal buyer is Chandra Shekhar who is a managing director and owner of a pharmaceutical company which would distribute and is also involved in importing items. Shekhar could be a potential Nepalese buyer because it will gain more profit selling distributing penicillin g to markets located in the capital of Nepal, Kathmandu. The penicillin G could be marketed by Canadians who work for

Teva Canada pharmaceutical company as they have the ability to demonstrate their knowledge to the Nepalese community and potential buyers. When the information on the antibiotic is given by professional biologists and manufacturers it can be increase the selling of the product. As the manufacturers have more knowledge of penicillin's overall purpose and benefits towards Nepal once it is sold to farmers and given to their livestock and other animals. Another strategy that could be used to sell and promote the product in Nepal is a free trial which could guarantee to the Nepalese buyers that penicillin g is a product to invest in. For the export of penicillin G from Canada to Nepal procedures of documentation must be taken into account beforehand. The Canadian company must have a business already given to them by the CRA which is known as the Canada Revenue Agency. The penicillin g must be identified with a valid description of the product, which will ensure if the antibiotic is managed by government departments. It must be established where the product is being exported to otherwise it can affect the permit requirements, also the penicillin g must be able to be exported to other countries. The antibiotic has the ability to be transported to different countries as the penicillin plant in Canada does export penicillin to other countries. Since certain drugs cannot be handled outside of the country that's importing the product because of the *Controlled Drugs and Substances Act.* Since penicillin g is not a restricted product no export declaration is necessary. A certificate that will be need for the exporting of penicillin g would be and *Animal Health Certificate* or the *Canadian International Health Certificate*. Potential trade barriers that could occur would be a tariff which imposes tax on the product that is being imported. This would result in an increase of the price of the penicillin g when imported to Nepal versus the price of the product in Canada where not importing has to occur. There are also subsidy barriers which cause also cause an increase in the product when sold in foreign markets. Thus, both barriers cause an increase in price of products

when imported to another country but remain at a lower price in the country where it was produced, in this case Canada. Embargo is a known trade barrier which consists of an agreement that causes a block in a foreign country from obtain or transfer products to other countries. The Canadian government can provide funding towards non-large corporations, *Mentor Works*, can aid individuals who are struggling with money to develop their company. Canadian government grants have been listed that are the most common consisting of, company expansion, training and hiring, capital investment and lastly, research and development. Depending on what the individual needs for their business they can apply for one of the following. They must be eligible for the requirements that each program lists, then a form is filled out ensure that the individual has applied their small company to receive funding or grants. The United States may become a competitor with Canada because America was the country that started the manufacturing and discovery of penicillin from Alexander Fleming. If Canada's economy increases due to the pharmaceutical companies such as Teva Canada bringing in money from exporting the antibiotic to Nepal the United States might begin to sell their antibiotics to Nepal as well. This will increase profit for the United States and overall benefit their country as a whole.

In conclusion the penicillin g is a very useful product that can benefit both Canada and Nepal. Canada will receive more profit from the pharmaceutical companies involved in the exportation of the product, increasing the overall economy. Penicillin G will help improve the food insecurity the country is continuously dealing with on a daily basis. Preventing their livestock from and bacterial diseases or animals that are used in the agricultural fields. Also it will provide more jobs for both Canadian and Nepalese individuals in the pharmaceutical industry and the marketing industry.

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