Jamie Nicholls:

Welcome to our 7th webinar in the Australian Biosecurity Series, 'Contagion - foot and mouth disease: is Australia prepared for an outbreak?', hosted by the Department of Agriculture, Water and the Environment. Hello, my name is Jamie Nicholls, and I'll be facilitating today's forum. Thank you for taking time out of your busy schedules to join us here today. I'd like to begin by acknowledging the traditional custodians of the land upon which we are meeting, and pay my respects to elders, past, present and into the future. I extend that respect to Aboriginal and Torres Strait Islander peoples attending today. We have an extraordinary mix of listeners with us today, from all around the country, stretching from Perth, over to New Zealand, over the ditch as they say, up north to Cairns, and down south to Melbourne, so all four points of the compass covered. We've got many regional and rural attendees as well, including places like Lang Lang, Wollongba, Condobolin, g'day Condobolin, also Balhannah, Tooperang and Colac in Victoria.

Jamie Nicholls:

There's also a great cross-section of federal and state government and private sector attendees. In fact, it's one of our largest registrations DAWE have had in this webinar, Biosecurity webinar series. Today, we're going to hear from experts who are at the forefront of response plans, policies, and tools developed to protect Australia from foot and mouth disease. Animal health experts estimate that a multi-state FMD outbreak in Australia could cost the Australian economy up to $50 billion over 10 years, and cripple the sheep, beef and pork industries. We've managed to keep this highly contagious disease out of our country since 1872, largely thanks to the vigilance of Australia's biosecurity systems and the dedicated biosecurity professionals supporting that. But keeping it from our shores involves continual monitoring and updating our approaches, plans and preparedness and importantly, exercising them.

Jamie Nicholls:

Today's exciting webinar looks at the aftermath of the 2001 UK incursion, from someone who was there on the ground during that recovery phase. It also explores the program of work being undertaken by the government animal disease response teams and partner agencies like CSIRO, the Australian Centre for Disease Preparedness, both spearheading new plans and technologies to keep Australia FMD free. To start today's session, we're going to start a short video showing real-life impacts of FMD. Some of the images that you'll see are quite graphic, so I'll just take this opportunity just to advise that some viewers may find them distressing. Nevertheless, they are very important as they show first hand why we are so determined to keep Australia free of FMD.

Jamie Nicholls:

Then we're going to hear from DAWE's, Matt Price. Matt is a Senior Technical Program Officer with DAWE's Meat Export Program. In a former life, Matt worked in the UK as an FMD contingency planner, with the British government's Animal and Plant Health Agency, APHA. He was there on the ground during that 2001 FMD outbreak. He's going to outline how they managed that incursion and talk about what lessons were learned. We'll then hear from Dr. Sally Thomson, Sally's DAWE's Principle Veterinary Officer in the Animal Diseases Preparedness and Response Team. She's going to talk about the ways Australia is prepared for FMD, the plans we have in place and what they look like. We'll then follow with Dr. Wilna Vosloo, the Senior Principal Research Scientist with CSIROs Australia's Centre for Disease Preparedness in Geelong. Wilna will give us insight into the technologies and the tools we have ready to combat FMD. So let's get started with today. We're going to show the introductory video and then we'll come and hear from Matt Price.

Jamie Nicholls:

Matt, that's some pretty confronting images we saw in that video. It must take a great deal of fortitude and sensitivity when dealing with impacted farmers. Can you please kick us off today with your talk about your on-ground experiences back in 2001? Over to you Matt, thank you.

Matt Price:

Thanks Jamie, and good morning everyone, and welcome to today's webinar. And thank you for giving me the opportunity to talk to you about my experiences that I had when I worked in the United Kingdom. So just to clarify, I worked for the Animal and Plant Health Agency from 2008 to 2021, where I was a contingency planner. So I worked on behalf of DEFRA, which represents England, but also the Scottish government and the Welsh government. And we were responsible for ensuring collective preparedness within our agency, our operational partners and stakeholders in responding to an outbreak. So in reality, I was in the UK during the recovery phase of an outbreak, and when we think about recovery, recovery depending on the type and scale of incident, could be from many hours to days, weeks, months, years, or even decades, as we'll see in today's talk. In 1995 to 2008, I was a quarantine officer, or as known today, a biosecurity officer and I worked for AQIS, and in 2001, I was the National AQIS Administrator for our computer system that regulates and deals with imported cargo risk.

Matt Price:

I distinctly remember the day that FMD was declared in the UK, because one of my first tasks when I arrived to work that day was to turn off the electronic profiles that control and deal with risk of imported cargo. Australia's approach there was to basically ban products which were of high risk and for certain products, we even reexported boarded them at the owner's expense before they're allowed to be unpacked. But first of all, I just want to talk a little bit about why does government control disease, and I need to just reinforce that I'm talking about my personal experience in the UK, and I'm representing myself today in this talk, even though I work for DAWE. So these were the five key elements of our contingency planning process in the United Kingdom, so protecting the interests of the wider economy, environment, society is our top priority, followed by human health, the health and welfare of animals, considering the international trade impacts to an outbreak.

Matt Price:

And then also thinking about the impact of disease control operations on biodiversity and particularly, threatened species. The United Kingdom and Europe in the whole, have a whole range of different rare breed species that are a key to ensuring the genetic diversity of those groups of animals. Good example from the UK is the Gloucester old spot pig. So before we talk about the actual response in 2001, I thought I'd just touch on what is foot and mouth disease. So it's a virus, there are seven different strains, it's referred to as a transboundary animal disease, and that's because of its rapid ability to be able to spread, and the disease does not respect borders when we're talking about foot and mouth. Approximately 77% of the global livestock population in Africa, the Middle East and Asia, as well as limited areas of South America, are affected by the disease.

Matt Price:

It's the first disease that the OIE, also known as the World Animal Health Organisation, established an official list of disease-free countries and put in processes for countries to be able to demonstrate they are disease-free. That's done through a whole range of assurance systems and programs to do with your surveillance activities that have to be undertaken by government. The other element I wanted to talk about was the OIE's definition of stamping out. So generally our first response to an emergence of new or an exotic disease in the UK was to apply the stamping out policy. And that's defined as a rapid depopulation of susceptible species, followed by the application of cleansing and disinfection, coupled with the biosecure disposal of the waste. Generally, once we kill the animal, we stop the disease spreading, but sometimes the animal byproducts can contain the virus or the disease we're trying to deal with, and can continue to spread that through other matters, which we'll see in a minute.

Matt Price:

It's also important to remember that there are vaccines available, not all vaccines have the correct efficacy due to the virus diversity. And it's also important to remember that one of the key decisions at government when they're deciding on a control policy is vaccination status. So basically if you vaccinate an animal, it takes you longer to regain country freedom once you've done all the other checks that the OIE require of you. It's important to remember that disease can be spread through direct animal contact, so nose to nose animals in fields. There's also fomite spread, which we talk about the contamination of inanimate objects, so a milk tankers tyres, drovers footwear, someone's gumboots, they can all carry the disease on soil or manure or blood, et cetera. With this disease it's also important to remember that you can have viral plumes.

Matt Price:

So the disease can actually be sucked up in the wind and blow across the field and infect susceptible species underneath them. In 1981, the French had a large outbreak on the northwest coast and the disease blew across the Channel Islands at Guernsey and Jersey, and ended up on the Isle of White. And because of the UK's detection systems, they were quickly able to deal with the disease on the Isle of White before the disease became established. It's also important to remember that the disease can be spread through ingestion. So that's by the animal eating either contaminated pasture or feed, or infected animal products that haven't been adequately treated or cooked. And probably a good example there might be a home cooked salami, which has come from FMD country, potentially the virus can survive some of that cooking process. It's also key to remember that the virus has a high survivability in cold environments and people who haven't been to the UK or Europe, they have long, dark, cold winters, and that brings its own challenges in disease control.

Matt Price:

So Foot and Mouth 2001, it actually started 21 years and 3 days ago, so on the 20th of February, the United Kingdom government declared the disease. It was identified at a pig abattoir in Essex. And our epidemiological tracing, which you can see on the left of my screen. Remember this was done well after the disease outbreak and the response, and this is how the epidemiologists put together the picture of where the disease might have come from and where it might have spread. It's important to remember that the disease was in country for 21 days before detection, and that allowed for silent spread. About 6.5 million animals were culled and disposed of, 4 million of those were for disease control, the other 2 million were for animal welfare issues that were brought about by the significant movement restrictions that had to be applied to stop the disease spreading.

Matt Price:

It's also important here to remember that when the culling operation was undertaken, we didn't take out just the infected premises, we took out dangerous contacts. So those animals that may have had nose to nose contact over a fence, or if we'd identified a milk truck had been on a dairy and had driven 10 kilometres down the road to a new farm. Those animals were also removed. The government also applied a contiguous culling policy, so every other susceptible animal in a 3 kilometre zone around your farm, was culled and destroyed. It cost the government 3 billion pounds, the compensation was 1.2 billion, and it's estimated to have cost the UK economy between 6 to 9 billion. It delayed a general election, there was a significant effect on the tourism sector and anecdotal evidence shows that stage shows on the West End shutdown, based on the fact that people saw all of these animals being killed, they saw the fires and the open pits burning animals, and that turned the tourism sector away.

Matt Price:

It also affected the footpaths and the right of way. So in the UK, you've got this ability to basically traverse any land, as long as you do it respectfully, and all that was shut. So that had a significant impact on local rural economies. It's also important to remember that such a rapid response can also lead to fraudulent activities. During the outbreak there were significant pinch points, culling being one of them, and then the disposal of the carcasses, and this led to a whole range of different challenges. For instance, how do you dispose of animals. And so at this point, there were a variety of methods. Rendering, which is the high pressure massification of the product, and you end up with blood and bone meal. There was also on farm burning, there was also on farm burial, and there were also mass burial pits containing up to 30,000 animals. Some of these pits are still being monitored today.

Matt Price:

There's also a significant human cost to the animal owners, the keepers, our own staff, and the contractors who delivered the culling activities and the general public. That's just a quick image of some of the different scenes which would've been putting those tourists off. So after the outbreak, there was a national inquiry headed up by a gentleman called professor Ian Anderson. And if you wanted to Google it, it's a really good document to understand the impacts of the disease and how it spread across the UK in those early days, and also what key lessons were identified. Basically, swill feeding was the main cause for this disease, so swill feeding is the use of restaurant food scraps, et cetera, which were being fed to animals. There were controls in place, but in this instance, the controls did not work, and somehow infected material arrived into the country and was introduced into a pig farm, and that's where the disease spread.

Matt Price:

The EU quickly learned from this, and they also introduced a new FMD directive, which came in in 2003. And that required that all member states have a contingency plan and that their plans are exercised at least twice in every 5-year period, and one of those exercises needs to be focused on foot and mouth disease. There was also a requirement to consider emergency vaccination as a control method, and we also were able to influence the ADR regulations, or international carriage dangerous goods, where we introduced sections there about how to safely deal with the bulk transport of infected material. Underpinning all of our planning and responses, we have models. So in 2005, the Exodus model was created, it's a numerical model that allows us to change different drivers, to understand how our policies may or may not affect our real-time response.

Matt Price:

It can also be used during a response to help us understand whether the techniques and approaches we're using are correct. The models also are used to drive our scenarios that we look to exercise on. So why do we exercise? It helps raise awareness of the various issues that we need to consider in a real response by stakeholders and operational partners. They can vary in scale from small team based events, to national exercise, and there's a whole variety of different ways you can do that. You have tabletop exercise, live play national exercises, and in the United Kingdom, we used a combination of all of those to exercise our operational partners and stakeholders. It's important to remember that you need to review your response and identify areas for improvement. It also allows you to showcase and share your best practice with your industry and other stakeholders, so they can go off and think of their own contingency plans.

Matt Price:

I should say that contingency planning is not just one person's responsibility, it's a collective effort of all involved. So one thing I'm key on talking about when we talk about lessons learned, they're not learned until they are implemented. Now, to understand what lessons you've identified, you have a series of debriefs of your teams, we used an approach called a hot wash up, where we captured initial ideas and issues that were talked about. Then we moved to something called the warm wash, where we reviewed in a more open environment. And then we went to a cold wash, which was the detailed analysis of what we did. We would produce our lessons identified reports and publish them online. We do that as well for real time responses. And that helps give not just stakeholders internally in the country, but other trading partners, the assurance that we've done the right thing in our response, and potentially sometimes they may be able to take best practice from us.

Matt Price:

So in concluding, I think the main things to consider are understanding how the changes in the various industries may affect disease transmission, or how you might mount an effective response, how technology might change, how animals are produced, how the cycle of movement between production facilities might work. I mentioned just before there, it's a collective approach, so all players need to be part of the plan, they need to be engaged, and they need to understand what the endpoint and the goal of the response is going to get to. Every outbreak is going to present its own challenges. Now, even if you don't consider these challenges in an exercise... Sorry, sorry, let me say that again. If you consider some of your challenges in an exercise, when they happen in a real life event you may be better prepared to be able to respond. And my last point there is that prevention is far better than a cure, and that's where I think our biosecurity net, at our international ports of arrival, do a great job in trying to prevent the disease arriving in Australia.

Matt Price:

Thank you for your time, I look forward to answering any questions at the end of the session. Thanks, Jamie.

Jamie Nicholls:

Thank you so much, mate. It's wonderful to have that on the ground approach, you spoke about the collective approach to response as well. And I can understand why you distinctly remember that first day on the job when it happened. So thank you for sharing that. Now we're going to call up Sally Thomson. Now Sally, colonial authorities managed to contain our one and only known FMD incursion back in 1872, 150 years ago, but how are we placed now to deal with an outbreak in 2022? Thank you Sally. I'll hand over to you, and we look forward to hearing your presentation.

Dr Sally Thomson:

Great. Thanks for that, Jamie, and thanks Matt for that great overview. And as you've all heard, the effect of an incursion of foot and mouth disease would be severe in any country, but in Australia, we are a major exporter of livestock and livestock products, and we export about two thirds of agricultural produce and 80% of its livestock produce, exporting meat and meat products to more than 120 countries. So all that would be affected if we got an FMD outbreak. So just some of the dollar values, in 2019/20, the gross value of livestock production was $32.9 billion, and our export earnings for livestock and livestock products was $26.9 billion.

Dr Sally Thomson:

And all those exports would stop for an extended period if we got foot in mouth disease. And the domestic market will be flooded with products that we couldn't sell, leading to significant drop in value of all the meat and meat products, which would have a significant effect on the industries. And there'd also be social impacts, including stress due to loss of income, as well as due to exposure of mass slaughter of animals, like some of the pictures we saw in Matt's presentation. And there are various other stakeholders involved in the agricultural supply chain that would be affected, such as the abattoirs, stock transporters, sale yards and milk producers. And there would also be a large effect on tourism, other rural businesses and communities.

Dr Sally Thomson:

So I'm just going to give you some information on how we prepare and respond for any disease outbreak, but including foot and mouth disease. So disease preparedness and response is a shared responsibility in Australia, where we have the Australian government is responsible for quarantine, international health issues and national coordination. So we'd be involved, like the Department. DAWE would be involved in negotiating disease reporting to our country, notifying them that we have the disease, and trade negotiations, they'd have discussions on our export permits. And I mean, they would all stop at the time, but the Department would be coordinating working within the national policy in response. Whereas, the state and territory governments are responsible for the disease control and eradication within their borders, and this includes biosecurity and quarantine activities. And industry also plays a key role in detection, as well as prevention, with their biosecurity plans that they need to have in place, and also how they are prepared to respond to a disease outbreak, so they need to know what would be required of them.

Dr Sally Thomson:

And they also help by working in disease control centres and providing details on the industry to the government offices. And finally Animal Health Australia is a not-for-profit public company that facilitates partnerships between governments and industry and other stakeholders, such as Wildlife Health Australia, who will be involved in disease response. And they manage the national programs and documents that I'm going to talk about shortly. And just on the top left of this screen, is an eye view of the Mickleham quarantine facility near Melbourne. And this was in the early stages, so it's been developed further since that photo was taken. And that's where all animal and plant products have to come in and are quarantine before they're released. And then the sign on the right is an example of a sign that a lot of industry will have up, asking visitors to contact them before they enter because there's biosecurity plans in place. And then the lower picture is example of a foot bath and person in overalls and mask, preparing to go into a property.

Dr Sally Thomson:

So our disease preparedness and response arrangements, they're covered by two main pillars or programs, where you've got the Emergency Animal Disease Response Agreement or the EADRA, and the Australia's Veterinary Emergency Plan or AUSVET plan, I'll be talking about them in more detail in a minute. And then of course, we've got Animal Health Australia, who I mentioned, and they manage both AUSVET plan and the EADRA, and the information on them can be found on the Animal Health Australia website. So firstly, we've got the EADRA, it's a formal and legally binding agreement, signed by state and territory and Commonwealth governments and livestock industries, and it's managed by Animal Health Australia. So this covers unfortunately 66 diseases, that's a bit of a typo there, and it defines the roles and responsibilities of all parties, including having the capacity to respond to an outbreak, and that will include producers need to have a biosecurity plan in place, including what they would do in the event of an outbreak.

Dr Sally Thomson:

And one of the main parts of the EADRA is this funding and cost sharing arrangement, where it provides details to industry on what they would get if they had to cull a whole lot of animals if they're involved in a disease outbreak. And they have the certainty that they will receive some level of compensation and funding for that, because part of the EADRA requires early reporting, within 24 hours of suspecting a emergency animal disease, you're required to report it. And that will then support our early detection of the disease, which then makes the response and eradication of the disease much easier and quicker if we detect the disease early. And if the livestock owner fails to report a suspect disease, then they may well not receive funding or compensation. So it gives them the incentive for early reporting. And there's guidance documents that have been developed to help with interpretation of this legal document, such as documents on compensation and cost sharing, livestock welfare management, and compensation. As Matt mentioned in the UK, a lot of animals were culled on welfare grounds because they couldn't be moved, so that may be covered under compensation.

Dr Sally Thomson:

And then there's also a guide to developing an emergency animal disease response plan, which the affected jurisdiction or jurisdictions have to do. So compensation is provided under jurisdictional legislation, whereas the cost sharing of the response costs, which will include any compensation paid as a result of the disease response that is covered under the EADRA. And so the other main pillar is the AUSVET plan, and this is a series of technical response plans, which have been agreed to in advance by industry and governments on how we will respond to an emergency animal disease. And there's one developed for all the different diseases that are covered under the EADRA. So it's science based policy, provides a response structure at the time. It may be altered if agreement is reached between all jurisdictions and parties involved, but it provides a basis to start and to get in early and start with responding to the disease outbreak.

Dr Sally Thomson:

And it includes, as it says there, stamping out, movement controls and disinfection and disposal. And the foot and mouth disease response strategy is currently being updated, and that's important because things change quite a lot in lots of different diseases, but particularly with foot and mouth disease and what strains are circulating at different times. So how might it be introduced into Australia? I mean the main risk is through illegally imported animal products, which then get fed as swill to pigs, as Matt mentioned, this is feeding products to pigs and like in the UK, it's illegal here, but it may still happen. And primarily risk is airline passengers bringing in salamis, ham sandwiches, food from their home country that they want to have access to. And then if it goes off and they toss it out into, well, if they've got pigs, or it might end up in a landfill which could then be accessed by feral pigs. And then there's various refrigerated cargo products, products that come in large amounts. And also lesser degree, they got semen or bovine serum, which can be used in products in the lab.

Dr Sally Thomson:

And the lower risk is imported animals and legally imported animal products, because they've all been assessed and we import very few live animals. But yeah, as shown on that picture down the left, if disease came into one of these large properties up in the north of Australia, we may not detect it for quite a while because mustering is intermittent and the farmers don't go out to see the animals very soon, so that's why prevention is best. So this involves prevention and preparedness, involves three levels of pre-border, border and post-border. So the pre-border activities, like Matt mentioned the OIE. We work with them to develop international standards and codes to facilitate safe trade. We do in-country assessments, determine the risk of the country, we have import requirements and restrictions on products that come in, we can't import meat products from FMD infected countries. And this is all monitored at the border where the quarantine measures, you've got the 3D x-ray machine that's shown there. And all the certificates are assessed and ensure that products are being treated appropriately. And then of course, we've got the detective dogs at the border helping with that.

Dr Sally Thomson:

And post-border includes our planning, like AUSVET plan, diagnostic capability at the Australian Centre for Disease Preparedness, where Wilna works. And there's also biosecurity measures for producers and training of staff at abattoirs, to enable early identification of disease, is just some of the examples. So as Matt mentions, exercise are very important, as in preparing for outbreaks. And some of their exercises we've done, we did a large one, exercise Odysseus, which was focused on national livestock standstill, which will be called in the event of a FMD outbreak, and how we would manage that. Each jurisdiction did their own exercise. The Commonwealth did an exercise, and it was determining what would happen if a truck's containing a whole lot of cows, in the middle of being transported and we get an outbreak, what would we do?

Dr Sally Thomson:

They'd have to be stopped or go to their destination or put in some sale yards. And then other exercise we did was Dragonglass, which was assessing import of FMD vaccine and its distribution out to Queensland, areas in Queensland. And there's other exercises like the wool industry exercise and jurisdictional exercises that happen on a regular basis, to be better prepared for any disease outbreak. So I'll just quickly run in here, so we do have a FMD vaccine bank where we have a lot of different strains ready to ... they're basically half made, half up to, half a level. So if we need one, then we can get it a lot more quickly than if we don't have that.

Dr Sally Thomson:

Then we have the IAHER, which is where we can call on other countries to help us respond to a very large outbreak. And those countries, the UK, Canada, New Zealand, Ireland, and the United States. We do some training with the European Commission for Foot and Mouth Disease, who have helped train a lot of vets and industry people in identification of foot and mouth disease. And also more recently, we're developing some virtual reality training, which particularly if we can't travel, where it's working with people, identifying and detecting the disease in the early stages. So I'll just leave it at that now, because my time's about up, but thanks for listening and I look forward to any questions.

Jamie Nicholls:

Great. Thank you so much, Sally. That was just brilliant as well. Really liked how you showed us it's a shared responsibility, about how different response plans come together if we were to have an outbreak. You also spoke about things continually change, really important note that Matt reflected on too, and talked about or ended with the exercises in preparedness. So thank you, Sally. Thank you so much for that. Again, questions please in the Q&A box at the bottom of your menu, your Zoom screen, and just include that person's name there as well. And we have quite a few coming through already, so thank you for those. So next up, we've got Wilna Vosloo. And Wilna, are we prepared technology wise to fight a battle against FMD? Please tell us about what tools and innovations we've developed and how they might work in the field. So thank you Wilna, in Geelong.

Dr Wilna Vosloo:

Thanks Jamie. And as Matt and Sally have said, when we look at foot and mouth disease control, it's indeed a team effort and everyone needs to work together, and that includes the laboratory. And quite often we are the people responsible for developing the new tools and innovations, but they need to be applied by other people. So I just want to quickly show you something that I think we're all very familiar now with the COVID outbreaks, and that is a epidemiological curve. But the information that you see in this graph is actually based on the real life outbreaks in the UK in '67 and also 2001. And what it indicates is, once you recognise the disease, you immediately start with your control actions. But of course, the disease had spread before you recognised it. Therefore, you see an increase in the number of cases and outbreaks and then your control measures start taking effect and the numbers start going down.

Dr Wilna Vosloo:

But in a large scale outbreak, what quite often happens is that you have this long tail of the outbreak. And with foot and mouth disease, the disease-free status we have with the World Organisation for Animal Health, we cannot apply for disease-free status until we've actually had the last case and then done some post outbreak surveillance. So the longer we have to wait for that last case, the longer it takes before we can actually apply for disease-free status. So anything that we can do to ensure that the disease is recognised quicker and we can immediately take action, would most likely lead to a very small outbreak, like the little blip that we see here, which then means that we can start applying for disease risk status much faster, and it will have such a huge impact. I mean, we've heard about the $50 billion over 10 year period. So of course, if we can start applying for our status and regaining our status, it will save us billions of dollars per month.

Dr Wilna Vosloo:

So I'm quickly just going to run you through a little bit of the tools that we have to assist us with disease surveillance, diagnostics, and control. And being an excitable laboratory person, you'll have to be with me, it's going to be a tour de force. So first of all, what can we do to prepare ourselves for an outbreak? And this is where modelling becomes really very useful, and Matt has also to spoken about how models can play a role. But for example, one of the projects that we've had under the foot of mouth disease ready project, was looking at how we can improve our post outbreak surveillance. So traditionally, most outbreak surveillance is done by serological tests, which means you have to go and bleed all these animals, which is an invasive technique, and it can take time.

Dr Wilna Vosloo:

And under certain circumstances, for example, if we do use vaccines and we don't remove all the vaccinated animals, we need to bleed every single animal except pigs. So it's a huge job. So what we've done was to model some outbreaks, where we were looking at alternative tests. So instead of doing serological tests, what would happen if we actually look for the virus in certain material, a serological test tells you the animal had been infected, but if you find the virus you know that there is actually active infection there, so it gives you much better information about your current status. So we looked at if we test bulk milk samples on dairy farms, for example, or if we collect saliva on pig farms using ropes, or if we take swab samples from animals, which again is not as invasive as having to bleed the animals.

Dr Wilna Vosloo:

And what we found when we modelled these approaches is that when we do the alternative ways, we could actually perform our surveillance much more quickly and less expensively than the traditional approaches. And also that using these new approaches would increase the sensitivity and specificity of our post outbreak surveillance. Now, we must always remember that modelling does have its caveats, and we would like to do a little bit more of this work and would be good if we can test this in a real outbreak situation, which hopefully will never happen for us. And this work has been published in the reference that you see there on the screen. Now, I just briefly want to look at diagnostics. Now quite often, when we think about diagnostics, we think about novel technologies, et cetera, which I will talk about, I promise. But I also just want to show you something that we've done in the foot and mouth disease ready project, where we wanted to make sure that if samples are collected in the field and they are taken to laboratories, these samples will not present a risk of infection.

Dr Wilna Vosloo:

So we've worked with colleagues at the Friedrich Loeffler Institute to do some live virus work, where we've looked at various commercially available buffers that claim that they can inactivate foot and mouth disease. Now, most of these buffers work very well when you take swab samples, but what happens if you collect epithelium where the tongue has sloughed and the virus is actually protected inside the cells. And we found that most of the commercial available buffers take a very long time before it fully inactivates the virus. Yet we found one buffer, which is a citrate phosphate buffer with a low pH, that works very well and inactivates the epithelium or the virus in the epithelium samples in less than 2 hours. Which is exactly what we want, because that means by the time that the sample leaves the farm, we know that all the viruses is inactivated, but we need to be able to still diagnose the disease.

Dr Wilna Vosloo:

So we've been able to extract the viral genomic material from the epithelium and could do PCRs to indicate that the virus genome is there. And we were also able to take that RNA, and with some laboratory magic, we were able to recover the live virus from the samples. And that is really important because once we have an outbreak, of course we need to know more about the virus, we need to know how infectious it is, how quickly it will spread, what is the clinical symptoms that we see with this virus. And also importantly, be able to do vaccine matching to ensure that the vaccine that we order from our bank will be able to protect against the disease. So definitely not high flying science, but certainly something that has a practical implication by ensuring our laboratories will not become infected premises. Now we've heard a lot about Point of Care testing with the COVID outbreak and they are also Point of Care assays available, very similar to what we see with COVID, for foot and mouth disease, to detect the virus and to also detect the antibodies.

Dr Wilna Vosloo:

But similar to what we've seen with COVID, these tests have a lowest sensitivity and specificity, so they're not always the best methodology to use in terms of detecting the virus, especially in the initial phases. There are other Point of Care tests available that will detect the genomic material, and that could be done on the farm. But for those types of tests, like the PCR or the LAMP, you do need specialised equipment and trained staff. So everyone is now working towards the application of novel Point of Care devices, and especially if we can develop tests where you don't need to amplify, or to manage the sample and to amplify the genomic material to first see it. So what we are talking about is single molecule detection, where you can just add the sample and detect the material that you're looking for. Now, of course, we also realise that there are policy and regulatory issues that surround the use of these assays, and that is certainly something that we need to investigate in future as well, because I'm a strong believer that these assays will be the future of diagnostics.

Dr Wilna Vosloo:

Now, I quickly also want to run you through some of the tools that we have to assist us during the outbreaks, and I am only going to focus on vaccines. Now, Sally has mentioned that we do have a vaccine bank and this vaccine is actually an inactivated or killed virus, and it's a good vaccine, but it has certain limitations. One of the most being that you have to grow the actual material in high containment, which is something that we can't do in Australia, and it adds to the cost when you have to work in a high containment facility to grow the virus. There's very exciting risk search going on to actually try and engineer the cell lines that are currently being used to grow these vaccines, which will assist with the current vaccines that we're using.

Dr Wilna Vosloo:

There's also been groups working on live attenuated vaccines, so this is where the virus is made weaker, so that it still infects the animals, but the virus doesn't cause any disease. Now for a country like us, those vaccines will be grown in high containment as well, which adds to the cost. But the advantage is that should the vaccine strain escape such a facility, it's not going to cause an outbreak. But of course, there are lots of issues surrounding that in terms of not wanting an outbreak anyway. There's some really exciting developments in terms of recombinant vaccines and very similar again, to the AstraZeneca vaccine, there is an adenovirus foot and mouth disease vaccine that has conditional licence in the USA for use. And there's also the possibility of growing virus that is actually not a virus. So you can use a bacteria or a yeast, to make the virus for you. And this is absolutely non-infectious because it only contains the capset of the virus, but not the RNA that will cause it to replicate.

Dr Wilna Vosloo:

We're all very excited about mRNA vaccines, and this is something that we at CSIRO will certainly work on as well, to see how can we use mRNA vaccines in animal health and against animal diseases. And I also just want to plug that we had a press release yesterday, some of the work that was done by colleagues of mine here where I am, to look at the use of organic metal frameworks to embed virus so that you don't need a cold chain for the vaccine. And then finally, in my tour de force, we've also been looking at novel application roots of these vaccines. The current vaccines all need to be injected using a needle, but this exciting development with intradermal vaccination and also intranasal. And we have looked at some of the intradermal vaccination in peaks under the foot mouth disease 3D project.

Dr Wilna Vosloo:

So I know that this is a lot to take in, and I just want to thank you for your attention. But as you can see, that there's a lot of really exciting novel developments already there, being developed and on the horizon, that will certainly assist us in controlling the disease much better in future. Thank you.

Jamie Nicholls:

Thank you so much, Wilna, a tour de force with excitement. I heard your excitement increase when you spoke about novel FMD vaccine. So thank you so much for sharing that with us, and also for outlining about safe transport principles and also about the Point of Care testing. So thank you Wilna. So now we get to an interactive stage where we go through the Q&A that you've been providing. Let's go to a question first from James Gilkerson and then we'll come back to that other question. So James is asking Sally, in this case, Sally, there's been a long term decline in the number of veterinarians employed in rural practice in Australia and other countries around the world. How will this impact our disease surveillance programs, our capacity to diagnose incursions such as FMD, and our consequent responses? So that's for Sally. Thanks Sally.

Dr Sally Thomson:

Oh, thanks for that. Yes, I mean, that's been known as an ongoing issue and it's been identified by the Australian Veterinary Association and the Department, as an issue. I've noticed recently that number of vets being trained has increased, and one of the changes which may help in as far as getting vets interested in working in government or even in rural areas, is the rotations that the vets undergo in their final year, they spend time either at the Department or state government sites and they learn about government work. And I mean, it's the government vets that will primarily be involved in response and are involved in promoting disease and biosecurity for industry. So hopefully would get more of the vets in their final year, become interested in working in government.

Dr Sally Thomson:

But also, as I mentioned in one of my slides, about the training, which was rather rushed at the end, some of the training we've done with the European Commission for Foot and Mouth Disease, was we did a number of years of in-country training in Nepal, where vets and industry people were trained in identifying the signs of foot and mouth disease. And that training is no longer possible, and we've been developing the virtual reality training to help with that identification. But we're also planning on reconnecting the people that have been trained in that previous rounds of foot and mouth disease training, reconnecting them, providing more updated information, some refresher material on foot and mouth disease and also developing more virtual training for FMD and other diseases like lumpy skin disease, African swine fever. And there's new disease simulation exercise software that's been developed to help in that training. So yeah, we are aware of that issue and trying to work at it and improve the situation.

Jamie Nicholls:

Thank you so much, Sally, for that answer. So the question from John McKenzie for Matt and Matt, you had answered that in the chat already, thank you. But just quickly verbally, you mentioned human health in your presentation. To the best of John's knowledge, there have been in very few human infections with one being in 1968, the Oswestry outbreak, is this still the situation?

Matt Price:

Correct, yes, and sorry, I was a bit rushed in my presentation. I should have clarified, it was the mental health impacts that I was mentioning in particular. So the effect its had on the farmers themselves, who may have seen many generations of breeding wiped out virtually overnight, but also the effect on our staff, and I'm aware of some of my former colleagues suffer PTSD from their exposure. So the other thing is, remember, whenever you hear foot and mouth disease, don't confuse it with the kindergarten variety which children can get, so it's a non zoonotic disease. From our quarantine approach and dealing with our staff who've been on an infected premises, we require them to undergo a 72 hour a quarantine period. And that is in case the virus, the FMD virus is surviving in nasal passages or ear canals, and potentially could escape that if they're exposed to other susceptible animals. So thanks for the clarification.

Jamie Nicholls:

Thank you so much Matt, for answering that. Now we've got a question for Wilna. Wilna, it may be premature to ask this question, but regarding novel vaccine routes, is it envisage that vaccines administered by these routes, whether it'd be intradermal, nasal, et cetera, would need to be done so by private or government veterinarians?

Dr Wilna Vosloo:

I actually think it would be better if Sally answers that, because that is more of a government type of question. If you don't mind, if I ask Sally or Matt to respond to that?

Dr Sally Thomson:

I mean, the requirement would be for either it to be, any vaccination in a disease outbreak has to be either given by a government authorised vet or under the guidance of a government vet. So potentially it could be private vets that would be giving it, but they would be directed and overseen by a government vet or be given instructions on how to do that by a government approved veterinarian.

Jamie Nicholls:

Thank you very much, Sally, and thank you Wilna. But I have got a question for you Wilna. It's about... Australia currently has that FMD vaccine bank you spoke of, could any of the new generation vaccines replace the need for having a bank, and if so, how long would it take before it would be practically, can't say that word, implementable? Thank you. Thanks Wilna.

Dr Wilna Vosloo:

A few tongue twisters there, that's for sure. So definitely the possibilities are there that some of these novel technologies would mean that we can actually produce the vaccines in Australia because it does not involve any live virus. So especially with a virus like particles or mRNA vaccines, you will never have the live virus, therefore it is possible to do it in country. As to the timeline, it will probably take a few more years, there's still some developmental work necessary, which will take some time. But then of course, we also need to engage with the vaccine manufacturers to see if they can actually produce these vaccines. So I wouldn't want to put a specific timeline on it, but it's certainly something that could happen in the future. But it's not going to happen within the next year or two.

Jamie Nicholls:

Thanks Wilna. Now a really quick question for Matt, then we'll have to start closing up. It's from Mark Ship, Matt, and Mark's asking, why were they spraying the ground and carcasses in the video? Just a really quick answer, please.

Matt Price:

Okay. The EU FMD directive requires preliminary cleansing and disinfection to be applied immediately after the animals are culled. And that requires them to be cleansed and disinfected with the preliminary disinfection in the area that they were culled, to deal with any blood, manure, et cetera.

Jamie Nicholls:

Thanks, Matt. Thank you so much. Look, and thank you all for joining us today. On the screen, you'll also see other channels to connect to the work that we're doing and details if you'd like to be added to the invitation list for this webinar series. If you'd like to read more about our speakers' work and learn more about the 2021 Australian biosecurity award winners, you can find their stories on the website awe.gov.au/aba for Australian Biosecurity Awards. Just really like to take this opportunity to just thank the presenters, thank to Matt Price, thanks to Sally Thomson, and thanks to Wilna as well. We really appreciate your time, you're putting together these presentations and squeezing them into this timeframe. It's wonderful to have our attendees on our participants as well, we're pleased we can share this information and we're certainly delighted with your contributions to today's sessions, with questions. With that, I'd just like to thank you again, have a great day, take care of each other, and we look forward to seeing you at our next biosecurity webinar series.