

Research Focus: Research in veterinary medicine

Down the drain – how spot-on parasiticides applied to dogs can contaminate the environment

Sally Everitt and Martin Whitehead

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Sally:

Hello, and welcome to this research focus podcast from RCVS Knowledge. During these podcasts, we will be covering all aspects of veterinary clinical research from getting involved in research in practice, to discussing the published papers and evidence with particular emphasis on how we can integrate them into our clinical practice.

My name is Sally Everitt and today I'm talking to Martin Whitehead about the implications of some research he's recently been involved in, which looked at how much topical small animal parasiticide are contaminating our waterways. After studying for a PhD that the sounds produced by the ears of vertebrates, from frogs to humans, Martin did basic and clinical research in U.S. tertiary care medical school ENT departments. On switching to veterinary medicine, he worked in mixed pet, farm, equine, and zoo practice for over 15 years. He is now a clinical director of a 15-vet companion animal and zoo veterinary hospital practice. His clinical work includes small animal internal medicine, running a radio-iodine unit treating hyperthyroid cats, first opinion and referral exotic pets, and zoo practice.

Martin is an RCVS recognized advanced practitioner in small animal medicine and international director of the Evidence-Based Veterinary Medicine Association. Welcome, Martin. Perhaps before we talk about this specific research paper, we could talk a bit about the broad research project that this is part of and how you got involved with it.

Martin:

Yeah, certainly. So, I've always had an unease about the use of large amounts of pesticides over the whole profession on well, all animals, not just pets, but the horses and the farm animals as well. I had an assistant working in my practice, nothing to do with research,

working as a vet, Rose Perkins, and she shared that unease and actually more so than me. And she got involved with a charity called Bug Life. And Bug Life had done some water measurements, just a relatively small amount of water measurements, measuring fipronil and imidacloprid and shown that these chemicals potentially coming from free treatments were in some rivers in the UK and raised concern. And Rose got involved in helping them to analyze their data. And because I've got that sort of basic science PhD background, I got involved in helping her to help them analyze their data to a small extent. And things grew from there.

And Rose then very unfortunately, decided not to carry on working for me, but to do a PhD following this up. So there we go. We lost a good assistant. But the Veterinary Medicines Directorate were also sharing some concerns, partly because Bug Life had been pointing this out, and they funded a PhD for someone to investigate this and Rose applied for that and got the PhD studentship, which she's actually at the University of Sussex with Dave Goulson, who is a very well-known bee biologist is supervising the project. But because a veterinary hospital is better set up for doing some of the practical stuff than a university, and a lot of the research in this down the drain paper actually got done in our practice.

Sally:

So there was a previous paper published on the potential role of veterinary flea products on the contamination of English rivers, which we may touch on. But mostly today we're going to talk a little more about this, what I'm going to call the “down the drain” study because that was part of the title and it's an easier way of describing it. And what that tells us about the potential for small animal spot on products, specifically fipronil and imidacloprid to contaminate waterways. So can you perhaps tell us a bit more about this study? The “down the drain” study.

Martin:

Yeah, so the previous study had shown that fipronil and imidacloprid are present at high quantities in rivers, waterways throughout the UK. The question was partly is it coming from dogs and cats?

And if so, how is it getting into the waterways from dogs and cats? In the previous study where it was just a matter of levels in rivers, we had shown that the levels of fipronil and imidacloprid were highest the closer you got to downstream from a wastewater treatment plant. So that obviously suggested it was coming from wastewater treatment plants. And we'd also shown that the imidacloprid concentrations were very, very closely correlated with

the fipronil concentrations. And because fipronil has hardly ever been used in UK agriculture that suggested that the imidacloprid levels were also coming from the same place as the fipronil, in other words, wasn't coming from agriculture because imidacloprid has historically been used quite a bit on farms in the UK.

So we knew it was probably mostly coming out of wastewater treatment plants. And that means not really from an agricultural or at least sort of arable source. So presumably from households or industry somewhere. And quite honestly, most of the imidacloprid and fipronil is sold for pets. So we had a very strong feeling it was coming from pets. And the VMD wanted to know how was it getting from pets into the waterways, and if possible some sort of estimate of how much was coming off pets or how much of what is found in the waterways might be coming from-

Sally:

Coming from pets. Yeah.

Martin:

And Rose also, as part of her PhD, did an internet survey asking pet owners how often they apply products, what flea products they use, how often they wash their dogs, how often they wash their hands, how often what they wash the dog's bedding, that sort of thing. So we had a bit of background information to help take the results of this Down the Drain study and work out how much might actually be going down drains. But in the Down the Drain study itself, we took volunteer dogs mostly from among the clients and perhaps some of the staff of, my dogs took part, of Chipping Norton Vets. And we had 98 dogs and they had to have not been flea treated for the previous three months.

Each one who signed up to the study was going to have a bath either five, 14 or 28 days after an application of fipronil or after an application of imidacloprid. And they also got given a piece of bedding for the dog to use for that time. And then that was going to be washed either five or 14 or 28 days after the application of imidacloprid. And we also got owners to wash their hands when they came in and we bathed the dog. So we were looking at how much was coming off the dog when it was bathed, how much was coming off the bedding and how much was coming off the owner's hands at five, 14 and 28 days.

Sally:

This was just the owners from handling their dogs. This wasn't immediately after they'd applied the product or anything like that?

Martin:

Correct.

Sally:

So this was just handling their pet or the bedding or things with the pet.

Martin:

Exactly, yes.

Sally:

So indirect role-

Martin:

Specifically didn't measure anything at all for the first five days.

Sally:

Yeah.

Martin:

So we quite possibly a very large amount of what actually comes off dogs does come off in that first five days.

Sally:

And owner's hands because it specifically says you should wash your hands after you've applied it.

Martin:

Exactly, yeah. I would imagine quite a lot comes off in that particular way and goes down the drain, but we didn't look at that. We're looking at that sort of background all the time, what's coming off dogs. And there are previous studies. We obviously know that imidacloprid comes off dogs for a long period because it helps prevent flea reproduction, so it must be coming off dogs. And the imidacloprid dogs, we also measured the fipronil coming off the dogs that had imidacloprid as a control.

Sally:

Yeah. So this isn't contamination from something you are doing in the practice because you're using each one as a control for the other group.

Martin:

And we agreed control measures of just the water that a dog would've been bathed in just to check that there wasn't fipronil. And that was all very good. There was no contamination at all. And we found that a lot of fipronil and imidacloprid came off after five days and a bit less than half as much came off at 14 days. So these were different groups of dogs. Dogs were bathed to-

Sally:

Yeah, it's not one dog being bathed on three occasions.

Martin:

Exactly.

Sally:

It's different groups of dogs. Yeah.

Martin:

And then even at 28 days, still almost as much was coming off for 28 days as was coming off at 14 days, but there was a decline from five to 14 to 28 days. But a lot of stuff was coming off. So even if you put stuff on your dog on day zero, 28 days later, if you bath it, quite a lot of it goes down the drain.

Sally:

And I have to say, when I read the paper, I was struck by how much work was involved in this because this involved collecting all the water that was used for bathing a dog.

Martin:

Yeah.

Sally:

And then sampling that.

Martin:

We bought a big bath.

Sally:

Yeah.

Martin:

Plastic bath. And they were bathed in there. And obviously we only had to sample a very, we had to stir the water very much, but we only took very small samples.

Sally:

Samples. But I still thought, wow, that's a lot of work to do. I've done a PhD, I know what's involved. That was a lot of work in there.

Martin:

It was a lot of work. Well done to Rose for doing all that.

Sally:

Absolutely.

Martin:

And for the bed washing, we bought our own dedicated washing machine, wasn't used for anything other than this project. And we collected the outflow from the washing machine. And again, there was plenty of stuff coming off. That didn't actually change over time. It was about the same amount of stuff came off the bedding on day five and on day 14 and day 28. And then for washing owners' hands, again, there was some coming off, much less than came off the dog as you might imagine, but still owners who had just been living their lives washing their hands as much as owners wash their hands, when they came in with their dog for us to bathe it and we asked them to wash their hands and we collected that water and it turned out there was some coming off there as well.

Sally:

Yeah.

Martin:

And again, that was higher at day five, lower at day 14, lower still at day 28. And unfortunately we only did this for imidacloprid. Sadly we didn't do it for fipronil. But we did just check owners... So the hand washing was after they stroked their dogs. But we did check for imidacloprid also, just the baseline level before they stroked the dog.

Sally:

Before they stroked.

Martin:

And it turned out there was quite a lot there as well.

Sally:

Because they probably had been handling their dog.

Martin:

Yeah. They'd been around the dog.

Sally:

And even if they've washed their hands between, it's not necessarily getting all the product off on every single occasion presumably.

Martin:

Exactly. Yeah.

Sally:

Because if you think of what it's meant to do on the dog, which is stay in the coat, skin, then presumably exactly the same is going to happen to the-

Martin:

And obviously if this stuff is coming off onto bedding, it's also going to be coming off onto blankets. So the carpet and the furniture and people are touching all those.

Sally:

Touching all of those things. So yeah.

Martin:

They're going to be probably contaminated all over the place really. It makes you think that you've got these extremely toxic chemicals in one way or another all of the time and you're eating your food and doing whatever you're doing around the house. It's got a little bit alarming really. But there we go. We found that lots of imidacloprid and lots of fipronil is going down drains and by using information that Rose had collected in her survey of owners

about how often they treat the dogs and cats, dogs in this case. But she collected information on cats too. How often people wash their bedding, how often they wash their hands. We can make an estimate of how much is going down the drains. We know how many sewage treatment plants there are in the country. We know that average households that are contributing to any one sewage treatment plant.

And we have a very small amount of information where water companies have measured imidacloprid and fipronil in the influent and effluent of sewage treatment plants. So we could make a very, very rough estimate of what proportion of the imidacloprid and fipronil coming out of sewage treatment plants is coming from bathing dogs, washing their bedding and people washing their hands. And overall it came out somewhere between 20 and 40% on the basis of our data. But as we mentioned before, that doesn't include what happens in the first five days.

Sally:

Yeah.

Martin:

It also doesn't include washing, human bedding where the dog's be lying on the bed or washing your carpets or washing your clothes, because the stuff will be coming off on people's trousers, or washing your body because it's coming off probably on your arms maybe, and you have a shower and that's washing down the drain. And obviously it also doesn't include dogs swimming because that doesn't come out sewage treatment plants at all. And it doesn't include things like, it doesn't include cats at all, doesn't include the Seresto collars that have imidacloprid in and that some animals wear. So no question, we very much underestimated the total contribution. So it seems-

Sally:

I suppose the other way to think about it is where else would it become... Okay, be other bits to do with the same animals, but compare, I would imagine that nowadays small animal antiparasitics are the bulk of the fail of these products because they're not being used in farm work.

Martin:

Yeah.

Sally:

So the question would be is if they're not coming from our pets and we know they're getting into the waterways, what are the other sources?

Martin:

Well, there are other sources, but they're all likely to be very small.

Sally:

Yeah.

Martin:

So you can use imidacloprid in internal agriculture, so in glass houses, although there's not actually any licensed products for doing that. It is used in some fly and cockroach baits as is fipronil. Almost all of those products are professional pest control people only. And the way they're used, they're usually contained in some sort of plastic sort of box or something in a building. So we wouldn't think they're likely to be going down the drain very much.

Sally:

Much. Yeah

Martin:

Yeah, there will be tiny, tiny amounts of residual on imported plants and vegetables from countries where they do use these products maybe. But as far as we can tell, the vast majority will be coming off dogs and cats. Yes.

Sally:

Yeah. So we've definitely got a risk of environmental contamination.

Martin:

Yeah.

Sally:

I suppose that leads to a few questions about what we should be doing. So I suppose this is moving from one area where we've got a little bit of evidence to an area where we probably don't have enough evidence to make a comparison, but is there an argument for moving from topical products which perhaps are more likely to come out, to oral products, which at least with dogs, if they're coming out in the faeces and we're picking those up, may be less likely to contaminate the environment?

Martin:

Yeah, it is a difficult question. And for sure if your dog swims a lot or it gets bathed, goes in the dog room as it gets regular baths, I wouldn't use a spot on that dog.

Sally:

Yeah.

Martin:

As we might talk about later, my own personal view is we massively over treat dogs [inaudible 00:16:43] preventively anyway. So my view, we generally just don't treat them [preventatively] for fleas at all. But if you are going to treat them for fleas, certainly if you're bathing them a lot or they're swimming a lot, I would use an oral product. But it's sort of hard to tell in some cases. Any oral product that treats fleas must be getting into the skin, possibly getting into the fur, because otherwise how's the flea going to get it? So I'm not entirely sure to what extent it might not be coming off the dog anyway.

Sally:

Yeah, okay. So there's another whole, when Rose has finished this, all of this work, she's got a whole life's work ahead of her.

Martin:

Yes, there's plenty to do. Yeah, if a topical product comes off, it's not just a matter of how much comes off. There is how long does that product last in the environment?

Sally:

Yeah.

Martin:

How toxic is it to important invertebrates in the environment? And also what's called its bioavailability. How easy is it for the wild invertebrates to get hold of it? And for an oral product, how much of it is metabolized on the way through the dog, as it were? And if an oral product, maybe only 5% of the amount of a topical product that comes off comes out in the poo, but if it's maybe five times more toxic, five times more bioavailable, five times the duration in the environment, it might actually do even more damage. But it's probably not getting into the waterways.

Sally:

Yes. But it may be doing-

Martin:

[inaudible 00:18:26] in soil. And fluralaner, for instance, if you give a dog fluralaner tablet, 90% of the fluralaner comes out unchanged in the faeces.

Sally:

Yeah.

Martin:

Which is that's a lot of product coming out.

Sally:

Yeah.

Martin:

But yeah, we know nothing. There just is no information.

Sally:

Okay. So you've touched on this and I'm going to put you on the spot slightly. So as someone who's been involved in this research and obviously has an interest in evidence-based veterinary medicine, you've already hinted that you're not keen on the blanket approach to treating parasites. Perhaps you'd like to just tell us a bit about what you do in your own practice for prescribing parasiticides for small animals.

Martin:

Yeah. What we don't do and never have done is have a pet health plan because to our mind it is just totally irresponsible that any dog that comes in or any cat, you just every month or every three months, however it works, you just give them some flea treatment and wormer to give your dog or cat. After years and years, I still can't understand what's going on in in vets heads that they think that's a good thing to do. So that's the basic one. Beyond that, it gets a bit difficult because, well, we've got clients who've been with us for a long time, but you're always getting new clients come in because they move house or whatever, and they come from practices where it's just routine, and they've been told all the time the animal's got to be given these things. So we have to train them out of that and say, well no, you don't need to do that.

It's much cheaper not to. You're damaging the environment and try to do that without making the vets previously look.... So it's an awkward situation.

Sally:

Yeah.

Martin:

So what we don't have is practice policies on this. Each of the vets can do what they think is best. And some of our younger vets maybe have come from another practice recently and they've got their own ideas. We sort of have to try and train them out of some of that as well. So we're very fluid and easy going about it. And different vets who saw the same client in our practice might do different things and that's fine by me. I'm quite happy for that. I can tell you what I do.

Sally:

Yeah, go for it.

Martin:

I inaudible 00:20:44 [] do very much first opinion [inaudible 00:20:45] days, but what I have done. So for fleas, well the most important thing I do is actually talk to the owners. So I don't just say, well, here's your flea product every month or so. So I explain to people that these things are toxic for the environment, at least some of them are. I explain to them that most pets don't have worms or fleas or ticks most of the time, even if they're not treated by parasiticide. And I would say dogs and cats are not going to die of these things. So I don't see a lot of need to be very strict in preventing them.

There are certain circumstances where it's a good idea to be strict about one sort of parasiticide or another for sure. So maybe if they've got badly immune suppressed family members, which might be at risk for Bartonella from a cat, well maybe we should be fully treating those a bit more rigidly. And if you've got a dog with flea allergic dermatitis, well they should be treated a bit more, especially in the summers or even if they just got [inaudible 00:22:04] because the flea sort of trigger it a bit.

Sally:

[inaudible 00:22:06].

Martin:

Yeah. So we talk about that sort of thing. But if they haven't got a specific reason why we should be very careful about it, I just advise them not to treat.

Sally:

So it's taking a risk-based approach and that will vary depending on the animal and their circumstances and the owner's circumstances and the parasite you're talking about. Because if I was taking my dog on holiday to Scotland or the New Forest, I would definitely be giving it preventative tick treatment or something like that.

Martin:

In the summers. Yes. Not in the middle of winter, but yes.

Sally:

No. Look, you can look at the [inaudible 00:22:45] data. The tick season is surprisingly long in this country because we don't have a lot of particularly cold weather. And then I suppose you get into the other parasites and the worms are a bit more complicated because we've got both a range of different worms and, yeah.

Martin:

Yeah. Well for fleas I should say, the other thing I ask people to do is check for fleas.

Sally:

Yeah.

Martin:

If they see a flea-

Sally:

And some owners will be better at that than others.

Martin:

Yeah, exactly. So if somebody with vision impaired, well fair enough, they're not going to see the fleas. So more reason to treat for fleas preventatively in the summer. And some cats won't let you check them I guess. But if people say, oh yeah, I think I can check the animal pretty well, it's better to give them a flea coat than it is to give them parasiticide every few

months. So if they see a flea, well then they can treat, problem solved. For worms, most dogs, as far as I'm concerned, most dogs or cats just don't need worming at all.

Puppies and kittens are very prone to worms. They can be made ill by worms. So I think it's a very good idea to worm all puppies and kittens. So you're aiming there at *Toxocara* primarily. But *Toxocara* is not really pathogenic in adult dogs or adult cats. So I don't think they need worming for that reason. It has been very strongly implied over the years that, well, *Toxocara* is zoonotic. It's very rare zoonotic disease in humans, but it's been very strongly said that we need to worm dogs to reduce *Toxocara* environmental contamination. But in fact, the one place where we do have actually quite good evidence for what worming does is the effect of worming on *Toxocara* in adult dogs. And it does basically nothing at all to reduce shedding prevalence.

Sally:

I'll just add in here if anybody wants to go into that in more detail, you did a very interesting talk at BSAVA Congress, so we'll put the links to that in afterwards so that people can follow that up if they want to.

Martin:

Yeah. So to my view, an adult dog in a non-long worm area just doesn't need roundworm treatment at all. Again, there might be high risk situations, but it gets a bit awkward there because *Toxocara*, obviously the eggs take a month or so to become infectious. So it's not totally clear even if you are really helping an immune suppressed person by worming their dog.

Sally:

Yeah.

Martin:

So it's a bit awkward there. Things are vague. But most adult dogs, I just say don't round worm them at all.

Sally:

Yeah. I live in a lungworm worm area

Martin:

If you are in a lungworm area, well they are round worms and you probably do need to worm there fairly regularly to protect the dog, obviously, that's not zoonotic.

Although it is not really clear how often you need to worm to provide that prevention. Again, most people say maybe three monthly is enough. And I also don't think we need to be worming for tapeworm because they're non-pathogenic to the animals.

Sally:

Dipylidium rather than echinococcus sort of distinction.

Martin:

Yeah. So the echinococcus in those areas, that's a zoonotic risk and that's obviously a dog thing. But again, the vast majority of dogs are probably not out roaming around eating fallen stock and the sorts of animals they can get echinococcus from. So it's mostly the farm dogs that need worming, not the great majority of dogs.

Sally:

Yeah.

Martin:

Those dogs that are likely to be not only scavenging and eating fallen stock, but also defecating around the place.

Sally:

The farm yeah.

Martin:

So yeah, there's a small number of dogs that definitely should be wormed for echinococcus. But the other take worms, my view is why would you try to prevent something that's non-pathogenic? We don't try to prevent giardiasis. Lots of dogs carry that around. So I don't see why we do that. If the owner is upset because they see some tapeworm eggs, well they can treat them then.

Sally:

They can treat them then. Yeah.

Martin:

Yeah.

Sally:

So again, taking a very individualized and risk-based assessment for all of these things. So we are not just thinking about the animal, but taking a much broader one health issue, which is thinking a little bit about the zoonotic potential, although making the difference between the actual hazard and the risks of these things that they may potentially be hazardous, but the risks are often extremely small because people are not becoming exposed. And then perhaps what we're coming to an understanding of now is the need, we need to take a bigger one health issue and think about the environmental impact of these products. And on the farm animal side, they've been doing this for a little while, but perhaps we're just coming to it really on the small animal side, and partly perhaps because as you say now we've got to the point where so many animals are being treated routinely, the-

Martin:

The quantities of parasiticide we use on dogs and cats are agricultural quantities for sure.

Sally :

Yeah.

Martin:

But it's not just about the environment. There's also worming the way that many vets do can encourage resistance.

Sally :

Yeah.

Martin:

And we don't have resistance to, in Toxocara, for instance, in this country as far as we, not that anybody's actually looking as far as we know. But it's there in and [inaudible 00:28:22] hookworms common worms in America, many of them are resistant.

Sally:

Well, they've been treating monthly for much, much longer than we have because of the heartworm situation. So it's our future potentially. Yeah.

Martin:

And it's there in the Mississippi area lung worm resistant, and so is [inaudible 00:28:38]. There's some resistance for that being reported. So yeah, it will happen eventually if you worm enough in this country I'm sure. But there's also the fact of just the amounts of owners money we're getting them to spend on these, what I regard as mostly unnecessary products.

Sally :
Yeah.

Martin:
If you are going to worm monthly or three monthly with these products all year round millions of pets, that's hundreds of millions of pounds that to my mind, it's mostly unnecessary. And what are you hoping to gain from that? Probably if you just treat high risk animals and you watch your animals carefully, you could achieve almost all the benefits for a tiny fraction that amount of money.

Sally:
I suppose we do have to remember certainly with some of these products is that they're not just sold through veterinary practices anymore.

Martin:
Yeah.

Sally:
There is a significant proportion that are now over the counter medicines that you can buy in pet shops, even supermarkets and places like that. So these are not entirely veterinary products, but I agree a lot of veterinary practices have policies, health plans, that do suggest that we should be using these things as routine without any real testing to make see if the animals are either infected or at risk when we use them.

Martin:
Correct. And in fact, one of the interesting things that I've spotted is that probably worm egg counts for Toxocara would be totally pointless.

Sally:
Yeah.

Martin:

It wouldn't even work as well as blind worming, and blind worming is not working. So that's not a way of replacing worming for Toxocara.

Sally:

[inaudible 00:30:29] shed and an individual animal's rather different. Okay so perhaps we could just take a few minutes to talk about the implications of these findings for the regulation of these products. Because I didn't know really until I went into it in more detail that there is a big difference between the regulatory requirements for large animal and small animal products. Because on the large animal side, they've been looking at the eco toxicity for quite some time now. And I suppose at the time when the regulations came in, it was believed that the small animal products were only contributing minimally because they were very small part of the amount that was sold. And this has probably changed quite a long way now. And that manufacturers of these products don't need to provide data on eco toxicity. So do you think there should be tighter regulation of these products in future?

Martin:

Absolutely. Yeah. And the first thing is there should be an environmental impact assessment. That's the thing that is specifically not required in the regulations.

Sally:

Well, I think they have to do a phase one impact, but because they're small animal products, it was felt that the quantities were small. And perhaps if we're bring optimistic-

Martin:

Well, the phase one impact actually consists of the question, are you [inaudible 00:31:45] on small? So it's not an assessment of any sort at all.

Sally:

No. Well, let's just hope that the VMD having funded this research have been seeing the results, think that this is somewhere they could go in future.

Martin:

Well, I hope so, but I don't feel tremendously optimistic on that myself.

Sally:

All right. Thank you, Martin. I'm sure you've given our listeners not only a greater insight into the different areas of research, but to something to think about in their own practice. If anyone would like further details of the study, we'll provide a link to the published paper on

the website. For those of you who are BSAVA members, you may also be interested in a talk that Martin and Ian Wright did at BSAVA Congress entitled, How Can We Prevent Worms and Still Protect the Environment? If you have enjoyed this podcast and would like to find out more about veterinary clinical research and evidence in practice, please have a look at the evidence and library sections on our website. For more podcasts from RCVS Knowledge, you can find us on your favourite podcast platform.

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