LEPTOSPIROSIS THE QUIET ACHIEVER

SIMON WISHNOWSKY

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EXECUTIVE SUMMARY

Leptospirosis is quietly achieving in its own right, It is becoming an important cause of human illness and absence from work in New Zealand.

It is a bacteria that can ultimately cause death of humans.

It has a large economic impact on at risk employers and is estimated at costing the meat industry over 1 million dollars per annum.

The disease has serious humanitarian consequences for individuals who contract the disease, its very unpleasant and symptoms can last for months.

The incidence in New Zealand is rapidly increasing and is being seen in sheep only industry that were previously unrecorded. A case study confirms the cost to the meat industry as being unsustainable, the meat industry now has the highest recorded incidence, having taken over from farmers, when you add the occurrence in farmers and the meat industry together, these occupations account for 75% of recorded cases and therefore it is a disease of livestock.

Individuals who have had the disease have vivid memories of the very uncomfortable symptoms and don't wish it upon their worst enemies.

Prevention is better than cure, but prevention is proving difficult, due to the bacterium's strengths and ability to survive and infect.

Currently there are no guaranteed prevention mechanisms, but protective equipment used against possible exposure to infected urine can reduce the chances of infection.

Vaccination of livestock and or humans maybe possible in the future 5-10 years, but for now awareness, protection and hygienic practices are the best defence for this horrible disease.

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INTRODUCTION

Leptospirosis is rapidly becoming one of the most frequent causes of human illness and therefore time off work in New Zealand.

Leptospirosis is commonly associated with the rural sector and associated animal industries, as animals are the common cause of the disease.

It is vastly important to at risk employers as it can have a large economic impact on a business and it is of humanitarian concern because of the serious symptoms and possible permanent damage to humans or possible death.

This project set out to find out what leptospirosis is and how it is caused, what is the occurrence of human cases and the spread throughout New Zealand and what financial implications if can have on a business. Also how it impacts on individuals who contract it and can it be prevented?

A review of leptospirosis was carried out through research, incidence in New Zealand was measured. And statistics have been summarised,

This revealed an increasing trend in the number of cases per annum, which is not desirable and some changes have occurred with the source of infection – sheep are now identified as a maintenance host.

A case study was carried out on an at risk employer to establish the cost of the disease on a business and it proves to be substantial.

A series of interviews with individuals who have had the disease was completed to establish the real life views and develop an understanding of the humanitarian side to it.

None of these people would wish anyone else to suffer from leptospirosis as it really knocked them around and has had some lasting effects and unpleasant memories.

A review of prevention possibilities found that currently there is no ultimate fix to stop humans from becoming infected, there are steps which can be taken to minimise the levels.

There are some medium to long term solutions that may provide protection for humans but more work is required to establish these possibilities, such as human vaccination.

In conclusion the project has identified leptospirosis as a major economic and humanitarian threat to our rural (animal) based country.

WHAT IS LEPTOSPIROSIS?

Leptospirosis is a serious illness and is potentially fatal, it is therefore a "significant hazard" as defined by the Health and Safety in Employment Act 1992.

It is a notifable disease in New Zealand.

It is New Zealand's most common occupationally acquired infectious disease. New Zealand has a high incidence in comparison to other developed temperate countries.

Leptospirosis is the most important directly transmitted zoonosis in New Zealand, it has also been nominated as the worlds most widespread zoonosis.
A zoonosis is a disease transmitted from animals to humans.

It is an acute generalised infectious disease characterised by extensive vasculitis.

Human to human transmission is extremely rare and has never been recorded in New Zealand.

It is a bacteria called leptospira – it comes from the same family of bacteria that gives rise to Syphillis and Leprosy.

The bacteria has the following characteristics:
- small helical micro-organism
- 10-20mm in length
- finely and evenly coiled
- hooked at one or both ends
- visualised by dark field microscopy
- pH 7.2-7.4

There are 202 known serovars worldwide, 8 have been identified in New Zealand.
These serovars are *hardjo, pomona, copenhageni, tarssovi, ballum, balcanica, australis* and *canicola*. *Hardjo* and *pomona* are the most common, due to their prevalence and relevance to beef, sheep and pigs. *Copenhageni* infections are rare, but much more severe.

Each serovar is generally maintained by a host group. A host group can carry and spread the disease but will exhibit few clinical symptoms, these symptoms are generally mild or totally in-apparent.

Possums are the maintenance host for *balcanica*
Rodents are the maintenance host for *copenhageni, ballum*
Cattle are the maintenance host for *hardjobovis*
Pigs are the maintenance host for *pomona, tarssovi*
Sheep have been identified and there is mounting evidence that they can act as maintenance hosts for *hardjo.* The increasing number of human cases amongst meat workers who work in sheep only plants has realised that sheep do play a role as a source of infection, which was previously un-noted.

Clinical symptoms will be more pronounced when a serovar infects another individual i.e.; in humans. The disease is present in almost all animals, farmed, domestic and feral. Different serovars result in different levels of clinical symptoms.

HOW IS LEPTOSPIROSIS TRANSMITTED?

The bacterium has the following strengths, which help in transmission and make it difficult to eliminate:

- Have high motility, moving at speeds up to 10mm per second.
- Vigorous motion, wiggle through small openings, have been observed to penetrate a 0.2 micron filter membrane.
- Can gain access to a host via any mucous membrane (i.e.: eye, nose, ear, mouth) or an opening in the skin.
- Survive in cool dark water.
- Survive in wet soil for up to 6 months.
- Migrate to kidneys after infection and the host's immune system has difficulty to kill.
- Spread by the shedding of leptospires (dead and alive) into urine. The length of time that the host will shed varies between serovars e.g. *pomona* 1-2 months, *harjo* 12 months plus.
- Can survive in alkaline urine of herbivores, e.g. sheep. Can't survive in urine of omnivores (e.g. human) due to the low pH.
- Survive well in neutral or alkaline solutions.
- Can survive freezing and chilling for up to 21 days.

Urine is the key to transmission both between livestock and then on to humans.

As the leptospires are shedded into urine, then any exposure to infected urine could result in the uptake of bacteria.

HOW DO ANIMALS GET INFECTED?

The following are circumstances which can be a source of infection for animals – but the possibilities are endless.

Any exposure of non-infected livestock to contaminated urine can aid transmission.

- Water or pasture that becomes infected can pass it on.
- Sexual activity could play a role.
- Can be passed onto the unborn foetus through the placenta.
- Once in contact with a new host the leptospire can gain entry through a mucous membrane or breaks in the skin. Eyes are very common.
- Wet pastures or paddocks aid transmission.
- Contaminated stock washes can act as a source.

HOW DO HUMANS GET INFECTED?

Any exposure to infected urine is the most likely cause. If the leptospires gain access to any mucous membrane or broken skin, such as rashes, abrasions, dermatitis or cuts then they can get in.

Leptospries only take 1 minute to infect once contact is made with any susceptible access path.

Direct contact with infected urine or tissue doesn't have to happen, a splash of contaminated water or an aerosol spray of urine can be enough to infect.

Leptospires can actually survive longer in a diluted form.

Contaminated food from inadequate personal hygiene can also lead to infection.

SYMPTOMS OF LEPTOSPIROSIS INFECTION:

Livestock

Symptoms are generally more evident in cattle than in sheep.

Symptoms can be:
- Abortions.
- Weak newborn which die within weeks of birth.
- Anaemia – pale looking as there is damage to red blood cells.
- Kidney damage, blood in urine 'red water'.
- Weight loss or slow growth rates.
- Drop in milk production.
- Can result in livestock deaths.
- Sheep appear to be able to survive infection with fewer symptoms than apparent in cattle – i.e. healthy looking sheep may be carrying bacteria and shedding.

The most contagious animals often exhibit next to no clinical symptoms.

Human

Symptoms can be very severe in human infection.

There are three phases to leptospirosis infection:

Incubation phase:	2-7 days – delay before the symptoms initially occur.
Septicaemia phase:	next 3-7 days – leptospires are found in the blood, urine and most body tissues. Symptoms are occurring and becoming more severe.
Immune phase:	4-30 days – the body reacts creating antibodies, Leptospires now only found in the kidneys, urine and aqueous humor. Symptoms gradually decline as the body fights the infection.

After the incubation phase the following are symptoms which maybe observed during the septicaemia phase:

- Initial flue-like symptoms, (flue is a virus so doctors won't treat with antibiotics and people get worse).
- Severe headaches.
- High fever.
- Vision problems.
- Eye irritation.
- Nausea and vomiting.
- Muscle pains.
- Photophobia which is sensitivity to light.
- Depression and grumpiness, mood changes.
- Hallucinations.
- Jaundice.
- Blood cell damage and anaemia.
- Sweating.
- Kidney damage.
- Loss of appetite.
- Loss of energy.

Leptospirosis is often misdiagnosed as the initial symptoms aren't specific and doctors' don't commonly recognise the possible diagnosis of leptospirosis.

Severe cases can result in permanent kidney and or liver damage and ultimately death if not treated in a timely manor.

DIAGNOSIS AND TREATMENT

Treatment should begin before diagnosis is confirmed as the sooner the treatment begins the greater the chance of success in reducing the effects is likely.

However a pre-treatment blood titre test should be taken. Blood and urine tests will be required.

Diagnosis often needs to rely on the initial clinical symptoms and the risk profile of the patient.

Always carry out first aid for possible exposure, i.e. flush mouth, eyes or any exposed skin with lots of running water. Wash with soap and water.

Treatment must be with antibiotics, the sooner the better – Penicillin. Some controversial reviews suggest that there is no benefit from antibiotic treatment.

Microscopic Agglutination Test (MAT) is used for confirmation. This test uses measured amounts of blood to show the concentration of antileptospiral antibodies in the sample (titre) to indicate how much infection is present.

A single titre of 400 or higher or a fourfold change in titre over two tests (3 weeks apart) will give a positive result.

INCIDENCE OF LEPTOSPIROSIS

Leptospirosis is the most commonly notified occupationally acquired infectious disease and New Zealand has a high incidence in comparison with other developed countries of temperate nature.

Leptospirosis was first identified in New Zealand in 1951 and climbed to a peak number of cases in 1971 with 875 notified cases. Most of these were dairy farm workers and the common serovar was *hardjo.*

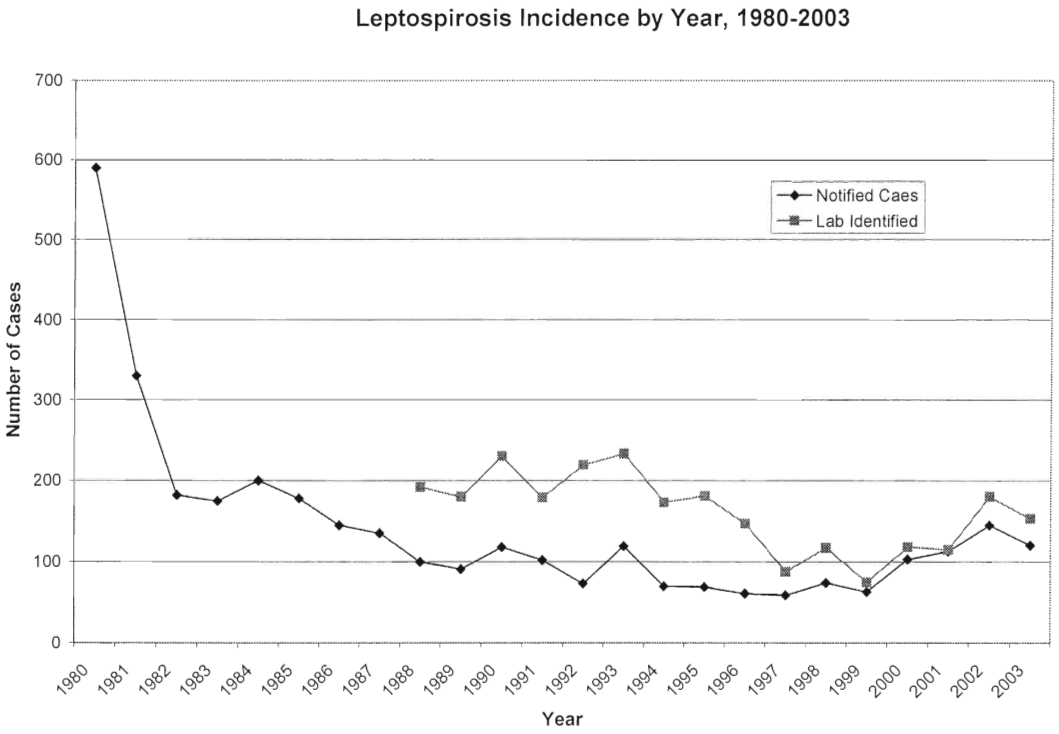
At this time dairy herds were grossly infected and the high number of cases resulted in a push to reduce the occurrence. A major vaccination programme was launched on cattle and pigs against *hardjo* and *pomona*, this was bought about by a large public health promotion campaign in the early 1980's.

Pigs were common on dairy farms at this stage but as they were identified as having a role as the maintenance host and the cattle were becoming infected with leptospirosis, pigs started to disappear from dairy farms.

As leptospirosis is a notifiable disease the Ministry of Health keeps a surveillance database. Information is entered from the notifying doctors who diagnose each case.

The disease is also under laboratory surveillance, so any laboratory that gets a positive titre test is required to pass this information onto the database.

The following graph shows the incidence of both notified cases and lab identified cases from 1980 to 2003.



The graph shows the trend that from the early 1980's and before the number of cases was continually declining to an all time low, however since 1999 this trend has reversed and the number of cases has begun to climb quite rapidly.

From 1995 through to 1999 the number of cases annually was almost static, indicating a constant level of leptospirosis infection in New Zealand's livestock.

Since 1999 an alarming trend has occurred, the number of cases is increasing and at a rapid rate.

A factor in our environment must have changed, a possibility for this is the role that sheep now appear to be playing as a maintenance host.

Using 2001 Census data as a measure of comparison, statistics illustrate this increasing trend.

During the 3 year period 2001-2003, there were 355 cases notified; an average of 118 cases per year, this translates to an average rate of 3.2 cases per 100,000 people.

During the previous 3-year period 1998-2000 this rate was only 2.1 cases per 100,000 people.

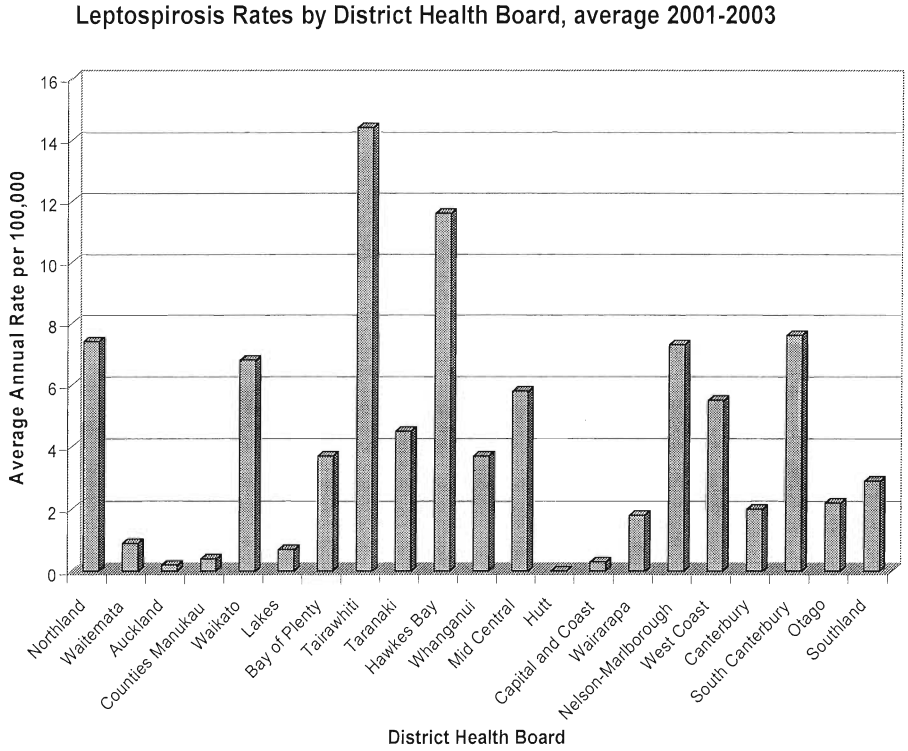
This shows an increase of almost 50%. An alarming increase, so you have to ask why, when you would expect awareness, technology and hygienic practice should be reducing this number.

DISTRIBUTION OF LEPTSPIROSIS

The following graph shows that rural areas have a far higher incidence rate than urban areas.

The District Health Boards that have the highest incidence are all health boards that have a high proportion of rural community members or have very high animal industry employment.

Leptospirosis rates by District Health Board, average annual rate 2001-2003 illustrates the average annual infection rate per capita for each of New Zealands District Health Boards:



This graph clearly illustrates the higher incidence in rural based health boards compared to the city health boards, however the population in rural areas may have some impact on this, i.e. more cases over less people, whereas urban health boards have high population and less cases.

Tairawhiti Health Board has the highest incidence (covering Gisborne Ruatoria and Matawai), followed closely by Hawke's Bay , these two are a significant level above any other Health Board. Both are located in the same area of the north island, the upper east coast, which would indicate a high level of infection in the livestock of this area. There is also a large area of native bush in the east coast region and lots of feral pigs, which may contribute, the pigs possibly act as a maintenance host.

The east coast does have a relatively low population which may contribute to a higher per capita rate.

The rates in the North Island are generally higher than in the South Island, the disease possibley likes a warmer climate.

SEX AND ETHNICITY

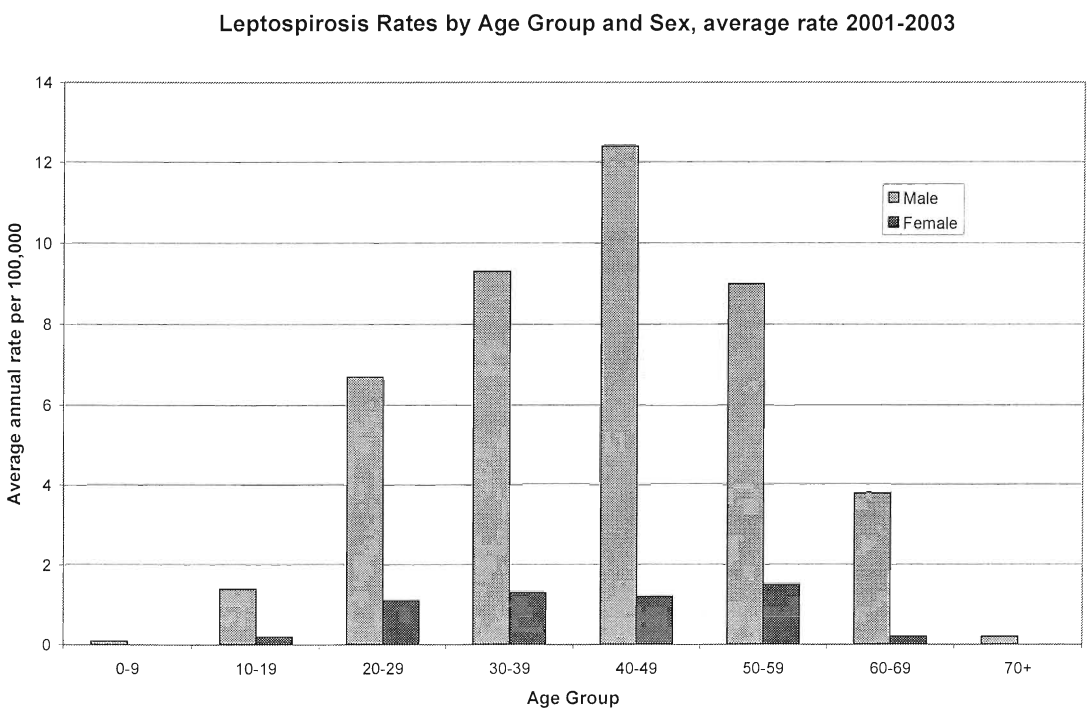
Sex of the individual also indicates that the rural environment plays a part.

Males are far more likely to contract leptospirosis than females.

The average rates for the 2001-2003 period are as follows:
- Males 5.6 cases per 100,000 people
- Females 0.7 cases per 100,000 people

This higher rate in males is likely to be a result of the working groups who regularly pick it up. Males tend to dominant in the at risk working groups, i.e.; farm and meat workers.

The following graph confirms the higher incidence in males but also gives a breakdown of age. It clearly shows that the working age group 20 to 60 years has the highest incidence again pointing to the fact the disease is an occupationally acquired disease. It is uncommon in school aged children and the retired age group of 65 plus.



Statistics also show that ethnicity may have some impact, but it is more likely to be related to job type and the ethnic groups that are common to some various job types, for example Europeans in farming, Maori in the meat processing industry.

The average rate for Maori, 3.2 cases per 100,000 and European, 3.1 cases per 100,000 is very similar, whereas there were very few notified cases for Pacific Islanders or other ethnic groups.

OCCUPATION

Occupation was reported for 91.5% of the 355 reported cases in the 2001-2003 period.

Table: Reported occupational exposure to leptospirosis, notified cases 2001-2003

Occupational Group	Total 2001-2003	
	No	%
Dairy Farmer	37	10.4
Other Farmer	96	27.0
Meat Worker	133	37.5
Other occupation with potential animal exposure e.g. stock agent, shearer, trapper, fencer, forestry worker, pest control worker	25	7.0
Other non-occupational exposure to farm, wild animal or products e.g. hunting	34	9.6
Unknown	30	8.5
Total	**355**	**100.0**

This table indicates that meat workers account for the largest proportion in the recorded cases, this is a change from historical data where farm workers accounted for over 50% of cases. In most of the cases reported, where the occupation is known, the occupation is a known high risk occupation.

Why have meat workers become the most at risk group of people? This must have some relationship to the fact that sheep only slaughter facilities are now getting recorded cases of leptospirosis, whereas previously this wasn't happening. There are a great number of people employed in the sheep processing industry and therefore if sheep are carrying leptospirosis as a maintenance host, more people are at risk of being exposed.

Serovar

The following statistics are the breakdown of serovar prevalence from the reported cases from 2001-2003. *Hardjo* and p*omona* are the most common by a long way, these two serovars are carried by cattle, sheep and pigs. These animals are the most common in New Zealand farming systems, which therefore naturally increases potential exposure for humans.

Hardjo	42.7%
Pomona	33.5%
Ballum	10.7%
Tavrassovi	7.9%
Copenhagani	2.4%
Other	2.8%

All of these incidence statistics point to the fact that leptospirosis is a disease common to people working with animals or freshly slaughtered carcasses. The disease appears to be more widespread through New Zealand, was mainly in the North Island but now the spread amongst the health boards indicates its now nation-wide, stock movement is more freely occurring particularly between the islands. Sheep are becoming a more important host, that previously wasn't existent or wasn't in a form that was causing transmission to humans.

There is a possibility that the disease may have mutated in sheep, causing the increase in transmission.

Leptospirosis remains an occupational disease; livestock, and the most readily infected – farm and meat industry workers.

Evidence points to the fact that sheep are emerging as an important reservoir than previously thought.

Sheep need more research, which is currently being started by PhD students at Massey University.

PREVENTION OPTIONS

Prevention is always better than the cure so the same would apply to leptospirosis. The aim of prevention would be to reduce or eliminate possible exposure to infected animal fluids particularly urine. The best way to prevent leptospirosis is to eliminate the infection from our livestock. How can this be achieved.

1 Vaccination of Livestock

Vaccination is probably the best method currently available, currently about 85% of the national dairy herd is vaccinated, 20% of the beef herd and sheep are generally not vaccinated at all – as sheep haven't until recently been identified as requiring vaccination.

While it sounds simple there are some major problems associated with vaccination, firstly the cost is large and farmers being farmers generally don't readily increase expenditure for a nil return, so unless there are identified production benefits, farmers won't buy in.

The cost of a vaccination programme has been estimated at $10,200,000 for the national sheep flock – this is at a cost of $0.35 per dose administered. This is then multiplied by the national flock of 30,000,000 head.

To vaccinate the beef herd the estimated cost is $2,500,000 at a cost of $0.50 per dose administered by the national herd of 5,000,000 head.

These are both annual costs as all animals would require a booster every 12 months.

Other issues resulting from a vaccination programme would be:

- The vaccine must contain all the correct serovars that need to be protected against.
- The vaccine may have some side effects on animal performance.
- A vaccination programme may not be 100% effective and stock may still shed leptospires if they have previously been infected.
- If a vaccinated programme was to be undertaken it must be maintained in order to avoid an epidemic amongst unvaccinated stock as natural immunity decreases.
- A vaccination programme also needs to cover all species to be totally effective. If a vaccine was available it is likely that it would take in excess of 10 years to achieve 80-90% of stock immunity.

2 Methods to reduce animal transmission

While this may sound like a possible prevention method it would be near impossible to stop animal to animal transmission.

Possible isolation of infected stock, but how do we know which stock are infected, especially if they exhibit next to no clinical symptoms. You would need to test, which will cost, so this won't happen in the real world.

Separation or isolation of different species to prevent transfer between species, in New Zealand's farming systems this would again be near impossible as beef and sheep operations are a major component of our pastoral farming. The practicality of keeping species separate is not possible and we have added production advantages from farming the likes of sheep and cattle or sheep, deer and cattle together.

There are also the likes of rodents and feral animals which contribute to the transmission of the disease, it would be impossible to eliminate these. We have found as a country that eliminating opossums is not easy.

Therefore prevention of transmission between livestock is in the too hard basket at this point in time.

3 Prevention of Transmission from Livestock to Humans

To completely prevent humans contracting leptospirosis the source of leptospires normally urine must either be eliminated from an environment or contained in a manor to prevent any possible contact and hence transmission.

Eliminating urine is again not possible as animals have to produce urine to rid the body of waste materials and hence survive. Prevention of contact is the only possibility that is currently viable and this is only a best attempt.

Any occupation that has potential contact must therefore have access to protective equipment, no protective equipment is ideal or can guarantee to give full protection.

Examples of safety equipment are:

- waterproof clothing
- waterproof footwear i.e. gumboots
- gloves
- aprons
- face masks
- safety glasses or shields

The idea of safety equipment is to seal the body completely from any possible contaminant.

Additional protective equipment should be worn in high risk occupations or positions that increase the risk of exposure.

Further development of new techniques and or technology to minimise possible spread of urine must be continually investigated.

Good personal hygiene of individuals involved in high risk occupations is important. Additional washing of self, covering or sealing of any possible skin blemish i.e. cuts, dermatitis or rashes.

4 Human Vaccination

This may be the way forward for any individuals who are at high risk due to their chosen occupation. If they are immune then the occurrence would disappear, however there are some associated issues with human vaccination.

Vaccination would only be recommended to people in a high-risk situations.

The vaccine would need to be serovar specific, so for New Zealand would need to include antibodies of the 8 known serovars found in New Zealand.

Vaccination can possibly result in unwanted side effects, which will not be desirable and could possibly result in time of work.

Vaccination boosters will be required periodically, probably annually, they have a cost and possible side effects.

Human vaccines are not currently registered for use in New Zealand or Australia and will take further research before they could be.

In real terms this is not an option currently and is probably 5-10 years before it is even possible.

In summary prevention sounds good, put the practicality is that there is still always some risk, as it is almost impossible to provide a sterile environment, there are possibilities for the medium to long term but in the short term taking steps in awareness and protective equipment is the best possible solution.

People in at risk occupations, such as farming and the meat processing industry need to be made aware of the disease, informed about the causes and symptoms and what to do for treatment if it is suspected.

Employers need to take all possible steps to minimise transmission either through improved processes or provision of protective equipment.

Employees need to wear the appropriate equipment and abide by requirements of their employers to do so.

CASE STUDY – LAMB PACKERS FEILDING LIMITED

Background

Lamb Packers is a lamb slaughter facility that slaughters around 750,000 lambs per annum.

The company currently has a staff of 150 and a wage bill of around $4.8 million.

It is a modern plant using latest and innovative techniques, producing good quality product and has a good reputation amongst the industry.

It also has a good historical record in relation to workplace health and safety, with no major accidents resulting in serious harm. However leptospirosis has changed this good record over the last 12 months.

As stated in earlier sections of this report leptospirosis is a serious harm disease and must be notified to the health department.

Lamb Packers has had 5 confirmed cases of leptospirosis in the last twelve months, after having only 2 previous cases in its ten year operating history.

These cases resulted in the staff members having from 2 to 7 weeks off work, which in any industry or job is a long time to be away from the workplace.

Even though this is an occupationally acquired disease, you have to ask why Lamb Packers as the employer should be held responsible for staff picking up this disease, however each case is registered against the employer and hence the company gets placed under investigation and ends up on the national database as having a poor health and safety record.

Annual ACC levies are derived from your accident and or serious harm history and the greater incidence of leptospirosis means that you are regarded as a poor employer – so levies get inflated upwards.

Meat industry ACC levies are averaged across the whole of the industry and the industry received a large increase from 2003 – 2004 due to the industries so called 'poor performance'. Leptospirosis has made a large contribution to this poor performance.

What does a case of leptospirosis cost the company?

Firstly the employee is entitled to accident compensation, so the provision for lost earnings. The employer must pay the first week at 80% of nominal earnings. In the case of a tally butcher this would be $880 – Gross Earnings $1100 – so at 80% - $880.

At the same time you must be able to replace the infected employee, while this doesn't cause a direct extra cost as you still need someone in the job, it does have a marginal cost probable equating to the other 20% of the gross earnings. Effectively this is the other $220 of the nominal earnings.

The employees, ongoing lost earnings for the additional time required off work are covered by ACC, however as an employer you must hold the job open and continue to replace the absent worker.

ACC pay at 80% of average earnings, so $880 a week, the average time off work for five recent cases at Lamb Packers was 4 weeks. $880 multiplied by 4 weeks is $3520. This is paid by ACC but is still a cost.

Direct medical costs, Literature indicates that these may be as high as $1000 per case, especially when around 25% of cases end up with the victim being hospitalized. One of the Lamb Packers employees was hospitalized for three days, so that equates to 20%, therefore the direct medical costs maybe marginally less for Lamb Packers, assume $900 per case.

These costs would include doctor fees, diagnostic test costs, treatments and prescription drugs.

Reporting and Investigation Costs

As leptospirosis is a serious harm disease, the employer is responsible for carrying out an accident investigation and filing a report to Occupational Safety and Health (OSH).

In some cases an OSH inspector may come and carry out an independent investigation.

These requirements have a cost to the employer as time is required by the employees, health and safety representative to carry out and report on each individual case.
For example:

Compliance manager	3 hours at $30
Production manager	1 hour at $30
Employee effected	1.5 hours at $20
TOTAL COST:	$150

ACC reporting for earning level establishment is also required. Completing all forms required for ACC to establish the employee's loss of earnings and liaise with any further information required: Pay role Office, 2 hours at $25 – total cost $50.

Leptospirosis Cost Summary for Lamb Packers per Individual Case

Type Of Cost		Cost
Nominal Earnings Paid for 4 weeks of Work	$	3,520.00
Additional Cost of replacement Staff, 4 weeks	$	880.00
Direct Medical Costs	$	900.00
Reporting and Investigation - OSH	$	150.00
Reporting and Investigation - ACC	$	50.00
Total Direct Costs per Case	**$**	**5,500.00**
Total Direct Annual Cost, 2004, 5 Cases	**$**	**27,500.00**

The summary table illustrates that the direct costs for each individual cost is equal to $5500, this is a best estimate, in real terms it may in fact cost even more than this, particularly if the individual requires time on alternate duties or there are ongoing symptoms. The annual cost to the employer is a large sum of money that would normally aid to the annual bottom line.

Impact on ACC levies:

While this is not an easy task to breakdown into a per leptospirosis case cost, each confirmed case assigned to the meat industry does have an impact on future levies.

Industry levies are averaged across the whole of the meat industry; so all plants and all claims are used as the background information to establish levy rates.

While it would be reasonable to expect an inflationary adjustment each year, of maybe 3% you wouldn't expect to get a rise of 28% from the 2003 calendar year to 2004 without something to base this level of rise on. According to the people who set the rules this level of rise was necessary to cover the lift in expenses the meat industry was costing ACC and leptospirosis is a big part of this, the 5 cases of leptospirosis at Lamb Packers accounted for about 53% of time employees had off work for work-related injuries or illness in the last 12 months. Earlier statistics also indicate the rise in meat industry leptospirosis cases nation wide.

Levies are calculated by using a rate set by ACC as the industry average and this rate is then multiplied by your annual wage bill and divided by $100. So for every $100 of wages you pay to staff in the meat industry, you have to pay $5.13 on to ACC, last year this amount was only $3.99.

On a $4.8 million dollar wage bill, the annual levies are just over $246,000, this was an increase of almost $55,000, from the 2003 annual levies of $191,520, that is a huge amount of money. In real terms we could make the assumption to account 53% of the levies to leptospirosis, that is over $130,000 per year in Lamb Packers situation, or $26101.44 per confirmed case of leptospirosis. If add this to the direct costs, each case is costing over $30,000, this is more than half the annual wages of an employee, it is horrific.

The most difficult thing to swallow about this is the fact that it is a dead cost and as the employer you are totally defenseless against leptospirosis, if infected stock are presented for slaughter there is a risk employees may contract the disease.

REALITY CHECK - INTERVIEWS OF THE UNFORTUNATE WHO HAVE SUFFERED WITH LEPTOSPIROSIS

Ten individuals who have suffered from leptospirosis were identified and contacted, an interview was carried out either over the phone or in person, the answers received generally confirmed the literature, but sometimes the real life view points make the literature look tame as the experiences were quite scary and very severe.

Each question that was asked is summarised:

1 **What was your occupation at the time you suffered from leptospirosis?**
Six of the ten were meat processing workers, 3 were at the time working in the venison plant and 3 had been working in the lamb plant.

There was a deer transport operator, a stock agent, a farmer and a wool processing worker, who carried out home kills on his days off, so the leptospirosis was likely to be linked with the farm kills.

2 **What were your first symptoms?**
The majority indicated that they believed they had the flue, the symptoms included headaches, painful joints, light headedness, blood shot eyes and loss of colour to the point where others were commenting that they looked terrible and asking what's wrong with you? One person said "it was like the flue just worse". Another quoted "I knew straight away it was leptospirosis".

3 **How soon did you seek medical attention and what was the diagnosis?**
A range of answers were received from 1 to 5 days, the most common, response was 2 to 3 days, only one person left seeking medical attention more than 3 days.

50% of the people were diagnosed as having possible leptospirosis at the first doctors visit, this was usually a presumption after they informed their doctor of their occupation and therefore the high risk profile. 40% were told they had the flue and sent away to recover, 1 person had the doctor puzzled and wasn't given any diagnosis.

Nine of the ten were sent for blood tests, as confirmation or exploring the possibilities, five also gave urine tests.

4 **Did you receive any form of treatment at your first consultation, or subsequent visits?**
Six people were given antibiotics immediately and four weren't given any treatment, of these four, three were prescribed antibiotics at subsequent visits, the one remaining person never received any form of treatment, he was informed that the body would naturally fight off the infection.

Three of these ten people ended up in hospital, on a drip and in a very serious condition.

5 Describe the ongoing symptoms and how they effected you.

This was the question provided the most varied answers and some of the things you couldn't really imagine. Continuation of headaches was the most common symptom.

Intense pain all over the body, which meant you just couldn't find a position that would provide any comfort, couldn't sleep because of the pain. Sore head to touch by one person, sore joints was reasonably common. No tolerance to any light, had to wear sunglasses inside to try to dull the headaches.

Urine containing blood was common to 5 people, all of the ones that were hospitalised had this symptom, which would indicate some damage to the kidneys and the level of severity that they were suffering.

Vomiting and continuation of trying to vomit, when he had nothing left inside. Sweats and fevers were common, but of differing levels, one person got the shakes; at one point and he shook continually for over two hours, this was totally out of his control and he started believing that his life was coming to an end.

Three people had hallucinations, but one was worse than any of the others, these went on for days and at one point his family thought he had gone mad and he wanted to kill them. The room was spinning and the walls were always falling over happened to someone else.

Most couldn't eat anything and if they did the brought it back, dehydration was also common as a result of not being able to eat or drink. Weight loss was also common, one guy lost 10 kgs in 3 days. Some were completely bed ridden for in excess of 10 days, some had nightmares.

These symptoms were very dramatic in some cases and have more than likely resulted in some permanent damage to their bodies. One thing that struck was the fact that they all had very vivid memories of the symptoms, these must mean they were so painful and had a lasting emotional impact on their lives, they never want to re-live the experience.

Another comment that was common was the fact that as they recovered, some days they would feel there was nothing wrong and then the next they couldn't do anything again, it kept re-occurring but at a lower intensity.

6 **How long were you off work for?**

This had a big variation in answers, the range was from 2 weeks to 6 months, most were around the 4 to 5 weeks.

The person who was only off for two weeks said he went back to work against the doctors recommendation. However he needed some income for his family, and he admits that he wasn't fit for work and after 3 days back he cut himself and ended up off work for 2 weeks with a cut hand.

The person off for 6 months was hospitalised for 6 days - in a very serious condition at the time he was admitted, he continued to suffer even beyond the 6 months off work.

The majority said work was a real struggle physically for the first couple of weeks back, as they just didn't seem to have the physical energy and mentally they were exhausted.

7 **How long did it take to make a full recovery?**

Most believed about three months, but one person believes he still has side effects 18 months later, a couple believed it was about 12 months, so it all indicates there is no quick full term recovery. Most said that their ability to drink alcohol was also reduced in the months afterwards, one still says he can't drink like he used to, but that may be old age.

8 **What did it cost you financially?**

For most it was difficult to put a value on this, because once they had a confirmed diagnosis ACC will pay out. The difficulty was mainly that ACC wouldn't pay up until the diagnosis was confirmed through a blood test, this sometimes took 6 weeks or longer, so they had no income for this period, which did cause some financial problems for a couple of people.

The transport operator had to employ someone to drive for him and when he couldn't get a relief driver he had to turn work away, so he believes he lost in excess of $5000.

The farmer didn't lose any income, but was just incapable of working physically for about a month. The majority estimated it cost them between $1000 to $3000 dollars, either in lost income, medical expenses or lost opportunities.

9 **What was the worst effect it had on you?**

Four of the people, who were all males, thought they were going to die, which must have some lasting emotional effect. One person said the headaches and one said just the general pain was so intense, he wanted to die. The fevers were like never before for two of the men, and one joker said the inability to drink and party was the worst part.

10 **Do you have any recollection of when you contracted the disease?**

Only two people believed they knew exactly when they got it, one was gutting a lamb and he split a kidney, urine shot straight in his mouth, the other said a bladder burst and went all over his face when skinning a deer.

Others thought it would have been when slaughtering animals, but couldn't recall any event, the stock agent guessed he had been splashed with urine at some time, and the transport operator thought probably when cleaning down the truck, he may have been splashed. They all believe they picked it up from contaminated urine.

11 Have you changed your work habits since?

One said no, but all the others said yes, of these they all indicated that they are more aware of urine and wash if they get contacted with it. One person said he is basically paranoid, he won't even go on the slaughter floor without safety glasses and if any urine gets on me I wash three times before carrying on. "I always wear waterproof gear when cleaning my truck now, including gloves"

One person said he never wants to work in the slaughter floor again, he has since worked in the boning room.

12 Has you work place made any improvements in the fight against leptospirosis?

Yes was the common answer, everyone is more aware of the disease, safety equipment is provided and ensured that it is always worn. We watch out for our work peers and tell each other about it, especially anyone new.

13 Do you have any other comments?

"Don't get it" was the most common answer, "Its so bad" Anyone that suspects they possibly have the disease must get to a doctor and get antibiotics as soon as they can, it will lesson the effects.

Most people wished it could be eradicated and don't wish others to suffer from it. I did get a nice nurse looking after me was one comment, but I couldn't even talk to her.

Summary

The interviews illustrated the facts that the symptoms are far more dramatic and severe than available literature suggests.

Ongoing effects can continue for many months, no one person has the same experience, every case has symptoms unique to it.

CONCLUSIONS AND RECOMMENDATIONS

Leptospirosis is a serious disease with very severe symptoms. It is extremely unpleasant for people. The bacteria is very persistent in the environment.

High risk occupations are meat process workers and farmers – although any occupation that has regular contact with animals has potential risk. Therefore the rural population is more at risk that the urban population.

The incidence of human leptospirosis is on a rapid increase and sheep are being apportioned blame as the source, which is a new concept.

Prevention methods are not ideal, protective equipment is the best solution currently for high risk occupations.

Vaccination of livestock and or humans may be the most viable option for the future, but are currently not economically viable.

Cost of leptospirosis to a high risk employer is becoming financially limiting.

Further research to develop prevention or elimination mechanisms is require, a greater understanding of the role of sheep as a maintenance hose is needed.

Awareness of the disease in at risk occupations needs to be continually pushed at employees.

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