Infection control: Organisms of concern and modes of transmission

Podcast transcript

Pam Mosedale: Chair of the RCVS Knowledge Quality Improvement Advisory Board, Lead Practice Standards Scheme Assessor (RCVS) and Bella Moss Clinical Advisor

Dr Tim Nuttall: Royal (Dick) School of Veterinary Studies, University of Edinburgh; RCVS Knowledge Infection Control Advisor and Bella Moss Clinical Advisor

Pam Mosedale

Hi everyone and welcome to this webinar. I hope you're all staying safe out there and coping in this strange world we find ourselves in. And at the moment, infection control is a very topical subject and I think will stay with us as a very topical subject for quite a long time now. So we're happy at RCVS Knowledge to bring you part two of our webinar series on infection control, which is about organisms of concern and modes of transmission.

So who are RCVS Knowledge then? RCVS Knowledge, we're a charity, a separate organisation to RCVS. Our mission is to advance the quality of veterinary care for the benefit of animals, obviously, and for the benefit of the public and society. And we do this by championing the use of evidence based medicine. Also the area that I'm involved in at RCVS Knowledge, is inspiring a culture of quality improvement, continuous quality improvement in practice. And we have lots of lovely free resources available on our website: quality improvement tools courses on things like clinical audit and significant event audit and writing guidelines, if any of you'd like to have a look on there. But at the moment we're doing quite a lot on the subject of infection control.

So we're going to talk, well, Tim is going to talk to you today about infection control, about organisms of concern and modes of transport. We do have webinar one, this series was about infection control for COVID. So those of you interested specifically in that, please have a look at that webinar, t's there on the RCVS Knowledge website. This is the second one about organisms of concern and modes of transport. We will have another one on biosecurity and implementing biosecurity in practice and having practice cleaning protocols and people responsible for infection control and lots of practical tips. We'll talk about auditing infection control, and we'll talk about disinfectants that you can use. So we're going to have a series of five webinars, which I hope you'll find interesting. And this is the link to the infection control and biosecurity during COVID 19 webinar that Tim also did along with Alan Radford from Liverpool, and I chaired that one too. But the one we're going to do today on organisms of concern and modes of transport I think is really, really relevant.

So today's webinar on infection control and biosecurity, it's about organisms of concern and modes of transport. This is really, really important. It's 'know your enemy'; if you don't understand about the organism that you're dealing with, how would you know what's going to be the best mechanisms for controlling infections and for infection control in the practice? So I'm going to hand over to Tim in just a minute. We're very lucky to have Tim Nuttall again to talk to us. Tim is an RCVS recognised Specialist in

Veterinary Dermatology and Head of the Dermatology service at University of Edinburgh. He has a particular interest in antimicrobial stewardship and infection control. He's worked with the Bella Moss Foundation, as have I, he's worked with the Scottish Veterinary Antimicrobial Stewardship Group, us in RCVS Knowledge and others to develop policies and guidelines. Tim, like all of us, is working from home and learning what his two cats get up to all day. So over to you Tim.

Tim Nuttall

Thank you Pam for that very kind introduction and thank you everyone for listening to this webinar. So this is part two in the series of infection control and biosecurity that RCVS Knowledge have organised. The first one covered the immediate alterations to infection control and biosecurity during the COVID 19 pandemic. But the standard need for infection control and biosecurity has not gone away, and so in this webinar and the remaining ones in this series, we'll just go through the standard approaches and advice to allow practices to stay on top of infection control and avoid nosocomial hospital-acquired infections.

In this one, we're going to look at some of the emerging microorganisms of concern either because they're becoming established in veterinary hospitals and can cause serious infections or they're zoonotic and/or they might be challenging to treat. And then we'll go through where these can be acquired from, and then hopefully this information will allow you to think about the risks that you have in your own practice or type of work that you're involved with and the sorts of cases that you see within your practice or farms, rescue centres and so on, that you may be involved with in helping to manage or advise. And then that will help you to make best use of the more specific information on biosecurity, infection control, cleaning products and clinical audit, that is coming up in the remaining webinars in this series. But then also to make best use of the advisory information that's been put on the RCVS Knowledge website for advice. You're welcome to send questions into RCVS Knowledge if you've got any questions about any issues that this webinar raises, and we'll do our best to answer those as quickly as we can.

So, to start off with, we're going to talk a little bit about the potential sources of infection. And the source of infection is anything that allows the organism to come into contact with the susceptible individual. But it's really important to realise that, that doesn't imply that they will always become colonised or infected as a result of that, because that will depend on the infectious ability of the organism and these vary widely in their ability to do that, but also on the immune status; both innate immunities such as physical barriers as well as the adaptive immune status of the potential host.

And the most obvious potential source is the actual natural habitat of the organism. And that could be the environment for some of these, so, for example some of the fungi mycobacteria that we see in soil environments, but it could be an animal that's infected with the disease. So for example, this little kitten here with Calici virus and less commonly it could be a human infected with a disease that is a reverse zoonosis, and that's much less common. But an example might bemycobacterium tuberculosis in an infected household.

And then we also have to consider the roots of indirect exposure to source of infection and that's where the infectious organism can form a reservoir outside of its natural habitat. And these can be on inanimate objects where they act as fomites, such as the door handle here, but we can also see animate reservoirs and again, animals may become asymptomatic mechanically colonised or contaminated with an organism without actually being able to infect them, and then can act as a fomite for that. An example might be contamination with dermatophyte spores from the environment without actual infection. But we may also see asymptomatic carriage where the organism establishes on an animal, is able to reproduce and then is able to spread from there. And an example of that, again, might be an

animal that's become asymptomatically colonised with MRSA, where it's now become established as part of its natural microbiome.

Now when we're talking about infections, really we're talking about transmissible disease. This is the concern about infection control. And this implies that it can move from animal to animal or from animal to person. Again, most of the time we're considering horizontal spread, but in certain instances these can also spread vertically, either in utero or during parturition or through milk, through nursing animals.

Now when we talk about contagion and the contagious disease, what we're implying there is that the disease is capable of spread by direct contact. So it will reproduce within the animal and then in some form of contact or secretion be able to be passed on. But that doesn't mean that it isn't also capable of indirect spread. And an example of this might be this young cat here with, with dermatophytosis with a fairly classic multifocal pattern of alopecia on the back of its head and on its ears there. Now that dermatophytosis is highly contagious to cats, dogs, humans and other species, and that may be through direct transfer, so direct contact with an infected case resulting in dermatophytosis in this other animal here. But this could also be by indirect contact, and that could be through fomites and I've just put down a vet bed there as an example.

Now when we talk about direct contact, we're often thinking about direct physical contact, but we also must understand that this means contact with anything that the animal produces that may contain infectious organism. And so this can be aerosol, some coughing, sneezing urine or any procedures that we're carrying out that result in splashing or aerosols and then any bodily secretions that the animal may produce. And a direct contact implies direct contact with those bodily secretions.

But the other thing to think about is where animals producing something is the potential for that to then contaminate the environment, which results in indirect contact and indirect contact really means that the organism, or at least in one state, is capable of contaminating the environment and surviving under the potentially adverse conditions that it's going to find there. And then this results in transmission through fomite, or it's sometimes also called vehicle carriage. Though I tend to try and avoid that term because it makes people think about cars and vans and so on, which obviously are a fomite, but fomites are much wider than that and hand touch sites and equipment are particularly important here.

And you can see this is just a photo I took with the sun shining down our corridor in the hospital, and you can see the extent of hand touch around the door there. And again we talked about mechanical carriage on animal surfaces. And again, carriage is the most common and important form of spreading organisms round healthcare environments. And this is why hand hygiene is the single biggest thing you can do, the single most effective thing you can do in infection control and that will be covered in other webinars later on.

Now there are a couple of special cases of indirect contact and one is called common source infection. And this is where you wind up with contamination of something that is then going to be used by a wide range of people and or animals. And I've put some examples down there for you. And one big example that's reasonably topical at the moment that's been kind of knocked off the news recently is the tragedy of blood transfusions, where haemophiliacs and other people that required blood transfusions were unwittingly infected with hepatitis virus and HIV through contamination of blood products. But we can also see this particularly with diluted products. And this is a very good example that's reasonably common in dogs. And this is a dog here with a post-bathing pseudomonas furunculosis. And this is commonly associated with pseudomonas contamination of water and shampoo products. And this can occur in veterinary practices and grooming parlours as well as well as at home.

And then the second case is vector borne disease and obviously this is very, very important in the general transmission of disease and certain diseases such as the tick borne diseases, Bartonella and cat scratch fever through fleas, Leishmania through the sandflies and, and possibly other biting organisms.

And there's a whole range of viruses that can be transmitted by mosquitoes. Now these tend to be a little less important when we're talking about control within veterinary practices, although it is worth checking animals for flea and tick carriage when they come into the practice and then taking steps to eliminate that before they joined the main body of the practice. But other situations, if you're involved in large animal work, stables, rescue centres, etc., then some degree of vector control may be advisable.

Now, something that is very, very important and must be considered in disease and infection control are biofilms. And these are extraordinarily common. This is a biofilm that we found in an ear canal. You can see that it has this typically dark brown green to black and very tenacious, sticky, slimy consistency to it. And biofilms are formed by many bacteria. And I'll mention some of the bacteria that are good at forming biofilms later on and they use biofilms to stick to surfaces. And this can be to inanimate surfaces. So you'll see this if you've ever felt the slime around the edge of a food or water bowl or if you've undone your U-bend, looked at your shower head, taps, anything like that, that slime there is a biofilm. We also see biofilms commonly on skin folds into digital skin, plaque on teeth is a biofilm, and then this is a pseudomonas ear infection. You can see the extent of the biofilm that is adherent to the hairs surrounding the ear canal there.

Biofilms allow bacteria to stick to surfaces. They allow them to, they provide a protected site where they can proliferate and exchange plasmids, which may include antimicrobial resistance genes, but they also can undergo physiological changes which can make them less susceptible to some antibiotics and disinfectants. And therefore considering biofilms when you're looking at treatment and hygiene in the environment is very, very important.

Now when we're talking about biosecurity and infection control, we're mainly looking at nosocomial infections, and nosocomial basically means anything that's healthcare associated. And the reality is that most antimicrobial resistant infections and certainly many other infections are associated with veterinary healthcare. And this is because we're not seeing by and large, healthy animals; they are going to be compromised to some extent, and this also has to be considered with rescue centres where you're having a high turnover of animals who may be coming in un-vaccinated debilitated and again more vulnerable to infection.

And this can be through immunosuppression, or any disease or procedure that is going to break the normal innate barrier between, you know, the oral cavity, the skin the gastrointestinal system, the respiratory system or the urinary tract. And then any form of prolonged hospitalisation and particularly intensive care unit hospitalisation, the increased duration of that is correlated to the risk of infection. And this can be due to the use of implants, because implants break barriers, so break the skin barrier or break other barriers, but they're also vulnerable to colonisation and biofilm formation and infection. And then we may see problems with non-ambulatory animals.

And again, vet-visiting animals generally carry more antibiotic resistant organisms. And this is as a consequence of their need for antibiotic therapy. Now, I'm not blaming anybody here because some antibiotic therapy is absolutely necessary, but we have to remember that once we use an antibiotic, we are selecting for resistance and the carriage of resistance. And this is why infection control and biosecurity is so important because of the vulnerability of the animals that we're caring for.

I'm not going to mention a lot about raw food feeding, because in August last year Andrew Wales, Joanna Lawes and Robert Davies wrote a very well-referenced, very well-written and a very measured article about raw food feeding. And if anybody wants to see that in more detail, I strongly advise going and having a read of that. But their conclusion (and this is now backed up by all the major veterinary medical healthcare groups around the world), is to have some caution over raw food feeding because of the potential for colonisation with bacteria that may be of direct health significance to the raw food-fed animal, but also then and possibly more importantly in contact animals that may be unwell and in

contact humans. And these are just some organisms of concern here that either were mentioned in the article and referenced or where there have been product recalls within the last six months. So again, I think it's up to individual practices to decide how they want to manage raw food-fed animals during hospitalisation. But there certainly is the potential for carriage of transmissible and antimicrobial resistant bacteria.

So I'm now going to look at some bacterial infections. And again, this is not an exhaustive list. And what I've tried to do is pull together bacteria where we either know that there is an important infection control risk or where these are becoming organisms of concern. I thought about a number of ways to try and do this to make it a little bit more interesting, a little bit less of a list. So I've done it by gram-positive and gram-negative, and to start off with the gram-positive bacteria.

Most of these are commensals but they can become opportunistic pathogens. And again, this is the reason I went through that nosocomial list, because whilst these organisms are largely completely harmless to a healthy individual, be that an animal or a human and in fact can become part of the normal microbiome, in these at-risk healthcare settings, they could be very important opportunistic pathogens.

And the ones we're kind of most familiar with are the coagulase-positive staphylococci. So these are things like staphylococcus aureus, which is the type species in humans. But also remember that horses, farm animals, rabbits and other species have their own staphylococcus aureus strains, and in dogs and cats differently, we tend to see staphylococcus pseudintermedius.

And then there's one called staphylococcus schleiferi, which is becoming a little bit more prevalent. It's more common in North America, but it's becoming a little bit more commonly recognised in the UK and Europe as well. The MS bit here means Methicillin Susceptible and the MR means Methicillin Resistant. So these are the ones where we have more concern because we have fewer treatment options, but it's important to realise that the more susceptible ones are no less virulent, or have no less infection-causing potential than MRSP, MRSA or MRSS. It's just that they're much easier to treat.

And then a special group are the coagulase-negative staphylococci, and these comprise a very wide range of different organisms such as staphylococcus epidermidis, staphylococcus hominis and staphylococcus sciuri, and a range of others. And these are much less pathogenic, and they may actually have a role in the microbiome in limiting the proliferation of the more pathogenic coagulase-positive staphylococci. But antibiotic resistance among them is very common.

So one study done by Vanessa Schmidt when she was doing her PhD at Liverpool, looked at Labradors that hadn't visited a vet other than for vaccination in over 12 months, so perfectly healthy Labradors, and 44% of them carried a Methicillin-resistant, coagulase-negative staph isolate. So it's very common in vet practice.

The important thing is these are only very rarely associated with infection. And where we see this, it's usually as a contamination of wounds. Streptococci received a little less attention, resistance is less common but it can be very important, It's a rare but very important cause of necrotising fasciitis. So the top, sort of, picture here is a dog with a severe staphylococcal cellulitis following orthopedic surgery on an elbow, and this picture here is the early onset of necrotising streptococcal necrotising fasciitis resulting from an infection associated with an intravenous catheter in an ICU setting. And that's obviously a very, very serious infection.

And then something that's becoming organisms of concern are the enterococci here because they have limited antimicrobial susceptibility. So for example, many fluoroquinolones and cephalosporins just won't work against enterococci and they are normal inhabitants of the gut but, again, are opportunistic pathogens. But through systemic antibiotic exposure, they can quietly acquire lots of antimicrobial

resistance, which means that if you then get a secondary infection with them through a faecal environmental contamination, they can become very, very hard to treat. And they're a very important emerging nosocomial pathogen.

So these, the gram-positive, absolute or facultative anaerobes here are a little less common but again, you can get a lot of gut carriage and environmental contamination with them. Infections with them are generally easy to spot. So this is a clostridial infection here because of the sporulation of the rods there. And in fact, in my own hospital, we saw a case of this quite recently in a dog that was on quite aggressive immunosuppressive treatment for an auto immune haemolytic anaemia, that developed some necrosing foot lesions that we identified a clostridial infection.

C difficile is a hugely important nosocomial pathogen in human medicine. There are reports of C difficile carriage, and isolation from the gut in dogs. The importance of this in veterinary healthcare is unclear at the moment, but one important problem is that both in the gut and in the environment, C difficile can be difficult to eliminate. And I've just included a bacillus anthracis there to emphasize the zoonotic potential of this disease. And the really important thing is both of these are spore forming organisms. And their spores are highly resistant to many disinfectants. And we'll talk about levels of disinfection a bit later on, but just to remember, sores are much more resistant than the vegetative bacteria stage.

Moving onto some of the gram-negative bacteria. And again, most of these are commensals and it's particularly important in a carriage in the gastrointestinal tract where they can get exposed to a lot of antibiotics and therefore acquire resistance both vertically and horizontally in the gut microbiome. And therefore we can see carriers of these organisms, particularly if they're antibiotic resistant, and then we can get environmental contamination or fomite transmission as well.

And again, organisms of concern include ESL and AmpC carriage or production by some of the enterobacteriaceae. And ESBL stands for extended spectrum beta lactamase. And these bacteria acquire additional beta lactamase enzymes that then confer resistance to most of the penicillins and cephalosporins, but they can also co-locate on plasmids with resistance genes conferring resistance to fluoroquinolones and other antibiotics as well.

Now at the moment, most ESBLs are still inhibited by clavulanic acid, so these will be susceptible to amoxyclav, but the big worry is AmpC, because most AmpC producers are resistant to clavulanic acid, and that can leave us very few treatment options to treat some of these infections once they get established. And this was an AmpC-producing e-coli infection that the rods, they're inside this neutrophil, that eventually we had to kind of treat topically, in this O tube infection in a cat because we had no appropriate systemic antibiotics that we could use.

And then salmonella, again, not particularly common in small animal practice, but we do see this certainly in farm animals and in horses a little bit more frequently. I've mentioned about the association with raw food feeding and then whilst most salmonella really have very little, clinical concern in dogs and cats, there is a huge important zoonotic risk there.

Some other gram-negative bacteria. So Proteus, which can be a very invasive organism of concern because we're getting to see multidrug resistance. And then eudomonas, and less commonly a closely related bacteria called burkholderia ceacia can contaminate healthcare environments because they just exist anywhere that's wet. So anywhere where you have standing water, you will find these organisms, and that can include taps and sinks and drains and puddles and ponds, inappropriately diluted cleaning solutions, shampoos, soaps, we had a fault some years back in our bronchoscope automated cleaning system, and that became contaminated with Burkholderia. So you name it they can colonise veterinary healthcare environments very, very easily. Again, they can be very invasive. They can have limited treatment options. And again, these are organisms that are very, very good at forming biofilm.

And this is a dog that I saw with pemphigus foliaceus and it was a little bit itchy and it wound up having a buster collar on over the weekend and the rubbing and the compression of the ear flaps and the wetting associated with the buster collar; by Monday morning that dog also then had a pseudomonas otitis. This is what the biofilm looks like on cytology. You can see the neutrophils here and they're embedded in this sort of veil-like, or net-like, pattern of slimy mucus there.

Campylobacter, again very, very easily transmitted in the faecal-oral route or by contamination of water or foods. And again, not a huge clinical significance for our species, but can cause diarrhoea and is a very important zoonotic risk. And then I've mentioned bordetella here because of the importance of aerosol fomites spread. And again, the potential that this has to be a zoonosis for vulnerable, particularly vulnerable individuals that may be elderly or have a compromised immunity. And it's worth remembering that the intra-nasal vaccine does recommend that dogs should be kept away from vulnerable humans for six weeks after vaccination.

Some others, so Leptospira. It is a very important consideration for infection control, biosecurity and barrier nursing because of its very serious, cotagious and zoonotic risks. And again, this can be through any form of being, coact with wounds or mucus membranes, diectly or indirectly with urine through splashing, bualso, itcan survive up to three months in contaminated water supplies.

And then these three are interesting emerging pathogens. They're becoming very important nosocomial pathogens in human medicine. And one of the concerns here is that they are highly invasive. So once they become established in a patient they can cause a wide variety of very serious infections. And they often display a high level of antimicrobial resistance.

And this is, Seratia here and it has this very distinct red pigmentation and it's thought to actually to be behind some of the Eucharistic miracles. This is bloody bread here that's contaminated. And I, once in our staff fridge, I have to admit, found an abandoned pot of yogurt that when I lifted the lid off, I saw a nice bright red colony of serratia in there. So very important ones to watch for with clinical audit and keep an eye on, if you're beginning to see cases in your practice.

Some other bacteria. So I've, gone through the, it's a bit difficult and there's a whole other lecture in how to handle mycobacteria cases, but generally the mycobacteria tuberculosis cases are highly contagious and this is through direct contact and therefore very great care needs to be taken with those, the avium complex is usually an environmental source but, depending on the case through aerosols or body secretions, that is a contagious potential. So again, great care needs to be taken with those, whereas some of the other rapid-growing mycobacteria are environmental and not normally considered transmissible.

And mycoplasmas again, these are the sort of naked bacteria without a proper cell wall and are therefore largely incapable of surviving outside of the animal. And therefore, transmission tends to be by direct contact. I've put as a zoonosis question mark here in that some individuals, some human individuals, sorry, and human cell lines, have become contaminated with mycoplasmas that are normally considered animal pathogens. So it's just for consideration there.

So I'm going to move on to look at fungal infections, and the big fungal infection when it comes to worries about infection control and biosecurity practices and for rescue centre, cat rescue centres in particular but also farms and stables, is dermatophytosis. And this is because it's highly contagious. Depends a little bit on the type of dermatophytosis that you have. So if it's one of the host adapted species, so it's the species that normally infects that host, it is highly contagious and this is both through direct contact and through fomites. And many of these can be zoonosis as well if it's a non-host adapted species. So for example, trichophyton mentagrophytes infection, which is normally the rodent or a hedgehog ringworm in a dog. It’s less, it's not impossible that it would get passed on, but it is less likely to be transmissible, although another dog, cat, person could get that infection from the same source.

And this is a little pussycat here coming into the practice with extensive dermatophyte lesions. And there's some hyphae that we found. And so with that animal, very great care needs to be taken in terms of barrier nursing, isolation, uniforms and cleaning to ensure that we don't get the spores contaminating the environment because again, they're very, they can be quite resistant and persistent. And again, animals that are having, they're being clipped for surgeries and they're having the integrity of their skin broken and or immunosuppressed or vulnerable to infection with these. Now, most other infections are not considered transmissible.

One example of one that is, would be Sporothix schenckii, and these cases need to be handled with very great care because it's transmissible and zoonotic and very serious. So far that's not been reported in the UK. We've just reported a case in a cat of a sporothrix infection from the pallida complex, but that's a much less pathogenic infection and is not normally considered transmissible.

Again, aspergillus might be another one if, if you're treating it and there is aerosolisation of the fungus, but it's, again, not normally considered transmissible.

Now one that I have to hold up my hands and say I was a bit behind the times here because I still thought E.cuniculi was a protozoa. But I discovered preparing this lecture that it's been reclassified now as an aberrant single-cell parasitic fungus. And this is very common in rabbits. It's a potential zoonosis to people and the main source of infection is environmental spores. And again, these can be very resistant to cleaning and disinfection. So again, anybody who's seeing a lot of rabbits with this condition, rescued rabbits and so on, this needs to be factored into infection control programs. So that brings me onto the protozoal infections.

Now I won't spend a lot of time on these because they do tend to be more rare and sporadic and less important for most practices. But again, petting zoos or rescue centres, farm animal practices need to be much more aware of these certainly because of their zoonotic potential. They're very highly transmissible and contagious. And this is through spores in the environment. And again, these are very resistant and we'll talk about what that means in terms of disinfection a little bit later on. And normally it's from an oral-faecal route either through direct contamination or through indirect contamination of water, fomites, uncooked foods and so on.

Now I'm going to spend a little bit of time on viruses because these tend to be the poor relation when it comes to animal infections. And we tend perhaps not to think about viruses in terms of causing disease as much as human medicine does, apart from a few headline viruses like parvovirus, although the COVID-19 situation may change that a little bit. And what we've got here is a sort of family tree of viruses. And what I'm going to do is kind of just go through those. And again, this is not an exhaustive... I'm not going to go into a huge amount of detail, but just to show you the range of viruses that we see that can potentially cause animal disease or even zoonotic disease.

And so we've got the virus group here and that's what the rotaviruses belong to. So there's a range of rotaviruses and reoviruses that can in particular cause gastrointestinal disease in animals. And then in the calici virus group, we have feline calici virus, rabbit haemorrhagic disease, and this is the group that norovirus also belongs to. And there have been isolated reports of isolating norovirus from dogs, although again, whether or not that's actually causing diseases is unclear. FIV and FeLV are the obvious important retroviruses.

Coronaviruses are obviously hugely in the headlines at the moment but it is worth pointing out that there are very many coronaviruses that cause a wide range of diseases particularly respiratory disease, but also gastrointestinal disease as well in humans and animals, that are not the same as SARS, MERS and COVID-19. So again, if you do get involved in conversations about SARS, MERS and COVID-19 I would echo Alan Radford's comments in the first webinar, which is try and be specific so you're not frightening

people when we talk about feline coronavirus, which is obviously the cause of feline enteric coronavirus and FIP.

Rabies is the classic rhabdovirus. Now again, perhaps not so important for most of us, but again for people working in wildlife rescue centres that may be handling bats it's very important. And then again it is something that was beginning to become a measure of concern with the concerns about illegal importation of animals and puppies, although again, it's kind of been knocked off the headlines at the moment. But this is something that perhaps practices working at the frontline of import people working as LVIs perhaps need to be aware of.

The orthomyxoviruses, these contain a very wide range of different influenza viruses and then infectious salmon anemia.

Paramyxoviruses. This is the group that measles and mumps and so on in humans belong to. This also comprises the range of distemper viruses affecting animals, parrot influenza viruses and Newcastle disease in birds, then parvovirus. And again, we do tend to think about canine parvovirus because it is just so highly contagious and potentially makes them very, very ill and, you know, potentially very, very serious and certainly any vet like myself who spent the early part of a career trying to nurse dogs with parvovirus back to well back to life basically, not just health, you know, I've fairly short shrift with the anti-vaxxer movement if I may be controversial for a moment, but we do see other parvoviruses in cats and other species as well.

Then there's a very wide range of papilloma viruses that can affect humans and animals. And again, a huge number of these have been now identified infecting dogs, horses, cattle and other species. And again, these tend to be very species-specific though.

And then we've got a range of adenoviruses that, again, in most cases cause respiratory signs. But we do see other diseases with those as well.

And then there are a range of different herpes viruses and particularly canine herpes virus is an emerging disease. And then obviously we're much more familiar with feline herpes virus causing respiratory signs predominantly, but also keratitis and conjunctivitis in cats, but it can also cause skin infections as well.

And then right at the end there, we have a very wide range of different pox viruses, Orf being the classic highly zoonotic disease there.

When we thinking about viruses, it's worth thinking about whether they're envelopes or not and the envelope viruses, and I've just picked out the envelope virus families here are the ones that have some form of lipid type envelope. And this is essential for survival and it does make them much more vulnerable so they're less capable of environmental survival, particularly in adverse conditions. So survival tends to last from minutes to hours to a few days depending on how protected the environment is, whether there are organic material, temperature and humidity and so on. And they're generally pretty vulnerable to disinfection and cleaning. And which is why at the moment, if I just pick out the coronavirus here, there is such an emphasis on hand hygiene, hand washing, and hand disinfection to try and break the route of transmission.

Now these ones are called the naked viruses, and I prefer the term 'non-enveloped' because naked at least in my mind, tends to imply vulnerability, whereas in fact the opposite is true. These don't have that liquid envelope. They have a tough protein shell which means that they're much more stable in the environment. They can survive for much longer and they are much less vulnerable to cleaning and disinfection. And this is where we tend to have to use higher levels of disinfection than for the envelope viruses. And they're generally not killed by simple hand sanitisation using the 70% ethanol or 70% isopropyl alcohols, although hand washing, thorough hand cleansing is still very important in control.

So I mentioned there about levels of disinfection. And from top down what's really the highest level is sterilisation. Now that's not really feasible, and unless you're preparing surgical instruments or something like that, and the idea is by using chemicals like ethylene oxide or heat, you are just killing - or radiation - you're killing all of the living organisms, so there's nothing left there until you open that up again.

In terms of both skin surfaces and general practice inanimate surfaces, when we talk about high-level disinfection, we mean that we're taking care of all viruses. Sorry, I meant to say, when we talk about high, intermediate, or medium and low levels of disinfection, this is not to imply the intensity of the cleaning or anything like that. These actually have very specific definitions. So when you see high-level disinfectant, whoever's producing that should be able to demonstrate that their disinfectant has worked to accepted standards to achieve that definition. So when we talk about high, we mean all viruses, envelope to non-envelope, the vegetative bacteria, that these are the living bacteria, fungi and protozoa. Bearing in mind that some, not all, but some spores and cysts are going to be resistant to that because they're designed to survive for long periods in the environment under adverse conditions.

And when we talk about intermediate level, again the bacteria should be taken care of, most viruses, fungi and protozoa. But again, a particular concern here would be some of the more resistant non-envelope viruses. And remember this is not going to include spores and cysts. These will persist despite that level.

And then low-level disinfection really is going to take care of most of the living bacteria and other organisms and envelopes, viruses, but will have very little effect on everything else. And this is the level that you achieve with hand sanitisation or simple sanitisation of surfaces. It's a low level of disinfection.

And then lastly, I'm just going to use this slide to introduce the concept of clinical audit, because this is something that's going to be covered in a later webinar in much more detail. But clinical audit is of crucial importance because it allows you to monitor nosocomial infections within your practice. It allows you to monitor the sorts of organisms that you're beginning to see. It allows you to monitor antimicrobial resistance.

This is a very effective way of giving you an early warning that there is a problem that is much more effective than you...This is passive surveillance. It's generally much more effective than using active surveillance where it's easy to miss organism. You're just keeping a rolling eye on what is happening and then using that to adapt your clinical procedures to take care of that. And I've highlighted the SAVSNET and VetCompass runs something similar, but I've highlighted the SAVSNET one because they also have the mySavsnet AMR system. And that allows you to monitor antimicrobial use and then compare this use within your area or similar type of practice so you can see whether your use is median, higher or lower than it should be. And again, investigate and adapt your procedures and protocols as necessary.

So I'd like to thank you for listening and as I say we're happy to take any questions that you can email into the RCVS Knowledge team and we'll endeavour to answer those as quickly as we can. And then I'd like to highlight part three of this series, which is going to cover infection control and biosecurity in more detail. And again, if you understand the risks, the major risks to your practice, then you can use this information to develop protocols that are going to be more effective in your situation.

Pam Mosedale

Thank you very much, Tim. That was great, that was brilliant. Thank you so much. Some of those pictures, some of those ears you could practically smell them. But anyway, now I feel that, I've learned an awful lot from that. I'm sure everyone else listening has too. Now armed with that information, we can go ahead to plan practice infection control protocols logically. And as Tim said, the next webinar will be about that, about practically implementing infection control in the practice scenario. It will be done

by Liz Branscombe from Davies Referrals, who's got lots of experience of this. So I think it should be really interesting too.

The other thing I'd like to just highlight is our resources. If you look, go on the RCVS Knowledge website and look under QI and infection control, you'll find lots of resources that have been donated by various practices and groups of the way they've done their infection control protocols. So have a look at those and it can be helpful in drawing up your own ones. So thank you again, Tim, thank you very much for that. And we hope that those of you on here will have had a look at webinar one and will go on to look at webinar three and four and five. So thanks everyone, bye.

This podcast is Part 2 in our infection control series. Listen to
Part 1: Infection control and biosecurity during COVID-19

See more RCVS Knowledge QI resources: rcvsknowledge.org/qi/infection-control