EMERGING SOURCES AND PATHWAYS FOR LEPTOSPIROSIS: A PARADIGM SHIFT

Massey University has been funded by the Health Research Council of New Zealand to understand how people get leptospirosis. This document explains **why** this research is important, **what** we are doing and **how** we are doing this.

Why are we doing this study?

Leptospirosis is an infectious disease caused by bacteria called *Leptospira*. There are over 300 different kinds of *Leptospira* worldwide but only 5 of these has been found to be circulating in New Zealand. These are called serovars. The 5 serovars circulating in New Zealand are called Hardjo, Pomona, Copenhageni, Ballum and Tarassovi. The bacteria can infect any mammal and can live in their kidneys. It is secreted in the urine of infected mammals and can survive in the environment (soil and water) for a long time.

In New Zealand, leptospirosis is a workplace hazard in the agricultural sector and people contract leptospirosis through contact with infected animal urine and contaminated water. To prevent infections in humans, measures like dairy cattle vaccination and the use of personal protective equipment have been implemented. However, over the past 15 years of leptospirosis research, we have found that:

- the current animal vaccines do not cover all the serovars of *Leptospira* circulating in the country
- the use of protective equipment does not prevent infection
- two-thirds of people with leptospirosis are hospitalized
- 1 in 3 people suffer effects long after infection (post leptospirosis symptoms)
- more women are being affected
- the number of people not in farming and meat working occupations has increased
- workplace compensation for people with leptospirosis can be challenging
- the infecting serovars have changed
- current diagnostics may not detect emerging or introduced serovars
- rodents and the environment can maintain the *Leptospira* bacteria that infects humans

We believe these changes indicate that there is a shift in the way the disease is being spread but we do not understand what the shift is. This research aims to address the gaps in leptospirosis knowledge through a case control study that will identify factors that increase or reduce the risk of having leptospirosis and the sources of the infections. Understanding this can help us prevent future infections.

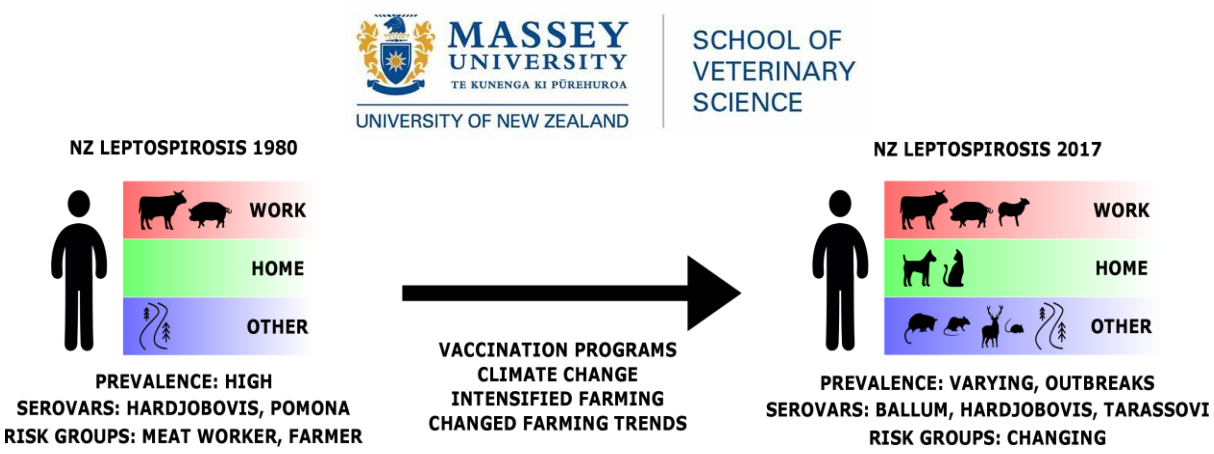

Figure 1: Leptospirosis in the 1980s with few know reservoirs for the bacteria *i.e.* workplace exposure of cattle, pigs and environmental water versus leptospirosis in 2010s *i.e.* workplace exposure with many farmed animals, home exposure from pets and livestock and other exposures with wildlife and the environment.

What are we doing in this study?

Aims of the study

1. Identify factors that increase or reduce the risk of having leptospirosis.
2. Identify the cost associated with the disease and investigate workplace compensation for leptospirosis.
3. Identify the different kinds of *Leptospira* bacteria that are causing disease in people.
4. Identify the sources of the disease, that is, the animals and the environment
5. Identify factors that can be improved in the current disease control strategies like vaccination and personal protective equipment.
6. Establish a group of people with leptospirosis to take part in a long-term study to look at persistent leptospirosis.

Benefits of the study

This study will have a direct impact on the health and well-being of the New Zealand population.

1. It will allow us to identify the factors that place people at risk of getting leptospirosis so effective preventative and control strategies can be put in place.
2. We will explore the worker compensation experience for people with leptospirosis with the aim of providing information to make access to compensation straightforward for eligible people.
3. We will identify the social, financial and emotional burden that leptospirosis has on people so useful measures can be put in place to support people with leptospirosis.
4. We will provide information on animal sources, including species not previously considered as carriers of *Leptospira*.
5. Information on pathways for infection previously not considered of importance in New Zealand such as flooding will inform health messaging.
6. We have the potential to identify new strains as vaccine candidates

How are we doing this study?

This is a nationwide study that is divided into 4 sections: 1 main study (a case control study) and 3 sub-studies.

Main study (case control study): We will compare the habits and experiences of people who become sick with leptospirosis (cases) with healthy people (controls) who are about the same age and of the same gender and live in the same region where people got sick. This will be done with a telephone survey. The survey will include questions that will cover aspects of participant's health, contact with animals, water and outdoor activities they may have taken part in. We can then look at these results to determine what aspects of people's habits and experiences put them more at risk of becoming sick. This information can be used to put measures in place to reduce the number of people getting sick.

We will contact everyone who had leptospirosis 6 months later for a follow-up survey to see how they are doing since they first became ill with leptospirosis, what costs they have incurred due to the illness and if they have been compensated.

Sub-study 1: This will include people suspected of leptospirosis. Sub-study 1 will only include patients from Hawke's Bay Hospital, Tuki Tuki Medical Centre, Wairoa Hospital and Health Centre, Te Kuiti Hospital and Medical Centre, and all Northland hospitals and GPs. Doctors will invited people they suspect to have leptospirosis into the study and patients will be asked to submit blood and urine samples for diagnostics and research purposes. Samples submitted for research samples will have a number of different tests done on them so we can learn more about the *Leptospira* causing the disease.

Sub-study 2: This will include people from sub-study 1 that have laboratory evidence of leptospirosis. They will be asked to participate in the main study survey. If the survey reveals that they have a stable animal exposure, we will offer to test their animals and environment (soil/water) for leptospirosis at no cost to the participant. This will allow us to identify the potential sources and pathways of the infection by comparing the results we get from the patient sample with the animal and environment samples. We will engage with the participant's usual veterinarian to sample their animals and the results from the animals will be returned to the participant through a consultation with their veterinarian.

Sub-study 3: This will include a subset of people from the main study that are from a farming and meat working occupation. Farmers and meat workers are high-risk occupations and intervention and prevention strategies like vaccination and personal protective equipment has been introduced to protect them. We will invite these people for a 1-hour face-to-face semi-structured interview. This interview will focus on their health after the

disease, any workplace compensation that they may have received, and their attitudes towards vaccination and personal protective gear. We aim to establish findings that will inform the improvement on current control strategies to prevent future illness in these groups.

Lastly, we will seek consent to contact everyone that got ill with leptospirosis for a subsequent long-term study to look at persistent leptospirosis symptoms. One in three patient have persistent symptoms from leptospirosis that prevents them from continuing their life as they did before the illness. We hope this study will allow us to investigate how or what may cause these symptoms.

Results and Confidentiality

All information collected in this study is confidential between the participants and the research team. Personal details will be treated with ethical respect and not be revealed to any person or institute other than the research team. All identifying information will be removed from the survey data and everyone's answers will be added together to create a de-identified dataset. This de-identified data will be used for data analysis. Nothing identifiable will ever be published.

Statement of Approval

This study has received ethical approval from the Southern Health and Disability Ethics Committee, ethics reference number 19/STH/80.

Contact details

The lead investigator for the study is Associate Professor Jackie Benschop from Massey University, Palmerston North.

If you have any questions, concerns or complaints about the study at any stage, you can contact the study coordinator:

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