

Carcinogens in Canine Fur:

A Special Interview with Robert Turesky

By Dr. Karen Becker

KB: Dr. Karen Becker

RT: Dr. Robert Turesky

KB: Hi, this is Dr. Karen Becker, and today we have a very special guest. Today I'm going to interview Dr. Robert Turesky. Dr. Turesky works at the Division of Environmental Health Sciences at the New York State Department of Health. Welcome, Dr. Turesky.

RT: Good morning.

KB: Thank you for joining me this morning via Skype. I was introduced to Dr. Turesky through a mutual acquaintance, Ted Kerasote, who wrote a really great book about why dogs – potentially some of the linking factors – become ill and die younger than what we believe that they should.

Dr. Turesky wrote a very interesting article in the *Journal of Agricultural and Food Chemistry*. The article title is “Biomonitoring the Cooked Meat Carcinogen 2-Amino-1-methyl-6-phenylimidazo[4,5-b]pyridine in Canine Fur.” Now, that's a really big title, Dr. Turesky. Tell me what you... Pare that down to layman's terms in terms of what your topic of research was.

RT: Okay. Well, first of all, it's a very long name for a carcinogen. People in the field actually use the acronym PhIP. It's a lot simpler to state than the long chemical name.

KB: Yes.

RT: We've been very interested in this class of chemicals called heterocyclic aromatic amines that are formed in well-done cooked meats, poultry, and other protein-based products and their potential role in actually human cancer.

One of the goals of my research is to develop methods to monitor the exposure to these chemicals in humans. And one way that we are doing this is by looking at the bioaccumulation of some of these chemicals in hair. As we eat these foods, they become absorbed from the gastrointestinal tract, go through the liver) and after what's called first-pass metabolism, a small portion of the chemical that we consume actually goes into the bloodstream.

What happens is that that goes through what we call the systemic circulation. A very small portion of the chemical can actually reach the hair follicle. The chemical actually becomes entrapped in the hair follicle. And as the hair shaft grows out, the chemical actually grows out into the hair shaft. We can monitor it. We take hair, we cut it, and we break open the hair. We can do chemical analysis by mass spectrometry methods.

I don't even know why I did this originally. But I decided to look at our dog first just for curiosity to see whether, in fact, my animals had actually this potential carcinogen in their dog fur. Actually, I was not expecting to see it, because my dogs don't eat grilled steaks or hamburgers. I was very surprised, stunned, in fact, to actually find out that my dogs did contain this carcinogen in their fur.

KB: Wow.

RT: Subsequent to that, I set up a collaboration with the University of Minnesota, the veterinary college, in a small pilot study of about 15 canines. We saw, I believe, it was 13 animals that were positive for this potential carcinogen in their fur.

KB: Wow. Initially, was your research done on mice or other animal species, looking at maybe human models down the road?

RT: Sure.

KB: Or did you start with dogs?

RT: There's been an awful lot of work that's been studied with these chemicals. There've been experimental animal model studies. They've been done with mice and rats. In fact, even non-human primate studies have been done at the National Institutes of Health.

And indeed, some of these chemicals are carcinogenic in these animal models. Based upon the biochemistry in the research that we learn in animal models, we tried to extrapolate to humans. In fact, actually, I might add that a structurally related class of chemicals called aromatic amines were actually first shown to be bladder carcinogens, actually using a dog as an animal model.

KB: Interesting. So, I know that you tested your own pets just to see. And of course, I'm sure that you were shocked.

I found one other journal article that was relating to pet foods and potential carcinogens. This study was done... It's called "Mutagenic Activity and Heterocyclic Amine Carcinogens in Commercial Pet Foods." It was done by Knize, Salmon, and Felton.

What this particular study shows (I think it was published in 2003) was that 25 commercial pet foods were analyzed for mutagenic activity. All but one gave a positive mutagenic response. Fourteen of the samples were analyzed for heterocyclic amine mutagens or carcinogens, and all but one contained a carcinogen. From these findings, it's hypothesized that there is a connection between dietary heterocyclic amines and cancer in animals consuming these foods.

The fact that there are now only two published studies on the fact that when animals eat cooked meat products that have been processed at high temperatures that carcinogens could be present. I find that a little shocking that, really, yours is only the second published article that's even discussing this. Is it just because you're interested? Or the veterinary community or pet food industry isn't interested? Are you able to have any thoughts as to why you're the only person doing this research?

RT: Well, I can't comment on the interest of the food industry on this. There is actually an awful lot of research that's being done on this class of chemicals in humans. There's tremendous

interest in the molecular epidemiology community on the role of well-done cooked meats in potential risks for certain types of cancers.

As far as animal models such as the canine, this has not been an extensively studied area. Certainly, we would love to be able to explore the potential role of heat-processed foods, which dogs are routinely eating on a regimen diet, and the potential role of these chemicals in cancer in canines.

KB: Yeah.

RT: They eat these foods consistently while we have a very diverse diet. So actually, their levels of intake and exposure may be much higher than ours and their risks toward these types of foods may be higher than ours, because of the highly regimented diet. More research should be done on these chemicals and heat-processed pet foods.

KB: Absolutely. You bring up a very valid point. The majority of pets in this country consume an entirely processed, inorganic, and really commercialized diet not just a couple of times a day. They just don't have one fast food meal. They're eating entirely processed foods for breakfast, lunch, and dinner their whole lives. In fact, very few animals actually get any fresh or unprocessed foods.

The majority of pets are consuming extruded foods. "Extruded," of course, means that the batter is forced through a dye and cooked at very, very high temperatures, which of course, not only changes their molecular activity, but according to your research could potentially (because these meats are cooked at very high temperatures) be contributing to a heavier carcinogen load for pets on a really consistent basis. When you found this out, did you test your own dog first?

RT: Yes, I did.

KB: Yeah. Were you able to discern... Is there like a level when you do this analytical testing? Is it a small level? When you do mass spectrometry, is it a small level and then a high level? Are you able to discern like a quantitative chemical load? Or is it just basically a positive or a negative?

RT: No. There are different levels of accumulation in this carcinogen in fur or in human hair. It's actually complex. One major factor, for example, is the pigmentation of hair or fur. For example, in my article, one of the dogs that we analyzed for this carcinogen in his fur is Moses. That's my Bernese mountain dog.

In that figure, what you will see is the beautiful black color of his back and his hind quarters. The Bernese has a beautiful white mane. What we did is we actually analyzed the dog coat – the black fur on his hind quarters and also the white fur on his vein – it turned out actually that the [black] dog fur contained all the PhIP and the white fur had none of it.

KB: Interesting.

RT: What we believe is the reason for that is pigments in fur such as melanin or derivatives of melanin have a very high affinity for this carcinogen.

KB: Wow.

RT: And thus, it accumulates in dark-furred animals.

KB: Wow.

RT: More so than in lighter-furred animals. But if we normalize for the melanin content or the hair pigmentation, we can normalize that level as a function of, say, melanin content. What we've seen in the small pilot study that we've done is we've seen variable levels of PhIP in fur of these different canines that we examined.

Same thing in humans: the variable levels of this carcinogen in human hair once you normalize it for the melanin content. It's very complex. Part of it is certainly due to the exposure. All of us have different diets. Certain levels of carcinogens that we have are different. So, we would expect that we would probably have different levels in our hair as a function of our diet.

But as I said, pigmentation of hair is going to have an influence, and other enzymes and metabolic factors that are involved in processing these carcinogens could also perhaps influence the levels.

KB: Sure.

RT: It's not surprising. We would expect certainly to have different levels in canine fur as well.

KB: For your research, did you feed all dry food diets to the dogs? Is there any research that's been done on dogs eating canned foods, unprocessed foods, let's say, freeze-dried foods, or all dried foods?

RT: That's an excellent question. In our study, I believe all the animals but one were on dried kibble-type food.

KB: Right.

RT: I believe there was one animal, one canine that was not. And actually that animal had, if not the lowest, among the very of this chemical in their fur.

KB: Yeah, interesting.

RT: But clearly, in fact, the influence of diet and different types of foods, it's an important thing to study in canines as well as in humans.

KB: Absolutely. Yeah, absolutely. When you tested your own dog, of course, and probably had to take a moment to regroup when you looked at your test results. And then you completed the formal study that was, of course, published in the journal. That's a really impressive enlightening study. How has that affected you personally with how you've fed your Bernese?

RT: Well, we've actually changed their diets since then. Their diet previously was based principally on a poultry-based protein. It turns out that under certain cooking conditions, the highest levels of this carcinogen are actually produced in poultry. Again, the levels can vary greatly depending on how high the temperature or the duration is. But I felt that I did not want to have my animals on that poultry-based diet. They're now actually on a fish – salmon and herring – diet. I have not re-analyzed their fur yet, because it will take a period of time...

KB: Sure.

RT: Before the fur is replaced. But certainly, sometime later on this spring, we intend to look at their fur to see whether there's been a diminution in levels of PhIP in their fur.

KB: Are you still feeding kibble? Or have you gone to like a freeze-dried...?

RT: No. Unfortunately, this is still kibble. This is a challenge, as you're well aware of.

KB: Sure.

RT: Of switching to fresh foods, raw foods versus... It's partly convenience, too, staying with kibble foods.

KB: Sure. It's a huge convenience.

RT: Yes.

KB: Just to open your pantry and scoop, I get that. But what's interesting is that I am interested in learning about what your new test result show. Because despite the fact that, let's say, seafood may have a lower level of accumulation, it's still extruded at incredibly high temperatures. So, it would be interesting to see what your research shows on that.

RT: Yes.

KB: Talk to me about the varying temperatures, let's say, of meats that are processed at 200 degrees versus 400 degrees. Is there a certain temperature at which these carcinogenic materials begin to build in terms of content within the meat products?

RT: With respect toward canine food, I can't answer about canine foods.

KB: Sure.

RT: Because I haven't worked enough within it. I don't know the complete industrial process. But, for example, for human consumption, human foods, generally speaking, the higher the temperature and the longer the cooking duration, you will increase the levels of PhIP and some other heterocyclic amines that are present in these cooked meats.

For instance, if you roast meats rather than fry or broil (roasting is done at lower temperatures), you will not produce appreciable amounts of these carcinogens. But when you go to a higher temperature (and I'm expressing this in Centigrade now), anything over 125 to 150 degrees Centigrade (I have to convert that into Fahrenheit, which would be probably over 350 Fahrenheit perhaps)...

KB: Yup.

RT: You will start to produce these chemicals.

KB: Okay.

RT: They form at the surface of the meat generally (the surface of the meat that's in contact with the heating element), which makes sense. That's where the highest temperature is.

KB: Sure.

RT: Generally, these carcinogens are produced on the external surfaces of cooked meats like hamburgers or the skin or the surface of the poultry.

KB: Sure.

RT: Rather than in the interior, where the levels would be much lower.

KB: Well, it's interesting. You probably aren't aware of this. But most of the raw materials for dog foods that go into kibble... Actually, kibbled foods, oftentimes their raw ingredients have been processed twice. So, first in order to get the meat meal – whether it's chicken meal, beef meal, or any type of meal – that's in the food has already been cooked once, and then it goes through a second cooking process.

That provides another question: if there are multiple processing techniques at higher temperatures, if that would in turn create more of a potential risk for greater carcinogenic exposure – impossible to know.

We have all sorts of potential research studies that we could set you up with, Dr. Turesky. We're really anxiously awaiting your future research. Because really, you're the only person that I'm aware of that's conducting this type of research.

I know that your focus was not in the pet food industry. But because ironically you conducted a research on dogs, it's very applicable to at least have all of us stop and think about what are the ramifications of feeding process foods to pets. You have found in a small study that there could be some tie-ins to carcinogenic activity through feeding foods that have been processed at high temperatures.

So, when you read Ted Kerasote's book, how early in Ted's book did you begin thinking that there could be a correlation to processed foods and cancer?

RT: Well, actually, I became aware of Ted's book through my wife who's studying to become a dog trainer. She got his book. She gave it to me to read. I did read along the chapters of food, nutrition, and health in canines. And actually, I had contacted him immediately, because I wanted him to be aware of our recent study.

KB: Yes.

RT: I believe his book came out sometime last year.

KB: Right.

RT: Well, it began. I've been very concerned, as many other research investigators in the field, about the role of diet in cancer in humans. The same concern also appears for our pets.

KB: Sure.

RT: I had discussions with him and had made him aware of these chemicals, which led me to have this interview with you right now.

KB: Right.

RT: I'd like to emphasize that the levels of these carcinogens in the canine diet as in the human diet, they are low, but these animals are consuming these daily. They're actually exposed to it already in utero. They've been exposed to these all their life either for breakfast, lunch, and dinner. I'm very interested in the potential that these chemicals may have in disease risk in canines.

KB: Yeah.

RT: Because of these exposures.

KB: Yes.

RT: We're hoping to be able to do further research on this very important problem not only in humans, but now also in canines as well.

KB: Do you have some research projects in the pipeline pertaining to dogs or not quite yet? I mean, have you thought about your future projects?

RT: Well, I have discussions with some of the pet food industries. I've also had some discussions with some organizations that sponsor research in our pets. Right now funding is very challenging to get with the current economy. I'm hoping though that we would be able to continue to pursue our research in this area. I'm hoping that we'll get further funding, specifically to look at the potential of all these chemicals in canine cancers. So, that's definitely in the pipeline.

KB: Wonderful. Well, let me tell you, your research has been enlightening to me. It will enlighten all of our readers. I'd like to point out that dogs and cats by nature are either obligate carnivores or scavenging carnivores. Raw meat, which is how nature intended them to consume it, does not contain heterocyclic amines. It's when the meat is processed that you could have exposure to an increased carcinogenic load.

RT: Yes, that's correct.

KB: Yeah. So, raw meat in and of itself is beautiful. And probably, although the research is not there, freeze-dried or air-dried meats, because they're not heated at high temperatures, would be safe.

RT: With respect towards this class of chemicals, yes. Again, I'm not a microbiologist.

KB: Right.

RT: But there are other health issues to be concerned about with respect to microbes in raw meats that need to be considered.

KB: Sure.

RT: But clearly, with respect toward heat-processed carcinogens, not only heterocyclic amines, but other chemicals that are produced at high temperatures (which are potentially carcinogenic), clearly they would not be present in uncooked meats.

KB: Yeah, great. Well, I'll tell you this is a fascinating research. I'm so excited that you have consented to share your information with us. It's enlightening, enriching, and certainly thought-provoking for all pet owners.

So, I appreciate what you do and for spending a few minutes with us today. I really look forward to following your future research. Thank you so much for joining me.

RT: And you're welcome. Thank you.

[END]