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#382: Going viral: Global food security under threat from crop and livestock diseases

VOICEOVER

This is Up Close, the research talk show from the University of Melbourne, Australia.

ANDI HORVATH

I'm Dr Andi Horvath. Thanks for joining us. Today we bring you up close to our relentless struggle with infectious diseases in our agricultural livestock and food crops. They not only threaten farmers' livelihoods and national economies, but the very security of the global food supply. Food security can be said to exist when all people at all times have physical, social and economic access to sufficient, safe and nutritious food. But we're nowhere near that, yet. We exist in a world where 30 percent of people are starving, while the planet's human population continues to surge. With shrinking global water resources and arable land, increased pollution and changes in climate and our food choices, it's not looking good for food security. Added to the mix are the pests and diseases that impact on our food supply and the human and natural factors driving their infection or transmission. But, according to our guest on this episode, it's not all bad news. Thanks to advances in surveillance, gene technologies and international cooperation, we can better track and address plant and livestock diseases. Yet, the situation remains daunting. So do we stand a chance of keeping on top of what can seem like a game of pestilence, Whack-A-Mole? John Fazakerley has spent three and a half decades, both in the UK and the US, researching and teaching the processes behind viral diseases in livestock and animal to human virus transmission. He's been a leader and advocate in the world of virology to support food security. John Fazakerley is currently Professor of Virology and Dean of the University of Melbourne's Faculty of Veterinary and Agricultural Sciences. Welcome to Up Close, John.

JOHN FAZAKERLEY

Thank you, Andi.

ANDI HORVATH

Let's start with food security. How much food do we need in the short and long term future, with current population growth estimates?

JOHN FAZAKERLEY

Well, as you said Andi, approximately 30 percent of the world are currently starving. We do need to, first of all, sort that out. So we've already got a shortage of food. Then we have to look at the world population growth estimates, which are put out by the United Nations. We've currently got about 7.5 billion people in the world. If we look towards 2050, we'll increase that by about a third of what we currently have. Up towards 10 billion people. That's a lot more people to feed. If we look at the Food and Agriculture Organization's (FAO) estimates for the extra food that we'll need, we'll need to increase our food by about 40 percent by 2030 and 70 percent by 2050. That's not just to do with population growth. That's to do with people's changes in the types of food that they eat.

ANDI HORVATH

Could we ever say the world has ever had real food security?

JOHN FAZAKERLEY

That's an interesting question, isn't it? I mean, back in the 18th century, people like Thomas Malthus had thought about this whole issue. He basically said that as we increase our food - food production - this drives an increase in the population and then we're short of food again. I think that's been going on for centuries. But now we've got to a point where we have pretty much covered the earth with food production and huge amounts of the land surface of the earth are used for farming. A lot of it has even been taken away by urbanisation, and we've been overfishing the oceans. So you are going to get to a point at which the world just finds it difficult to produce more food, and we're in that position. We are producing more food, but it's becoming increasingly difficult.

ANDI HORVATH

John, what are, broadly, the types of threats and therefore challenges for food security?

JOHN FAZAKERLEY

Well there's a number of challenges. I mean, one of them is that to have food, be it trees or be it crops or be it animals, or whatever the food is going to be, you need water and you need quite a lot of water. There is the challenge of providing enough water for growing the food. Then, on top of that, there is the land. You need good land. In many parts of the world there are lots of uses of the land. Urbanisation is taking up good quality farmland in many parts of the world. Then we've got the threats of climate change, potentially - environmental change, and we can roll these together. The environment is changing. The climate is changing. Then we've got changes in food consumption - what people eat - which is putting pressure on certain types of foods. Then we've got the pests and diseases. Huge amounts of the global food production are lost to pests and diseases.

ANDI HORVATH

Can we focus a little bit on the soil? You have actually spoken about agricultural practices also being a threat to environment. So it's agriculture, itself, that could be redesigned. Tell us more.

JOHN FAZAKERLEY

Yes. Agriculture, itself, is a threat to the changing climate. People will have heard a lot about the CO2 load in the world, but also methane and nitrous oxide. These so called greenhouse gases - agriculture is one of the main producers of these. For example, the CO2 production in Australia - about 16 percent of it comes from agriculture. Then the methane production in agriculture, in Australia - about 60 percent of it comes from farming, particularly cattle, for example. Then nitrous oxide - 77 percent of the Australian total is coming from the agricultural industry. Agriculture, in itself, is driving some of the climate change. Then as the climate changes, this changes the areas of the world that are suitable for agriculture. There's a bit of a spiral going on here.

ANDI HORVATH

Are we likely to see a change on the global map of, say, wine growing districts? Are we likely to see wine growing districts be - not France and Italy, but Scandinavia?

JOHN FAZAKERLEY

I don't think it would get quite that dramatic. Having been to Scandinavia on a number of occasions, it can be quite cold there. I'd be surprised if we end up with that being the premier wine producing region in Europe. But if we take Australia, for

example, it's clear that the rainfall patterns have been changing across Australia in recent decades. That might make adjustments to where the wine producing regions are and various other crops, for that matter.

ANDI HORVATH

Tell us more about the challenge, then, of water. The challenge is growing more food with less water.

JOHN FAZAKERLEY

That's right. As we increase the population, the population needs water as well, of course. If we think about that, some of the major river systems in the world are already reaching the oceans with relatively small output into the oceans. A lot of the water is already taken out. Building of dams on river systems is actually a big geopolitical issue, and which countries get the water. The water is needed for the urban populations, it's needed for industry and it's needed for agriculture and many other uses. In some parts of the world - if we take some parts of Asia and Africa, for example, maybe up to 80 or 90 percent of their current water supply is already used in agriculture. If we're talking about increasing agricultural production, there isn't very much additional water to be had to water that agricultural production. Water is definitely a limiting factor in many parts of the world and is becoming more so in other parts of the world as other uses for that water increase.

ANDI HORVATH

John, are there foods that actually require enormous amounts of water compared to, say, other staple food sources, before they even get on our table?

JOHN FAZAKERLEY

Yes, that's right. Water consumption is very different for different kinds of food. For example, let's say for a tomato. You might need 13 litres of water to produce a tomato and then you might need 140 litres for a cup of coffee. But if you wanted to buy a chocolate bar, that could take up to 2,400 litres. Because we're talking, there, about growing big trees. It's the trees that are particularly intensive of the water.

ANDI HORVATH

Oh, no. But I hold up the world's chocolate supply.

JOHN FAZAKERLEY

[Laughs] Yes, okay. Well, think about it next time. 2,400 litres of water for a 100 gram bar of chocolate.

ANDI HORVATH

Would it be fair to say, too, that one of the major threats to food security is infectious diseases to crops and animals?

JOHN FAZAKERLEY

I think that's right. Huge productivity losses occur due to pests and infectious diseases. When I say pests, I'm thinking about flies or locusts. There's many different kinds of pests out there. But, also, certainly infectious diseases.

ANDI HORVATH

I'm Andi Horvath and you're listening to Up Close. In this episode we're talking about food security and infectious diseases with John Fazakerley. John, let's talk more about some case studies in infectious diseases, of crops, livestock and agriculture. Give us a sense of how devastating diseases have been in the past.

JOHN FAZAKERLEY

Okay. Let's take wheat rust. Wheat rust is a fungal disease of wheat and barley, actually. Let's remember, wheat is a major crop in the world and it provides a third of the world's calories. Wheat rust - in the 1950s in North America it destroyed 40 percent of the crop. I mean, that was devastating in the 1950s. What happened since is that, through breeding, they were able to establish cultivars - strains of wheat which were resistant to wheat rust. That's been very successful since the 1950s and has helped ensure the security of our food supplies. But these infectious diseases do change, as well, and new ones are constantly arising, as we can think about with our own human infections. In 1999 in Uganda there was a new strain of rust called Ug99 or Uganda 1999, which is a highly virulent strain. In Africa, most of the wheat strains that had been planted were highly susceptible to this strain of rust. The rust has since spread to Kenya and Ethiopia and Iran and Yemen and through the Middle East and it's been a major problem. If they sent us big agricultural production areas, say, in Australia or in Asia or in America, it will be, potentially, quite devastating.

ANDI HORVATH

Can we ever win the war? Can we eradicate some of these diseases altogether?

JOHN FAZAKERLEY

Diseases can be eradicated. For example, the human disease Smallpox, which was caused by Variola virus, was eradicated by vaccination. The second virus disease to be eradicated from the world was an animal disease. That's rinderpest or cattle plague. By a vaccination campaign, which was carried out throughout the world, by 2013 it was finally declared by the OIE - the World Organisation for Animal Health, to have been eradicated by that vaccination campaign. So yes, you can. But eradicating diseases is terribly difficult because there are certain things that have to happen. You've got to have a good vaccine, you've got to have a good way of delivering it and you need a disease that isn't going to be hopping around between lots of different species. You know what you're going to vaccinate. In the case of Smallpox, it wasn't coming from animals to humans, it was just sustained in the humans. Therefore, by vaccinating all of the humans, we were able to eradicate it. The same was true of cattle plague - rinderpest. It wasn't hopping around between lots of different animals, it was in the cattle. By vaccinating the cattle we were able to eradicate it. It would be much, much more difficult to eradicate something like influenza, which is in many mammalian species. Humans and horses and pigs and avian species - the birds, of course, which is its natural habitat. Also wales, in the sea. How do you eradicate influenza? That would be very difficult.

ANDI HORVATH

Tell us about Avian flu, talking about influenza.

JOHN FAZAKERLEY

Influenza virus - its natural host is water fowl, it is in birds. In birds it's a gastrointestinal infection and it goes through the birds' gastrointestinal tract and it ends up in lakes, where you can actually measure the amount of influenza in the water there. Then it gets into other species. When it gets into other bird species, apart from water fowl, certain strains of it can produce devastating disease. For example, in poultry farms where you've got chickens. Influenza virus can destroy a shed full of birds. When I say a shed full, these days in large, intensive agricultural practices, you could have a farm with something like half a million birds. If influenza got in that, you'd have most of half a million dead birds. Influenza can be a very devastating disease. It also will infect pigs and cause disease. You might remember swine flu. Then, of course, it also infects humans. That's a big problem.

ANDI HORVATH

I imagine the impact is also economic, for some nations.

JOHN FAZAKERLEY

Well if you have a major outbreak of influenza, it can be devastating to the economy. But there's two ways in which it can be devastating. For example, you can have a strain of what we call highly pathogenic avian influenza, which will destroy many, many birds in an economic region. That can be devastating to that region. But you can also have the strain H5N1, which has been in the news in recent years, quite a lot. This strain is very dangerous for humans. Since 2003 there have been about 700 human infections with over 60 percent mortality for those human infections. Therefore, to control this disease, from the point of view of human health, there has been a destruction of birds that have H5N1 in order to make sure that the virus is not transmitted from the birds to the humans. For example, in Vietnam, 44 million birds were destroyed, which is 17 percent of the bird population. It cost about $120 million, which is a major economic impact on a country like Vietnam.

ANDI HORVATH

It certainly is. How is it that some of these diseases have returned with more virulent strains? What's going on there?

JOHN FAZAKERLEY

Many of the viruses that cause problems have a genome which is made of ribonucleic acid (RNA) as opposed to deoxyribonucleic acid (DNA). RNA is a very changeable molecule. What happens with a lot of these viruses, like influenza for example, or foot and mouth disease - something we've not talked about, yet. Or, indeed, viruses like ebola, which is also an RNA virus. These viruses can be very changeable. So you're always getting new strains of virus which are arising. If we take the common cold, which is another RNA virus, there are over 100 serotypes of the common cold. The common cold virus is constantly changing. When I say there are 100 serotypes that means if we've had one, we don't have the antibodies in our system to neutralise the others. There's 100 different types, so if you live for 100 years you could have one common cold, on average, each year. These RNA viruses are constantly changing. This is a huge problem for us, as infectious disease specialists, to try to get on top of all of these very changeable viruses. One thing is that the viruses are constantly evolving. So when we put some pressure on them, for example we have a vaccine of one kind, it might not protect against all of the different strains out there.

ANDI HORVATH

John, everyone's heard of avian flu, but they may not have heard of blue tongue. Tell us about that particular disease.

JOHN FAZAKERLEY

Blue tongue is a disease of cattle and sheep. It's transmitted by midges, so little fly midges you'll be familiar with. This is one of those viruses in which there are many different strains. In fact there are probably 26 different serotypes of blue tongue. Immunity to one doesn't protect you against the others. There are groups of people around the world who are looking at the different strains of blue tongue and how they travel around the world. It's mostly a tropical disease and many people thought that it would never actually come into Northern Europe. But in 2006 it did come into Northern Europe. This was a big problem. It turned up on the German, Dutch border in Northern Europe and spread, from there, around the whole of Northern Europe and it crossed over into the UK, but vaccination brought it under control. Australia, actually, also has some strains of blue tongue in the Northern Territory. These don't happen to cause disease in cattle, which is good. But it is a disease that's spreading. It's spread by midges and the movement of midges around the world is probably moving the disease around the world, as well.

ANDI HORVATH

How much has human factors been a part of the problem of infectious diseases?

JOHN FAZAKERLEY

Humans haven't intentionally, for the most part - well, you can actually go back to the Middle Ages where humans actually did intentionally spread infectious diseases. There are all of those stories of people catapulting carcasses which had infectious diseases in them, over the walls of ancient cities in medieval times. But if we leave that aside, in recent centuries there hasn't been a deliberate attempt to spread infectious diseases. But if I think of something where human intervention has resulted in the spread of infectious diseases, I could probably think of two examples. One would be mad cow disease, which was in the United Kingdom. Here we had a very unusual disease. It seems to be a protein misfolding disease where one form of protein, which is folded incorrectly, causes normally folded proteins to fold incorrectly and that is infectious. Mad cow disease first came to prominence in about 1986, in the UK. There was a big epidemic of it.

What happened, eventually, was that it was found out that the human disease, a variant, Creutzfeldt-Jakob disease, was actually being caused by humans being infected with the BSE (bovine spongiform encephalopathy) agent. Then large intervention programs had to be brought into place. For example, to slaughter a lot of the older cattle in the UK. There was a ban on cattle that were greater than 30

months of age entering the human food chain, which resulted in three million cattle slaughtered, for example. From the point of view of the UK economy, sales of beef products immediately declined about 40 percent and export markets were completely lost of the UK. For example, the EU banned British beef. That became a very big story back in the 1980s and 1990s.

ANDI HORVATH

John, we seem to be in the process of depleting our natural fisheries and we're now increasingly dependent on aquaculture and harvesting of farm bred fish. How have we managed infectious disease problems of, say, salmon stock?

JOHN FAZAKERLEY

Well infectious diseases in fisheries and aquaculture are, actually, an increasing problem. These industries are relatively new and, globally, aquaculture is the fastest growing food and is currently providing about 50 percent of the world's fish. The world of aquaculture produces about 100 million tonnes of live weight and had a huge value, in $US, of about $150 billion. It's a very big industry. There are a number of diseases there, which are threatening that industry. In, for example, salmon, pancreatic necrosis virus is one, and salmonid alphavirus is another. What these fisheries need to do, actually, is to vaccinate. Although there are some vaccines, actually delivering the vaccines is a problem. It's quite difficult to put them into the water, directly. Therefore you have to get the fish and actually inoculate the individual fish. Yes, infectious diseases is a problem for the aquaculture industry and not just fish. Also for producing things like mussels and oysters and shrimp. There's a disease called white spotted shrimp, which is a big threat to the shrimp industry.

ANDI HORVATH

Do we breed particular fish for aquaculture?

JOHN FAZAKERLEY

We do and people have looked at fish that are resistant to diseases. Actually, with fish, that is something you can do. Select the fish which seem to be the most resistant to disease. Interestingly, talking about fish though, it's now possible to genetically modify fish. We have, now, the world's first GM animal, which is a GM fish. A GM salmon, which has now been licensed for human consumption by the Food and Drug Administration in the United States. This is a fish that grows faster than natural fish. The FDA has considered that this fish is safe from the point of view of human consumption and safe for the health of the fish. GM fish that grow faster are a reality. But, going back to your point, you could also make GM fish that are

resistant to infectious diseases. I'm sure that would be a step that a lot of people are working on.

ANDI HORVATH

I'm Andi Horvath and our guest today is virologist, Professor John Fazakerley. We're talking about management of infectious diseases in our food crops and livestock, here on Up Close. John, let's explore management of infectious diseases of our crops and livestock. For animals, prevention in the form of vaccines has played a role. But how much do we still depend on them?

JOHN FAZAKERLEY

Vaccines are a very important way of controlling infectious diseases in animals. If we take, say, poultry. Poultry meat is rapidly becoming one of the most important protein sources for the human diet. Numbers of birds in agricultural production in the world has been just going up in recent decades. So the poultry industry is enormous and one of the biggest threats to the poultry industry is infectious diseases, and there are lots of these. From Marek's disease to infectious bronchitis virus. I won't go into all of the names, but there is a large list of virus and bacterial infections and, actually, parasitic infections of poultry. These need to be controlled and a lot of them are controlled by vaccines. But the vaccines have got to be cheap. Nobody wants to pay a lot for the bird or their eggs and so we need to have cheap vaccines. There is an industry which is out there, working to produce poultry vaccines at the cheapest possible price.

But to go back to something you were asking me earlier, can human factors drive these infectious diseases? There is a disease called Marek's disease, it's a herpes virus of birds. So there was a vaccine that was produced. Birds were vaccinated worldwide with this vaccine, and it helped to prevent Marek's disease. But then the virus evolved. We were talking about virus evolution before. This happens to be a DNA virus, but it did evolve. The virus evolved to become more virulent and not to be controlled by the vaccine. So a new vaccine was produced to deal with the virulent Marek's disease and this dealt with it for a while. But then the virus evolved, again. Then we had very virulent Marek's disease virus and a new vaccine was brought in. There is - or there can be, sometimes, a battle between the vaccine and the viruses. Viruses can evolve to evade the vaccines. A bit like antimicrobial resistance in bacteria.

ANDI HORVATH

John, let's move on to gene technologies. How have these changed our approaches to preventing infectious disease, say in livestock?

JOHN FAZAKERLEY

Gene technologies in livestock. Well, you might remember the headlines of Dolly the sheep, which was produced by the Roslin Institute in Edinburgh. Since Dolly the sheep, we've been able to clone a number of animals and genetically modify them. You can now have genetically modified chickens, genetically modified pigs and a number of other species. Fish I already talked about. Why do people want to genetically modify them? Usually two major factors. One, they want to increase productivity, and I talked about the "Aqua Salmon", the salmon that's been licenced by the Food and Drug Administration in the United States. That grows faster. But the other thing that people want to do is prevent the infectious diseases from destroying the animals and the production. For example, at the Roslin Institute, they have been able to produce chickens that are less able to transmit the influenza virus. They're not resistant to influenza, but they are less able to transmit it and therefore would be more resistant to an outbreak of influenza. But that's just the first step. The next thing would be to have chickens that would be resistant to influenza. But you could imagine producing genetically modified cattle that couldn't get foot and mouth disease.

ANDI HORVATH

Okay. We've mentioned vaccines, gene technologies to keep the infections at bay. But let's talk about other approaches. Tell me about biosecurity.

JOHN FAZAKERLEY

Biosecurity is incredibly important, especially as we are sitting in a country like Australia. Australia doesn't have many pests and diseases, relative to some other parts of the world. Keeping them out - the biosecurity of it - keeping these diseases out of the country is incredibly important. Australia, for example, has a very strong biosecurity at its borders. When I first came in here as a Brit I was asked, did I have any hiking boots. So, yes, I said I did. They said, did they have soil on them? I said, well, of course, kind of thing, because they're hiking boots. Of course, they were washed. But now I understand these biosecurity measures much more. There's lots of things that are being kept out of Australia by the very stringent processes that exist on the borders. Other countries do it as well, of course. An example there is that in Europe there's a lot of concern over bees, also in North America, and the varroa mite, which is a parasitic mite of bees. Australia doesn't have this mite and there's a lot of work that's going on in the biosecurity systems in Australia to keep the varroa mite out of the bee populations.

ANDI HORVATH

I imagine part of the management is surveillance and emergency plans. Tell us more.

JOHN FAZAKERLEY

Yes, it is. Most developed countries will have emergency plans for what they will do if a disease comes in. We were talking about blue tongue a little earlier, Andi. Blue tongue - we never really thought it would come into Northern Europe. Yet, the United Kingdom had made a plan for what they would do if they had blue tongue. It was all there, ready to go. When indeed it did hit the country in 2006, 2007, they were able to implement that plan. Which, basically, was they were able to introduce vaccination much earlier than the European neighbours. The UK eliminated blue tongue within a year, whereas it took quite some years for the other European countries to do it. Australia has a plan, for example, to deal with foot and mouth disease, should foot and mouth?

ANDI HORVATH

Yes, tell us about that.

JOHN FAZAKERLEY

Well, maybe I should just give a little background on foot and mouth and its importance. It's a disease that spreads very easily. Going back to when we were talking about strains, before, there are a number of strains of this. There are vaccines, but you have to vaccinate with the right type of vaccine to eradicate or prevent or at least curtail the strain of foot and mouth that is a problem in your country. Vaccine manufacture is one thing and making sure the world has enough supplies of that vaccine. Because when there's not an outbreak, who's going to pay for its production? Countries do actually have agreements to stockpile vaccine supplies for foot and mouth disease. That's the first thing. Then you will have a plan for what happens when it comes into the country. If I go back to the foot and mouth outbreak in the United Kingdom in 2001, in 2001 we had foot and mouth which started in the north east of the United Kingdom and spread very rapidly, partly because there was a lot of animal movements to markets, partly because veterinarians hadn't seen foot and mouth for many decades. The infection became very widespread before anybody realised it. What happened, then, was the plans that were ready for foot and mouth disease were implemented and that was to cull the animals that were infected with foot and mouth. Massive numbers of animals were killed throughout the United Kingdom and there were also restrictions put on people going onto farms and walking near farms, which meant the closure of footpaths, which hit tourism. Eventually the whole thing was eliminated, but the cost to the nation was about £8 billion. That's a huge cost. If we had foot and mouth that came into Australia, we would be faced with the same sorts of problems - how to deal with it. Well, there's a couple of ways to deal with it. One is to kill animals and

stamp it out, as the vets dealing with these kinds of outbreaks call it, or it's to vaccinate. The problem is that if you vaccinate, those animals test positive for foot and mouth disease. If you have animals that test positive for foot and mouth disease in your country, you can't sell your meat. Your meat exports disappear. If you vaccinate the animals, you probably then have to kill them to get rid of them. Although you might have to kill fewer, because you've reduced the scale of the epidemic. But it's a very complex thing.

ANDI HORVATH

We can't predict these things, can we?

JOHN FAZAKERLEY

It is very difficult to predict them. Because sometimes something comes along that we just don't know anything about. An example was Schmallenberg (virus) in Northern Europe. This was a virus disease that started producing abortions in sheep and cattle in Northern Europe and nobody had ever heard of this virus before. When some work was done to see what was the nearest relative virus, it turned out it had come from, probably, somewhere in Central Africa. Yes, you get surprises. But what we can do to predict them is, for those infectious diseases that we know about, we can do surveillance. The world actually does this reasonably well at the moment, for some diseases. If I take foot and mouth disease, for example, the foot and mouth disease strains that are circulating in the world are currently surveyed through a number of laboratories based around the world and coordinated through the Pirbright Institute, which is in the UK. That's the UK's national infectious diseases laboratory for virus diseases of animals. They are the world reference laboratories coordinating centre for foot and mouth disease and accredited by the OIE - the World Animal Health Organisation and the FAO of the United Nations. Then, if you take influenza, there are influenza reference centres around the world. For example, the influenza reference centre for the Southern Hemisphere is here in Melbourne. Actually being able to survey these diseases around the world is very important and having centres that do that and have the technology to do it.

ANDI HORVATH

John, are insects a major problem for the transmission of diseases and do some of them go with the wind?

JOHN FAZAKERLEY

Well, they do. That's right. We talked a little bit about blue tongue, Andi, and the midges that were spreading blue tongue. In fact, when blue tongue spread from

Europe to the United Kingdom, a lot of modelling was done looking at air plumes and the air currents that were going from Europe to the United Kingdom. It was worked out that the midges that actually caused the first case in the United Kingdom were, actually, blown over from Northern Europe on plumes of air, on a particular day, at a particular time. It could be predicted that if you looked in a particular farm in a particular area of East Anglia in the UK you could actually find blue tongue, and that's exactly where it was. Meteorological assessment of these things is very important. But, also, insects are changing in their distribution in the world and they do carry disease. If we take Japanese encephalitis, which is a disease of humans and also a disease of pigs, it's transmitted by mosquitoes. Zika's in the news at the moment, from the point of view of human health, and that's transmitted by mosquitoes. Yellow fever is transmitted by mosquitoes, dengue is transmitted by mosquitoes, chikungunya is transmitted by mosquitoes, Rift Valley fever (RVF) is one in Africa that's transmitted by mosquitoes. Then we've got West Nile virus. That's a virus that was in the Nile River valley, and hence the name, and suddenly turned up in 1999 in New York state in North America. It was subsequently spread, from there, right the way across North America and infected lots of people and lots of horses. It produced encephalitis in the horses, also in people, and has probably become endemic, now, in North America.

These mosquito transmitted diseases are a big way that viruses and diseases can be spread around the world. An important
point here is that the distribution of these mosquitoes is changing with climate change and also with globalisation. We haven't spoken, Andi, very much about globalisation, but this is another major issue for this whole area of food security. Because as people move more around the world and as goods are transported more around the world, so the infectious diseases go with the people and the goods. Probably a good example is the mosquito Aedes albopictus. It's the Asian tiger mosquito. As the name suggests, started off in Asia and has subsequently become spread around the world. Mostly because the larvae have been transported in lucky bamboo plants or in the transport of used tyres around the world. Used tyres hold a little bit of water and they hold the mosquito larvae in them and they get put on ships and they get taken to landfill sites around the world. They've transported these mosquitoes around the world. These are the mosquitoes that spread diseases like Zika and chikungunya and dengue. The Centre for Disease Control in Europe estimates that, actually, Aedes albopictus, which is currently colonising the northern shores of the Mediterranean will spread up through Northern Europe, not quite as far as your potential Scandinavian vineyards, but into Northern Europe, and with it may go the diseases. This is an important issue, too.

ANDI HORVATH

Scary and fascinating. But yet, there's hope. John, thanks for being our guest on Up Close.

JOHN FAZAKERLEY

Thank you very much.

ANDI HORVATH

We've been speaking about the critical management of infectious diseases of livestock and crops to ensure food supplies for the future, with John Fazakerley, Professor of Virology and Dean of the University of Melbourne's Faculty of Veterinary and Agricultural Sciences. You'll find a full transcript and more info on this and all of our episodes on the Up Close website. Up Close is a production of the University of Melbourne, Australia. This episode was recorded on 20 October, 2016. Producer was Eric van Bemmel. Audio engineering by Gavin Nebauer. I'm Dr Andi Horvath. Cheers.

VOICEOVER

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