

The Hidden Toxins That Can Spark Tumors

Welcome to day one of bark & whiskers' Creating Healthy, Happy Pets Week 2023! Today's expert introduces us to a threat that your pet may be exposed to on a daily basis that can promote diseases like diabetes, heart disease, brain and nerve disorders, as well as the growth of tumors.

Analysis by Dr. Karen Shaw Becker

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STORY AT-A-GLANCE

- Today is day one of bark & whiskers Creating Healthy, Happy Pets Week 2023, and our first guest is Dr. David Turner, an expert on the dangers of advanced glycation end products in ultraprocessed foods and president and co-founder of the Anti-A.G.E.S. Foundation
- In our interview, Dr. Turner explains exactly what AGEs are, how they end up in processed human and pet foods, and the ways in which they turbocharge the aging process
- One challenge in limiting the damage AGEs do in the body is that the majority of people, and the vast majority of pets in the U.S. eat mostly ultraprocessed diets

Welcome to day one of bark & whiskers Creating Healthy, Happy Pets Week 2023! The next several days will feature articles on many different aspects of pets' physical, mental, and emotional well-being, including interviews with experts in nutrition, behavior, enrichment, exercise, and physical rehabilitation.

Our first guest this week is Dr. David Turner, president and cofounder of the Anti-A.G.E. Foundation. Below are some of the highlights of our discussion, but I encourage you to watch the full interview above for much more detail and information.

Advanced Glycation End Products (AGEs)

Today is the first day of bark & whiskers Head to Tail Health Week 2023, and I'm very excited to have my friend and colleague, Dr. David Turner, join me to kick things off. Dr. Turner is an expert and the world's foremost researcher on **advanced glycation end products** (AGEs), which I asked him to explain for those who are unfamiliar with the term.

"AGEs are advanced glycation end products, and they're produced in the body as we produce energy," he explains. "Basically, what happens is a sugar comes into contact with a protein, which results in a rearrangement of the chemical bonds, and the formation of advanced glycation end products. The issue is that these are quite toxic to the body and normally they're removed as waste products."

"About 15 years ago, I was working with transcription factors in cancer, and I came across the term advanced glycation end products in a paper I was reading. I wanted to know what AGEs were, and I discovered hardly anyone knows what they are, even researchers."

"The more I read about them, the more I realized these are part of our everyday lives. Most things we eat contain advanced glycation end products at different levels depending on the type of food. I wanted to know about AGEs and cancer, but I couldn't find much information. But once I found out how detrimental they are, and how little they're understood, I decided to focus my research on them. So, my team and I have been studying the role of dietary advanced glycation end products for about 10 years now. We've found that in humans they can cause cancers to be more aggressive once they form.

*"I'm a pet owner. I love dogs and have had them all my life. We realized **processed dog food** contains high levels of AGEs — hundreds of times more than human foods. We had already shown that in humans, AGEs promote chronic diseases like diabetes, cardiovascular disease, neurodegenerative disorders, and cancer. We thought they must also be having a big effect on the health of our dogs and all our pets, and that's basically what we discovered."*

Ultraprocessed Pet Food and AGEs

The reality is that most dogs and cats are fed ultraprocessed food, canned and/or kibble, from weaning through the end of their lives. Whereas most of us humans eat at least some less or minimally processed foods, our pets are often not given that choice. I asked Dr. Turner if he feels he's fighting an uphill battle against pet junk food diets.

"Yes, in a lot of different ways," he replies. "Trying to get funding for this type of research isn't the easiest thing to do. The research I've been doing with pet food has actually been funded through philanthropic sources rather than from, say, the FDA, the NIH, or anything like that. We have lots of funding looking at human cancer and AGEs, and we've tried to secure grants to research the same for pets, but it's not an easy area to get funding in. It shouldn't be that way.

"The problem is growing in humans because we're eating more and more of these processed foods. We know that AGEs cause cancer, are involved in diabetes, are involved in most chronic diseases because they increase inflammation in the body, which damages the body. You might be, say, 36 years old, but if you've been exposing yourself to a lot of dietary AGEs, your organ age could be 40 or even 50. We're seeing diabetes in teenagers and younger kids, and we never used to see that. We're seeing cancer in more and more 20-year-olds.

"A lot of this is because organs are growing older quicker. Cancer is a disease associated with older age. If our organs are growing older, we're getting these diseases earlier in life. And I think processed food has a lot to do with that. Extrapolating that to our dogs, whereas prostate cancer was once unheard of in dogs, we're now seeing it, along with diabetes, and other once unheard-of diseases. Lymphoma in dogs has really increased over the last 10 years. And I believe AGEs are playing a role in that."

AGEs Result From High Heat and Other Food Processing Methods

I completely agree with Dr. Turner, and when I started doing my own research into why so many animals are developing lifestyle-related diseases, I found research on AGEs and almost every degenerative disease you can think of in humans. We don't have the same kind of studies in animals due to lack of funding, but we're all mammals, and the same reaction is occurring in every warm bodied creature when protein and sugar merge. I asked Dr. Turner what makes ultraprocessed pet food four times higher in AGEs than processed people food. Is it the high heat processing?

"If you have three ounces of raw steak, it has around 800 AGE units," he explains. "If you boil it, you get to about 2,000 AGEs in those three ounces. If you fry that steak, the high, dry heat drives the AGE units up to about 8,000. All the methods used in processed pet food product that reaction occur much quicker. The extrusion, the retorting, the irradiation, all of those things.

"Another aspect of this is that AGEs taste fantastic. The charred areas on meat. Or when you heat sugar and get that caramelized area jam-packed full of AGEs. It tastes great. Food companies, particularly in the pet food industry, actually add AGEs or AGE derivatives directly to the food to make it more appealing to pets.

"If a food is processed, it's sky-high in a lot of bad things, not just AGEs. But AGEs are predominant in these foods. Our bodies and the bodies of our pets can deal with a certain amount, but at some point, our repair systems, our renal clearance system gets overwhelmed, and the AGEs start to accumulate at a faster pace. Another piece of this is physical activity. We've seen from our research that physical activity can help reverse or prevent many of the effects of the AGEs."

People and Pets in the U.S. Eat Mostly Ultraprocessed Foods

Dr. Turner advocates for getting the ball rolling in studying the topic of AGEs and all things lifestyle-related in pets, using clinical trials like those used in human research.

I'm in complete agreement. The **Companion Animal Nutritional Wellness Institute (CANWI)**, the nonprofit I co-founded with board-certified veterinary nutritionist Dr. Donna Raditic, has done one university-based scientific study looking at raw pet food compared to canned food and kibble, and the results are exactly what you would expect. The less processing of pet food, the lower the level of AGEs.

I asked Dr. Turner what other suggestions, besides **exercise**, which I love, he has for limiting and detoxifying our pets' bodies (and ours) of AGEs. He believes the use of antioxidants to bring down inflammation-related oxidative stress may be useful.

"Pet food manufacturing companies could make basic changes to what they're doing to reduce the AGEs in the foods," he adds. "They use high temperatures to sterilize the food; they could look into cooking methods that use moist heats rather than high dry heat. Processed foods are being used more and more.

"A paper came out recently about research using artificial intelligence (AI) to evaluate 50,000 food labels. The results showed that 75% of all foods in America are ultra-processed, which is just amazing. A lot of studies before that done by humans (vs. AI) estimated 35% to 40%. I would love it if they could do the same thing with dog foods. I think that would be more like 90%."

My co-author Rodney Habib and I actually did some research on this as we were writing *Forever Dog*, and at that time, during COVID-19, the estimates in the literature were that 85% of dogs were deriving 100% of their calories from ultraprocessed foods. People living in the U.S. during that time were consuming 50% of their calories ultraprocessed foods.

How AGEs Turbocharge the Aging Process

I asked Dr. Turner to explain how AGEs age our bodies and those of our animal companions.

"On the outside of every cell in our body, of which there are trillions, there's a protein receptor for advanced glycation end products (RAGE — receptor for advanced glycation end products)," he says. "When AGEs bind to that receptor, it sends a signal inside the cell that switches on a lot of genes that increase inflammation. The RAGE protein is there to control the immune response when we hurt ourselves. If we get a scratch on our skin, we can also develop a red area around the scratch. That red area is RAGE sending proteins to the location to fight infection. We need RAGE, but when we add AGEs, it can become over-activated. AGEs upregulate RAGE, which can lead to inflammation in our organs, tissues, and cells."

"AGEs are cleared from the body through renal clearance, so they tend to accumulate in the digestive tract, the liver, the kidneys. They're at higher levels in those organs. But when we're looking at the brain, the prostate, or the breast, for example, we're seeing a pretty even distribution apart from the organs involved in clearance. We're finding that if you have too many AGEs in the body, the renal clearance is easily overwhelmed and AGEs are accumulating in the liver, and kidney, contributing to diseases of those organs."

Dr. Turner further explains that AGEs contribute to eye disease and also cardiovascular disease, as they play a major role in plaque formation in blood vessels. When it comes to **diabetes**, the H1AC marker used to measure blood glucose levels is actually an AGE product — it's AGEs bound to hemoglobin.

AGEs Awareness Projects

Dr. Turner makes the point that we can't avoid AGEs; they accumulate in our bodies from the day we're born until the day we die, plus they're in many foods we love to eat.

"I still eat steak now and then," he says, "but the next day I'll have a low AGEs meal and get some exercise. It's about making commonsense decisions. We're also working with some natural product researchers, looking at seaweed and algae and a few other compounds that might prove to inhibit AGEs formation, which would be great. There's a lot of basic research we could do to get some answers, but research is expensive, and we don't have the funding."

"Another huge problem is that very few people are aware of AGEs. The FDA.gov site has no mention of them, which to me is just wrong. These things are in virtually every food we eat. They cause inflammation and disease. They should be a scientific focus. Food animals are eating highly processed foods. They're putting pesticides on all the crops. Those things increase AGEs as well."

Dr. Turner and his colleagues have launched a nonprofit, the **Anti-A.G.E.S. Foundation**, that provides lots of information on advanced glycation end products, such as what they are and how they work. There's a clickable diagram of a human body that describes how AGEs affects all the major organ systems. You can also find a growing library of blog posts on various subjects. A future goal is to work with food companies to generate an AGEs certification system for both people food and pet food.