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Spreading of the deadly disease Botulism among Cattle

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ABSTRACT

The botulinum toxin, which is produced by the clostridium botulinum bacterium, causes the disease. The high mortality rate associated with an epidemic of the cattle disease botulism poses a significant environmental and economic risk. In this paper, the deadly disease botulism which is easily transmitted among cattle is discussed. Both the internal and external transmitting modes serve as tools for spreading. There is a greater chance that if one cow has been affected, it will have an impact on all the other cows around. However, the Prufer code is employed to identify the source of transmission in order to stop other cows from contracting it, and it is also thought to be the fastest way of spreading the disease botulism from infected cattle to a healthy one.

Keywords: botulism, cattle, Prufer code, transmission, etc.

INTRODUCTION

A tree in graph theory is an undirected graph where any two vertices are connected by exactly one path. Arthur Cayley, a British mathematician, first coined the word “tree” in 1857. Although not all graphs will be trees, a tree is always a graph. A tree with n vertices has (n-1) edges. Here, a rooted tree is used to evaluate the fastest way of transmitting the deadly disease botulism among cattle.

The deadly disease called botulism is the one that affects cattle and spreads quickly. Most animals are susceptible to the severe, often dangerous blood poisoning known as botulism. This is a powerful toxin generated by the bacteria clostridium botulinum causes the neuro-paralytic sickness. E. Van Ermengem first characterized this bacterium in 1897.

Sometimes, the feed may occasionally become contaminated with rotting plant matter or dead animals, extensive diary feeding systems that rely on stored feed put cattle at risk for botulism. Considering how sensitive they are to the effects of the botulinum toxin, cattle are particularly vulnerable. Botulism doesn’t cause fever in infected cattle. Other prevalent causes of “downer cow syndrome”, such as three day illness or milk fever, are not affecting them. When cattle reach this stage, they frequently rest on their briskets with their hind legs extended behind them and may not include tongue paralysis (cattle cannot draw their tongues back into their mouths when they are taken out).

The first indications of botulism include increasingly greater difficulty in chewing and swallowing due to paralysis of the tongue and masticatory muscles. This causes sluggish prehension and chewing of feed, water and grain pouring out of the mouth, excessive salivation and tongue weakness [1]. The last stage of this disease begins with severe constipation and pharyngitis. Saliva was frequently visible dripping from the mouth and the tongue protruded[3]. The quantity of poison consumed determines how quickly and severely the disease advances. Under, “special treatment certification”, two vaccinations are accessible for the defense of cattle at danger of botulism. The only effective way of preventing botulism in high risk conditions is immunization. However, this paper uses the Prufer code to identify the fastest way of transmitting the disease botulism from infected cattle to a healthy one. Since, if one cattle is affected, there is a much greater chance that it would also affect other cattle too.

RESEARCH METHODOLOGY

The Prufer code is used to evaluate the fastest way of transmitting the deadly disease botulism from infected cattle to a healthy one. Many pregnant cows and newborn calves are now affected by the deadly disease botulism. As a result of the increasing paralysis brought by botulism, cattle eventually die of respiratory failure and labored breathing. Vaccinating the cattle is a crucial element of the botulism disease prevention plan. Because immunity can take up to 4-5 weeks to develop, vaccination is unlikely to have much of an influence once an outbreak has begun. Feeding nutritious

food is a second important preventative measure. Botulism may affect cattle at any age. The existence of the toxin was later confirmed using a mouse bioassay. Initially the acute fatalities and diagnosis hampered identification of the source of infection on the farm[2].

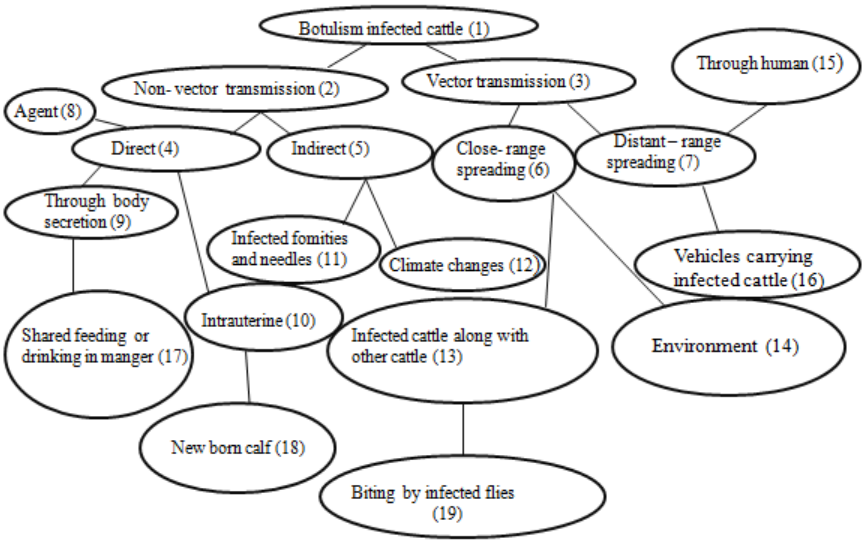


Figure 1.various modes of transmission takes place in botulism.

Here, the Prufer code is particularly generated for the botulism infected cattle, and the resultant Prufer code clearly explains the question, "what is the easiest way to transmit the disease botulism from infected cattle to a normal cattle?"

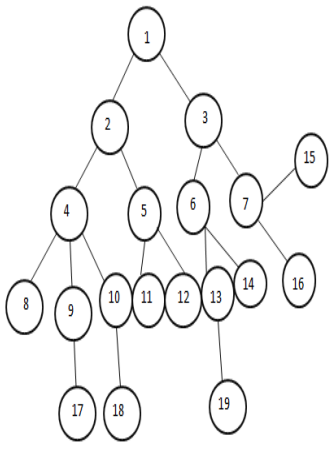
The prufer code of a labeled tree is a unique sequence that is associated with the tree. A simple iterative approach may be used to generate a series of length n-2 for a tree with n vertices [4]. Heinz Prufer developed the first Prufer sequences in 1918 to demonstrate Cayley's formula. By removing the vertices from the tree until there are only two left; one may create the Prufer sequence for a labeled tree. The Prufer sequence of a labeled tree is unique and has length n-2. The resulting sequence of n-2 labels is called the Prufer code of the tree.

On finding the Prufer code for the above rooted tree (fig.1) the following steps are as follows:

Step-1: Initialize Prufer code as empty.
Step-2: Starts with a leaf of lowest label A. find the vertex connecting it to the rest of tree say B. remove A from the tree and add B to the Prufer code.
Step-3: Repeat above Step-2 until we are left with two nodes.

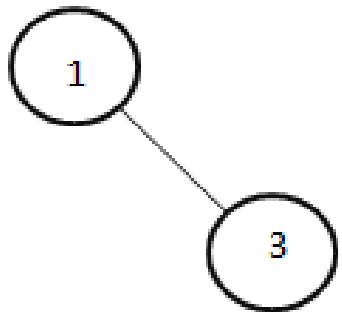
FINDINGS

Table 1: Illustrating the Prufer code

Tree	Leaves	Smallest label	Neighbor	Prufer code
	17,18,19,8,11,12, 14,15,16	8	4	4

On proceeding in a similar way until the two vertices remain, we get the resultant Prufer code as follows:

Table 2: Illustrating the resultant Prufer code

Tree	
	Prufer code: 4552677394104211363

Hence, there are 19 vertices and 17 labels, which are 17-digit codes as they satisfy the Prufer code property. Finally, the resultant Prufer code enumerates the resultant tree which gives the clear explanation for the question, "what is the easiest way to transmit the disease botulism from infected cattle to normal cattle?"

RESULTS AND DISCUSSION

The below resultant tree is generated by the above Prufer code:

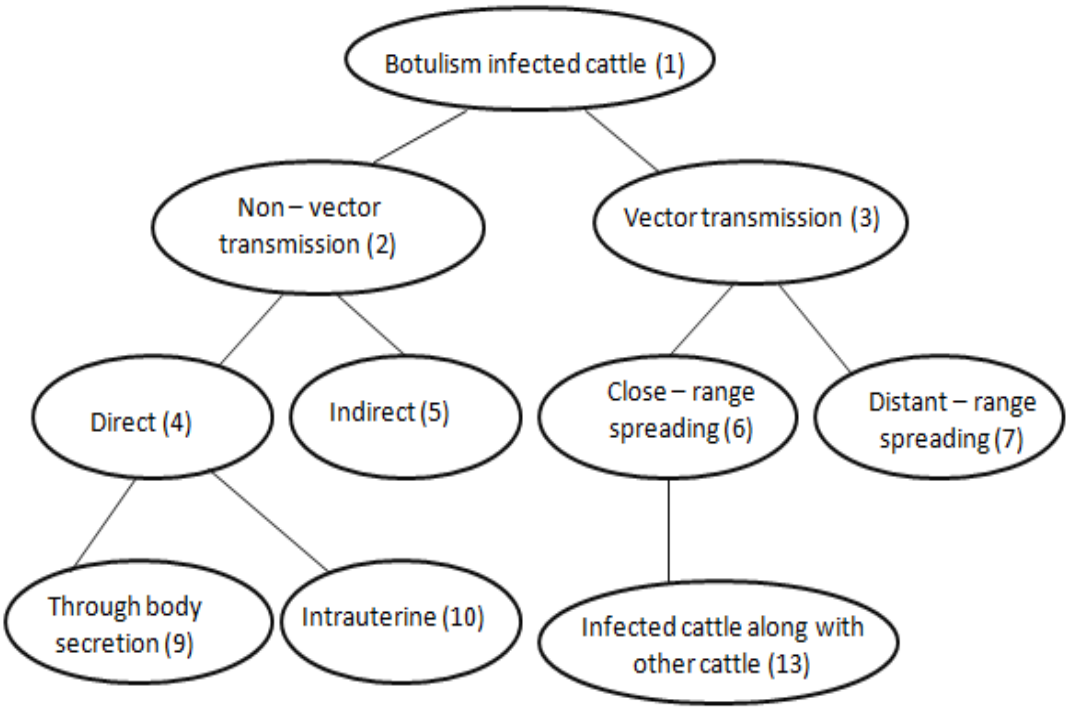


Figure 2. Resultant tree

By using this code, we can conclude that the deadly disease botulism easily transmits from infected to normal cattle in the above way. This disease spreads through various modes of transmission such as non-vector and vector transmission. Non-vector transmission comprises both direct and indirect transmission, with direct transmission occurring by bodily secretion and intrauterine transfer. On the other hand, vector transmission encompasses both close- range spreading and distant-range spreading with close-range spreading occurring through infected cattle among other cattle; therefore it must be protected carefully. Unfortunately, there are no effective therapies for botulism, thus cattle that become infected typically do not recover [5].

CONCLUSION

The aim of this paper is to control the deadly disease botulism among cattle to avoid a high death rate. Even a single cow's life is important in this current scenario. Because without cattle, there would be no farmers, and if there were no farmers, there would be no humans at all. Apart from other diseases, transmitting diseases should be carefully monitored. This paper ultimately addresses the query, "what is the easiest way to transmit the disease botulism from infected cattle to normal cattle?" it also emphasizes how codes are not only used in programming but also in everyday applications too.

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