**Transcript**

17 June 2025, 10:27am

**Roopika Ravikanna (18724409)** started transcription

**Roopika Ravikanna (18724409)** 0:07  
 So that's stage.  
 Accent is so weird.  
 You can't take.  
 Me to like, ask follow up questions. So same thing it's not.  
 No. Hi, Helen.

**Helen Zulch** 0:59  
 Hi there.  
 Sorry, put my camera on, it's better.

**Roopika Ravikanna (18724409)** 1:05  
 Well, Helen, nice to see you today. Nice to meet you.

**Helen Zulch** 1:08  
 I see this.

**Roopika Ravikanna (18724409)** 1:09  
 Thank you so much for agreeing to answer a few questions that we have actually this activity as you know is part of the CDD Summer school and you know me and rupika and I would like to introduce the others with me.  
 This Andrew and other PhD students from East Anglia, yes, from UEA and Amanda. Would you like to introduce yourself to Helen? Helen. Hi, Helena. Our console fire under board study.  
 I'm Catherine. I'm also a PhD student studying at cambridge.

**Helen Zulch** 1:50  
 Great. Nice to meet you all.

**Roopika Ravikanna (18724409)** 1:53  
 Nice to meet you.  
 So Andrew, yeah, is going to ask you most of the questions and we'll most of the time just be silent observers. We just and thank you once again. We slide your perspectives and opinions on these questions, thinking your answers can be as long as short as you prefer. And yeah, very informal. So it is very informal. And if you know any of our questions seem out of context or you want some background to what we're asking them, please feel free to to.  
 Stop me. And so. Oh well. Oh yes, we're just admitting another one of our team. Two people in our team, I think.  
 OK.

**Helen Zulch** 2:32  
 So yeah, just as a. As a caveat, I had a look at the questions and you know I'm coming at it this from a dog behaviour perspective rather than anything else. I'm I'm not a wide welfare scientist. I'm not an ethicist. So purely coming from dog behaviour, veterinary side of things. So I may not be able to answer all of your questions, but I can give you opinions on what.  
 I think about.  
 Things.

**Roopika Ravikanna (18724409)** 3:05  
 And when you say dog behaviour, would you be able to extend that to general animal behaviours? It may be the sheep as well.

**Helen Zulch** 3:16  
 Yes.  
 But I'm not going to claim that I'm a specialist in reading sheep, and I can.  
 I have trained dogs with sheep before, so I have some knowledge of sheep, but that was many years ago.  
 Having said that, things like the physiological measures go across species, so largely I'm not sure of the levels of validation of some of the measures in sheep.  
 But I can tell you what I know of the measures that 'cause you were talking about, measures of welfare, et cetera. So some of those will go across species.

**Roopika Ravikanna (18724409)** 3:54  
 OK. Well, I'll start with the first question. I'll start with the first question then.  
 So from your perspective, what behavioural signs would indicate additional stress in sheep when interacting with a robot dog?

**Helen Zulch** 4:11  
 Yeah, I think the the question is, is it additional? Because I think you'd only know if it's additional if you were comparing.  
 The sheep with the dog, the sheep with the robot and potentially the sheep with same or different levels of of exposure. So I would potentially if a dog if a sheep is already used to working with dogs, yes it would be additional.  
 If potentially new stresses rather, let's say, new stresses, if it's sheep who've never been worked with a dog or a robot.  
 It would be difficult to say whether one or the other is more stressful until you did the testing, but I think what you'd be looking at usually in welfare we use because there is no gold standard, single welfare measure. We usually use a combination of measures of welfare.  
 So.  
 How distressed are they by exposure? By exposure to?  
 The stimulus.  
 Which would be physiological and behavioural measures and stop me if I'm telling you things you already know.

**Roopika Ravikanna (18724409)** 5:24  
 Please, please continue.

**Helen Zulch** 5:25  
 OK.  
 So behavioural measures.  
 You would be looking at at an ethical gramme of things like stress behaviours and without the problem with sheep is they don't. They can be quite challenging to read from a an external observer.  
 Who doesn't know sheep, and particularly from a distance, so you'd probably be going on the more overt behaviours such as flight.  
 In some sheep threat, so foot stamping charging, but usually sheep would be showing a more likely to show a flight response, but then you'd be looking at the more phys signs of physiological.  
 Arousal. So things like penting increased, increased respiratory rate all the way up to panting where?  
 They haven't been overexerting themselves.  
 Pupil dilation if you can see that.  
 You may get vocalisations, but in again not as a sheep expert, but having worked with sheep less likely to see the vocalisation side of things, so it would be more the flight parameters. But then I think you'd be looking for things like the physiological measures that say we usually use the two together.  
 And I would imagine in sheep you have validated.  
 Less invasive means of measuring. You'd be measuring cortisol, basically, and if you're looking at less invasive then you'd probably from a sheep perspective be looking at saliva. If you can handle them.  
 Probably not going to catch urine sample really easily, so you're probably looking at saliva saliva for the more acute stress response, or faecal cortisol for the.  
 More prolonged stress response. So again being a ruminant, I wouldn't be able to tell you how many days you'd be looking at for that or even if it is validated in sheep. But certainly in dogs, faecal cortisol will give you a representation of stress over a longer period of time, whereas salivary cortisol gives you that measure within usually 20 minutes or so.

**Roopika Ravikanna (18724409)** 7:47  
 It's really helpful. Thank you. Well, I think you've answered that question comprehensively. So I don't think we've got any follow up questions for that one.  
 Do you think that sheep could habituate to a robot herder over time?  
 What factors would affect that?

**Helen Zulch** 8:06  
 I thought that was a really interesting question.  
 And I think.  
 I I don't. I don't. I mean theoretically, yes. If something is not a threat, it's not perceived as as a negative stimulus in any way.  
 Constant exposure will habituate is likely to cause that the the animals to habituate.  
 Would would it happen with sheep? Usually? Habituation. You have the same stimulus presented over time in the same way.  
 So because the robot will be doing different things, moving in different ways, looking at the videos I've seen, you've got capacity to make the robot jump. You've got the capacity to make the robot go down and up as well as move in different directions at different speeds. I think it's probably less likely that you'd get quick habituation. And I also think that.  
 Even mostly the sheep are going to be going to be.  
 Oh no, that's not true. I was going to say move to something that they would like, but they're not. Sometimes they're going to be moved to erase and be handled, which they won't like.  
 Outcomes will be different.  
 I don't know. I think it's possible. I think the less.  
 The less predictable the stimulus is, the less likely they are to habituate. But that comes with again, it's going to be a fine line between something that's going to start or sheep into flight versus something that's just going to keep going to keep them moving.  
 Because if you, if you're trying to move pregnant, use or use with young lambs at foot, you certainly don't want to scare them, so it's going to be how that stimulus is designed to keep them moving but not habituate them to it.  
 We believe that the main reason that sheep move for dogs is because of the eyes. Because of the predatory the the, the predatory stare of a predator as well as of course the natural.  
 Probably ethological response to an in an animal that looks like a predator. So I think if if the sheep, if the robot had something that looked like eyes.  
 Might make a difference, but I think that would be. I think those would be very interesting questions to test in research environment.

**Roopika Ravikanna (18724409)** 10:40  
 Yeah. OK. So we could design something very specific for that.  
 OK. Question #3, do you think that there would be animal behaviour risks in automating tasks like herding?

**Helen Zulch** 10:56  
 I think if you're looking at the welfare of the sheep, probably just the things I've already mentioned, which would be the same for using.  
 A an unschooled young dog.  
 That is behaving inappropriately round a flock and is is not under control and is moving them too fast. So I think if if the sheep if it's introduced to the sheep carefully.  
 And it's and the shepherd who is using that robot knows sheep because that's what you would expect with a shepherd and dog. They read the sheep. They pull the dog back. If they see the sheep are becoming distressed, they even take the dog off. If they're. If the sheep are becoming too distressed. So if you've got a skilled handler.  
 My feeling is, but again, you'd have to look at the the those stress parameters we talked about in the beginning. But my feeling is probably from the sheep's perspective not.  
 I might be overlapping with some of your later questions I think.  
 The questions then come into does this have an implication for sheep dogs?  
 Who are superseded in their use.  
 Now.  
 Probably there's no welfare implication for those dogs if they if they're never being born, they're not being bred because the need isn't there. If those dogs are being replaced on farms.  
 And retired as it were then. I think you do have behavioural welfare concerns because a lot of those dogs probably and I'm generalising, but certainly a proportion of those dogs will probably not adjust well to a pet home.  
 So you're looking at if you're going to take cheap a robot into and replace sheep, dogs that are working, potentially if they're going to go in and replace dogs that haven't yet been born, one would hope those dogs just won't be bred.  
 And if that's the sort of thing you were getting at.

**Roopika Ravikanna (18724409)** 13:15  
 Yeah, yeah, I I think so. I mean, if I had a follow up question for that, it might be around the types of activities that sheep dogs do. I mean, at the moment, you know there are nipping behaviours and things like that for some dogs with sheep, which could not be present, for example, in the robot dog. But that's taking something away.  
 But are there potential behaviours, maybe of a robot dog that could cause the sheep extra harm by the virtue of the fact that they're robots and knock dogs?  
 Yeah, it's a difficult one though, but I yeah.

**Helen Zulch** 13:51  
 Yeah.  
 Oh, I can't think that there would be, as I say, as long as the robot is used.  
 Carefully, I guess the one thing that you could be a temptation.  
 You know, a working sheepdog will only be able to work for a certain period of time.  
 So hopefully that means that the sheepdog.  
 Tyres is removed from the sheep. The sheep then get a break. I guess the temptation might be if you've got a robot that doesn't need a break.  
 Would the temptation be to move the sheep and keep working the sheep because the robot can, whereas a dog couldn't, and that then is to adapt the detriment of the sheep?

**Roopika Ravikanna (18724409)** 14:42  
 Yeah, that, that's that's a very interesting point, yeah.  
 Great.  
 So question four, what what measurable indicators are established that could be extended perhaps when I say extended for a robot to ensure welfare is protected and it's sort of covered in what you've said already I suppose.

**Helen Zulch** 15:09  
 Yeah, I I think it's it's before. Before robots were deployed on any scale.  
 Doing enough research to be relatively certain that sheep and that is sheep, not just not just a couple of single flocks of, you know, the sort that that people do, sheepdog trials with the the young weathers or the the gerlings who.  
 Don't have lambs aren't pregnant, don't have lambs at foot.  
 You don't have Rams, and with them who might be more defensive, so you've you've done enough research to show that having a robot is no more stressful than using a dock.  
 So I think that's really key. Sorry. Can you just repeat your question again?

**Roopika Ravikanna (18724409)** 16:02  
 Yes. What measurable indicators are established and could be extended to ensure welfare is protected. So as I imagine that there are already some welfare indicators.  
 Are there any key metrics that are widely used in the welfare community to maybe you know, ensure that welfare like say something like Qantas dollars? I think you might have covered that in the previous questions. I think it's it's very similar to that when we're looking at measurable indicators, yeah.

**Helen Zulch** 16:34  
 Yeah. I I think those those are the indicators that the indicators of stress or although they would also be other indicators that would be indicators of welfare in the longer term. So things like fertility rates.  
 Ability to wean lands. Number of you know proportion of lambs weaned.  
 Body mass to slaughter, days to attain body mass. So growth rates.  
 Illness records injury records, so those would be on any farming enterprise. Those are the sort of measures are the longer term measures of welfare. So the cortisol, the behaviour is sort of more in the moment, although cortisol can be used longer term of course.  
 As can behavioural observations, but if you're looking to see if you put a robot dog on a farm, you replace the sheepdog with a robot dog. Nothing else changes.  
 Or or you control for everything else the changes, and suddenly you're seeing the animals aren't growing as fast or reproduction is down or illness is up. Those are some of your indicators of longer term stress.

**Roopika Ravikanna (18724409)** 17:55  
 OK. Yep. Thank you. Question 5, How do you perceive replacing trained dogs with robots in terms of animal ethics? And you've touched on one already, but?

**Helen Zulch** 18:07  
 Yeah, I I'm. I'm not sure that it that there is as long as the welfare of the sheep are maintained. And as I said, as as long as but I'm I'm not an ethicist so I can't go down all the the models of ethics et cetera. But from a just from a layperson's perspective, if sheep welfare is maintained, we're not.  
 Replacing dogs who are then being euthanized or.  
 Rehomed to inappropriate homes, so we're not impacting on dog welfare.  
 I'm not sure that there are ethical concerns apart from one which I don't know. If you called it an ethical concern or more moral societal concern is.  
 We know that the farming community.  
 Has.  
 Potentially has high levels of poor mental health.  
 We know that in certain sectors, and I say we know this is what I read, I don't. I haven't read the peer review literature, but I am aware that these things are talked about, mental health challenges being a lonely profession. All of those sort of things.  
 If you are replacing if a large conglomerate decides it's cheaper to run robots on their farm than dogs on their farm.  
 Are you removing from the farmer a companionship that they would have derived from a dog?

**Roopika Ravikanna (18724409)** 19:49  
 OK. That's very interesting. That's that's a very interesting perspective, very interesting thought.  
 Thank you.  
 So question 5. How do you perceive replacing treatment? That's done that one. Sorry. Yeah. Let's go on to question 6:00. Not that one again. What kinds of studies would you want to observe before approving widespread use?  
 For robot dog, that should be.

**Helen Zulch** 20:17  
 Yeah.  
 I think I've probably touched on on most of them. I think it would be looking at.  
 Sheep welfare.  
 From a range of perspectives. So a range of welfare measures, but also.  
 All but, but also looking at all the tasks that that the potentially a robot dog would do.  
 And not only.  
 Would they do them without stressing the sheep? But would they do them efficiently because.  
 If we take the flip side, if the sheep aren't worried by the dog.  
 Sorry by the robot.  
 And but they also don't move as fast for the robots.  
 Would that mean longer periods of of so I I can't really give you a list of studies.  
 But I would want to be convinced that all aspects of sheep welfare and well-being have been considered.  
 With respect to the tasks that the robot dog would be required for, and then I guess looking at the dog side of things.  
 Say that it was determined that there's some jobs that the robot could do and some that the dog could do.  
 In that situation, I'd want to be assured that.  
 If the robot was doing a chunk of work and the dog was doing less work, are those dogs going to be then kept in a kennel?  
 For days on end because they're not required for the job, the robots going to do so. I know I didn't mention that earlier. With respect to ethics and dog welfare, but I think if dogs are going to be replaced and no dogs are going to be disadvantaged by that in a wide scale, that's one thing. If dogs and robots have to coexist on a farm, then can that be done in a way that maintains the welfare of the working dog?

**Roopika Ravikanna (18724409)** 22:31  
 Point. Yeah. Thank you.

**Helen Zulch** 22:32  
 Because it's faced a lot of working sheep, sheep, dogs are kennel. They're not house dogs. They are working dogs. They live in a kennel. They come out, they're with the farmer over the farm. If that is, then cut down, that could impact their welfare.

**Roopika Ravikanna (18724409)** 22:49  
 Yeah, yeah, yeah.  
 OK, #7, what are the problems that exist in animal welfare that you could see robot or robot or technological solutions being applied to? So it's more of about looking at the states of play at the moment that is there an opportunity attention.

**Helen Zulch** 23:09  
 Well, I was thinking about this from from the the robot sheep dog perspective and I actually think.  
 You could use the the robot sheep dog to gather data on that flock that the sheepdog can't do because the sheep dog can't absorb it and and return the data. So you know, filming capacity.  
 If you then you know these days with with algorithms to examine large chunks of data.  
 I can see potentially a sheepdog robot filming a flock of sheep plugging that date, that video footage into a programme and potentially getting a lameness score for the flock on that day.  
 Rather than waiting until the farmer examines each one of those sheep in a, you know, in a race to to check their foot health. So I think that.  
 But if you if you're doing up close work.  
 Guess sheep? Not such a good one to this, although if they've been shown maybe but looking at infrared reading of body temperatures you could do it on the faces.  
 Could you get it again indication of of health by temperature readings remotely from a robot? I don't know what technology exists and what doesn't, but you know, those are the sorts of things that I think.  
 On the farm, a robot's dog could do.

**Roopika Ravikanna (18724409)** 24:47  
 Could do faecal samples, couldn't it?

**Helen Zulch** 24:49  
 It could.

**Roopika Ravikanna (18724409)** 24:50  
 Yeah.

**Helen Zulch** 24:52  
 I think there are a lot of things that that you know, absolutely if we go away from it working, you know and it's downtime, it doesn't need to rest and recuperate.  
 Set it out across the the farm and and collect as you say, random faecal samples and that can be brought back for egg counts.  
 For example.  
 I think if we look wider.  
 Then, then, then the sheepdog side of things.  
 At the moment.  
 Or or being able to automate processes for video footage analysis of behaviour at the moment. Usually I know, I know there are some automated systems but I don't know anything about them, but generally if we do a research study and we're looking at welfare.  
 It takes a researcher hours of going through video footage.  
 To look at behaviours.  
 I you know, having a robot who could sit in a risk, sit in the top of a rescue kennel and be.  
 Or in a corridor, and so that you can move it around and you can observe different things at different times. And it's absorbing that visual information.  
 And using algorithms to pick up behaviours of interest. I don't know if those are the sort of things you're thinking of.

**Roopika Ravikanna (18724409)** 26:29  
 Yeah, yeah, yeah. I think we also, you know, from a talk with Lewis Manning, like, she gave us a talk. She mentioned, you know, monitoring dogs and guardian dogs being used in shepherding community. So it struck us that, you know, maybe that is another area where.  
 We could potentially see technology being applied to so sheet monitoring and just like informing in case of a predator that would all. I think you know some people who specialise in computer vision. They might just bring about a system that goes through a live feed and.

**Helen Zulch** 26:57  
 Yeah.

**Roopika Ravikanna (18724409)** 27:02  
 Notices of Fox or something like that. Yeah. Like, exactly like you said. So we. Yeah, that's very much doable.

**Helen Zulch** 27:08  
 Yeah. And I think if you if you're looking at guarding sheep guards rather than sheep herding.  
 That's a very interesting area because.  
 There are.  
 Huge challenges with deploying dogs with with flocks, some of those.  
 But they, but they would also be huge challenges with deploying.  
 An electronic gadget that needs upkeep and and charging and all of that sort of thing.  
 But yes, I think definitely and that would overlap with the conservation community too, because.  
 Although we typically tend to think of flock guardians as protecting the flocks.  
 A by product of that in certain countries is conservation because.  
 For example, there's a cheetah conservation project in Namibia who places guardian dogs with flocks because they can scare off cheetah. So the cheetah, the cheetah, are not haunted.  
 Because they're not no longer praying on flocks. So I think there's a lot of overlap with those sort of things with with the conservation community too.

**Roopika Ravikanna (18724409)** 28:35  
 Interesting. Yeah, I think we've come to almost the end. The final question, the final question and it's one that you don't actually need to give us an answer straight away. I mean it could be something that maybe if you think of something you might send us a little bit of guidance on what principles should guide ethical robot animal integration design. So we're looking at you know how how a future, a future iteration.  
 That's probably practised in the welfare community follow, like if anything like that.  
 Yeah. If you anything like that.

**Helen Zulch** 29:07  
 Yeah.  
 I I nothing comes to mind. As I say, I'm not an emphasis. I'm not a welfare scientist, so I'm very much a clinical behavioural practitioner. But if if something comes to mind, I will send it across.

**Roopika Ravikanna (18724409)** 29:24  
 Thank you so much. That's me. Thank you so much, Helen. I think it's been of great help for us and I know that I asked you on short notice and you very graciously agreed. Thank you so much for that. What we're trying to do in the summer school is like it's it's three days that we have all of these people together. It's three that you see on this call and three others who are silently observing from another room. The meeting that we're having.  
 And so we're trying to like bring about a publication where we interview a few different people like yourself and the shepherd, one of our farm and state managers, who Matt Bagley, who's shepherd. We interview him tomorrow, and Jack Grant, another postdoc who's on an entry tech side of things, will give us that perspective a little bit. We're trying to collect different opinions, and we observe that that is very less.  
 Existing documentation.  
 Animal robot interaction or animal robot technology, animal technology. So we we're trying to bring about a a publication that people can refer to which has a collective set of opinions on ethics to be followed in animal technology design or implementation. So yeah, that's. And maybe we we also think we've been very ambitious down somewhere down the lane we can maybe even propose a White paper to say Defra or drspc.  
 You're suggesting a set of animal welfare guidelines that need to be followed for any robotic technology that's probably implemented in our farm space with animals or even a domestic setting with pet animals. So these are more long term goals and I'd love to have a chat with you on a different occasion about, you know, specifically about dogs, which is your area of expertise.  
 But thank you so much for this and we will keep you updated on any publication that we propose to do. And yeah, we'd love for you to have a look.

**Helen Zulch** 31:20  
 No problem at all. And in case you're still looking for input.  
 I did think about it after you set this meeting up.  
 One of our staff members, who's just left and gone back to the US, Beth.  
 She's a specialist. I don't know if you've come across her. She's come a she's a specialist in.  
 Farm animal welfare and human animal interactions. So if you are looking.  
 For and and she's just lovely. She's a really lovely person, so if you're looking for an additional input, she may be a good person to contact so I can put her. I can try and get her updated e-mail details and send them through to you.

**Roopika Ravikanna (18724409)** 32:10  
 Be helpful for us. Thank you so much. It'd be very helpful. And I can get in touch. And beside your name that we passed on to us, that'll be very helpful. If you could do that. Thank you.

**Helen Zulch** 32:20  
 No problem. Good luck with everything.

**Roopika Ravikanna (18724409)** 32:22  
 Very nice to meet you. Thank you. Thank you, Helen. Thank you. Bye bye.

**Helen Zulch** 32:26  
 Hi.

**Roopika Ravikanna (18724409)** stopped transcription