It's putrid, it's paleo, and it's good for you

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As our ancestors moved to the far north, where in winter there are no fruit and veg around to supply the essential vitamin C, how did they avoid scurvy?

John Speth, an archaeologist and Emeritus Professor of Anthropology at the University of Michigan in Ann Arbor, found clues in the accounts of sailors and explorers shipwrecked in the Arctic. Those who, turned their noses up at the "disgusting" diet of the locals paid with their lives. Paul Rozin, retired professor of psychology at the University of Pennsylvania, illuminated the evolutionary history of disgust, and what we might learn from it.

What is the difference between merely fermented, and putrefied?

John Speth: Different fields will use different vocabulary, but when you read the literature and what they're describing, in many cases they end up being exactly the same thing. When you read the forensic literature, they talk about decomposition of bodies and putrefaction. But then they start talking about invasion of various bacteria. And often they're lactic acid bacteria, and they talk about the invasion of other types besides lactic acid bacteria produce gases that cause the bloating and the foul odours. And at that point, you've reached what the sausage people would call spoilage. All right. So basically there's a very loose use of these terms. The way sausages, for example, this is where a lot, but other foods as well that are fermented you have typically taste panels. And these taste specialists will will decide at what point the food no longer meets the texture criteria or the taste criteria that in that society is considered acceptable. I, you know, no forensic pathologist who's dealing with a corpse is going to go around tasting their corpses. But I suspect you'd find that they are going through the same stages, only they're going to call it putrefaction. And they have a series of stages of putrefaction. And at some point it would reach what the food scientists would call spoiled. And then it goes on to the point where the the flesh becomes literally very,

almost soupy. And then eventually you end up with just the bones. And obviously in the food sciences, nobody goes that far.

Jeremy: But now, you know, I like I like a fermented sausage, but the sort, if I can call it the anthropological putrid fermented meats meat, this is a really important food for them. I never think of it in those terms. But that's what you've established really is how important this is in the diet.

John: Well, yeah. It's particularly critical for people's ... If we look at the human story, not just at modern humans, but in the past, particularly in the days prior to agriculture. Agriculture is basically brand new. So before that, you have people that are, that do not have access to this real, abundant source of carbohydrates. Now, at some point, humans left Africa and began entering Europe and Asia. So they were entering colder latitudes. And that one of the consequences is the climate is increasingly seasonal as you move north and then eventually as you continue pushing northward and you get into subarctic areas, Scandinavia and in the New World would be a lot of Canada. Plant foods are available in smaller amounts and very short growing seasons, and you have to rely more and more on meat or fish. And that places a real constraint on certain nutrients and perhaps the major limiting variable for a lot of subarctic and particularly Arctic groups, once you really get into cold habitats like the modern Arctic, vitamin C becomes really, really critical. And vitamin C, we get it from fruits and vegetables. But as you enter these highly seasonal northern environments, you don't have access to that. The only thing you might have are some berries in the summer. So the question then is how do you get vitamin C?

And it turns out this was a surprise for me. I knew vitamin C was vulnerable. You can oxidise it very rapidly and lose it very rapidly. But I had no idea until I started reading the literature about sailors in the 19th and 18th century that hundreds upon hundreds upon hundreds of sailors were put out of commission, and many, many, many died from the disease, scurvy, which is the result of vitamin C deficiency.

Jeremy: Yeah. As a limey, the idea of treating that with lemon juice, lime juice, sauerkraut, that's well known. So how does how does the Arctic figure into this?

John: Well, the thing is, you see, there was no, obviously, no lime, lime juice or anything like that. And they didn't have sauerkraut. When you

don't have access to fresh fruits and vegetables, to citrus fruits and so forth, vitamin C is very scarce. And if your diet, the further north you go, the more your diet consists of meat, and that's not just protein. It's ... A typical traditional northern diet was about 75% fat and 25% protein, and I include fish in that, right. Although, you know, you might want to distinguish those, but it's essentially the same thing. You're basically dealing with, with protein and if you're lucky, fat. But muscle has virtually no vitamin C, so it's really interesting.

I was always curious. For many years I had heard that for traditional Eskimos, the thighs of animals, which looks like the meeatiest part in the animal, was dog food. And I didn't understand why. And there are two reasons. One, there's very little fat and two, there's no vitamin C, so there's really very little reason to eat it. If you exceed about 35% of your calories from protein, not from meat now, but from protein, and you have to sustain a diet like that, you'll ultimately die. But let's get back to the vitamin C story, though. There is a lot of, not a lot, but there is enough vitamin C to avoid scurvy, vitamin C deficiency, and scurvy, but it's in the organs. It's in the brain, the retina, the lungs, the testicles, the spleen, the kidneys, the liver, and so forth. And your western explorers, when they went in the Arctic, they wanted muscles. That's what we like to eat. And that's what Euro-americans favour. Nice big hunk of of sirloin, right? There's no vitamin C in it.

What the traditional Arctic groups — Eskimos and the First Nation groups of Canada, Native Americans in Alaska and so forth that were in the forest, not on the coast — what all of them did was they ate every part of the carcass. They, I mean, they would eat all the organs. They would drink all the fluids, the blood, the fluids in the rumen, all the things that that good, healthy Westerners would avoid. And they either barely cooked it because the cooking oxidizes the vitamin C and you lose it, or they would eat it raw. And the one of the ways of preserving vitamin C ... It oxidises as it reacts to free oxygen very rapidly and is lost and degraded, the vitamin C is very sensitive to oxygen. But if you ferment it, putrify it, rot it whatever term you want to use, depending on whether you're coming from the food sciences or the forensic side of things, if you get anaerobic bacteria in there ... What happens is you start with aerobic bacteria. They rapidly deplete the oxygen supply and then you get anaerobic bacteria like the lactic acid bacteria that reduce the pH. And the combination of eliminating the free oxygen and acidifying the food preserves the vitamin C. So

it's a beautiful system, even though we, you know, most of us, myself included, would have a great deal of trouble eating a lot of this stuff.

Jeremy: In your paper, you've got about four and a half pages, maybe a bit more of verbatim descriptions of people eating fermented, purified meat. And two things run through that. One is that the people being observed, as it were, local hunter gatherers, whatever they might be, um, absolutely relish it. And they, you know, they love it. They're very happy eating it. And the other thing is that the people doing the reporting cannot believe how much they love it. I mean, it seems to them utterly disgusting. I mean, how can that be? People are people. I don't know how long people have been in separately in the Arctic and in other places, but the disgust you probably, me probably, if we're not being intellectual about it, the disgust we feel for what we call rotten meat is obviously not shared. So where does that disgust come from and how come they don't have it?

John: Well, you know, that's a really interesting question. And again, I'm not an expert in this. There's been a lot of debate in psychology, but there are assumptions underlying a lot of this that pervade many other fields. The assumption that underlies a lot of the attempts to explain the disgust response — nausea, the facial expressions that go with disgust, you know, gagging, all of these sorts of things. And not only the the sight of rotten meat and the sight of maggots in the meat, the smell of it, the things like ammonia and putrescine and cadaverine that give it that really foul smell. I got really intrigued by this. And one of the reasons for all those quotes is there's a huge amount of baggage in our culture that I felt the best way to convince people is not just tell them that other people don't mind eating this stuff, but stick it under the nose if you like, and show them that from the 1570s right to the present day. northern peoples love that stuff. And one Eskimo was asked in the 19th century, how can you eat something that smells like that? And the answer was very simple. We don't eat the smell.

We operate with the assumption, often unspoken and widely shared, not just in the popular image, but in the scientific communities, that rotten meat, when you see maggots in meat, it's not just rotten, it's dangerous. You should never put it in your mouth because you'll probably get really sick or more likely, die, or at least a good chance that you might die. And it's justified by a very sophisticated Darwinian kind of evolutionary model. The assumption is this comes hardwired,

right? And it's universal. And the reason for it, the way it evolved, was it protects infants from putting poisonous things in their mouth and getting really sick or dying. Right? And it makes ... It's very logical. And so this is sort of the pathogen theory for for the origin of the disgust response. Psychologists began to question this. Again, here, I'm dabbling in something where I'm not really any sort of expert. My impression from the literature is initially this was the work of Paul Rozin. It was kind of on the fringes.

Paul: Ok. I'm Paul Rozin. My background that was in biology and psychology. I am now a professor of psychology, retired at the University of Pennsylvania. Still active, and I've studied many things, but for the last 30, 40 years, my main interest has been in how humans think about food and what makes them eat some things and not others.

Jeremy: And that feeling of revulsion that people have. It's so strong. I mean, it really does feel as if it's hardwired. But you've always said that it's learned. How do you know that?

Paul: Well, we don't see it in infants. They will reject something. But, you know, there's a lot of reasons you would reject the food. One reason is you don't like its taste. Another one is you think it's bad for you. A third is you just think it's not food like a piece of paper. And a fourth is disgust, which is most complicated because it includes the implication that it doesn't taste good. You never tasted it. And also, that it is bad for you. Now, what's disgusting varies greatly by culture. Though, of course, I think faeces is always in there. Probably vomit too. And urine. But lots of other things become disgusting. And those things are somewhat culture related. Faeces, by the way, is nutritive. I mean, the colon bacteria break down some things that we can't eat. But it seems to be a universal disgust and a primary disgust. And we don't know what the origin of that is. Well, it isn't present in young children who, by the way, will eat faeces. They'll eat their own. Then something happens that's very powerful. And my guess is the origin is toilet training where faeces is the bad guy. But even in the case of faeces, if you eat a shrimp is a good chance that little strip of faeces is in it. Now you can get it out fairly easily. It's possible. Yeah, it's perfectly nutritive.

John: The psychologists had come up with a series of core disgust elicitors, and at the centre of these things were obviously rotten and

maggot and foul smelling meat, faeces and urine. So what I did, looking ethno-historically, is that at all sorts of cases where there's absolutely no evidence. For instance, the soap for traditional Eskimos was urine. They had no soap and they had very little water. And the acidity of the urine cut the grease and fat. And so they cleaned that way, and they saved their urine and kept barrels of it in their in their houses. And it was utterly disgusting to Europeans and totally normal to these traditional Arctic groups, because that was their soap. And then we have these wonderful Jesuit missionaries in Baja California in the mid to late 1700s, observing the hunter gatherers. They're eating huge quantities of cactus fruits. The seeds would pass right through their digestive tract into their faeces. They would dry their faeces and then pound them up and winnow out the cactus seeds, and then roast them and eat them. And the Jesuits called this the second harvest, and they were utterly disgusted by it. And it didn't faze the hunter gatherers the least. And I think they were probably very amused at this bizarre reaction by the Jesuits. So, you know, what it shows is that these things that we find disgusting, the smells, the tastes and so forth are very are culturally learned and they're incredibly powerful.

Paul: It's fairly easy to overcome disgust, and we do this all the time. Cheese is a very good example which is, you know, disgusting. It's rotted milk and it smells a little disgusting. And people can, you know, get used to it and love it. Fish sauce used in Southeast Asia as the basic flavouring is made of rotted fish and smells very bad. So we not only have disgust, but we have some favourite foods that are disgusting to many of us and many more people outside our home. So it disgusts us, though it's very powerful, it is fairly easy to remove. In fact, just exposure. The problem is that when you find something disgusting, your inclination is to never eat it again.

John: I would say I've partially overcome it. I've never been in a context where I've had to. I mean, I've eaten lots of strange things, like in the Middle East I've eaten sheep eyeballs and I've eaten a lot of brain and so forth. Things that many Americans wouldn't touch. These hardly qualify.

Jeremy: Uh, yeah, I was going to say, that that's all fairly normal stuff. I mean, I'm talking about, you know, the the buried fish or whatever it might be.

John: The closest I've come to that is I did a lot of work with animal bones in archaeology, and I would collect — I wouldn't kill animals to get the comparative skeletons — but I would collect road kills, maggots and all, and I would horrify my students when I would drag a maggoty deer carcass into the car. And, you know, I'm aware of the smell, but I sort of learned to tune it out. But I've never actually eaten any of that, nor would I. I'm not sure I would fare very well.

Jeremy: One final thing. The fear in Western cultures that rotten meat is dangerous, it's not entirely mal-founded. I mean, botulism is named after the Latin word for sausages, and it was a fact. Still is a fact. So, is there evidence that people who regularly eat purified meat, do they suffer more than we might expect?

John: Well, this is a great question, and it's something that I would love to actually cooperate with a specialist who deals with the bacteriology and who really knows about. botulism; the bacteria that causes it, when it grows and the conditions under which it grows. Because it is an interesting question in the ... I can't explain it, but let me give you the Arctic example. There's virtually no evidence of botulism among northern people until the 1970s. And then it began to become a real serious problem. And what happened was, well intentioned Euro-americans thought that the traditional techniques, the things that you read in all those quotes about just burying the stuff in the floor of a tent or in a pit out in the backyard for three months before you pull it out and eat it, that that was unsanitary. And they introduced sealed glass bottles and sealed plastic bags that were, you know, pre-sterilised and so forth, and they tried to get the Eskimo to move their fermentation or putrefaction from below ground into food sheds above ground. And that's when you started getting the outbreaks of botulism. And I don't really understand enough to know exactly what the differences were. That is why those changes brought about the outbreak of botulism. So what I concluded, and this is as far as I felt I could go with my knowledge or lack thereof, was to say we can't simply assume that rotten meat is poisonous meat. We have to understand why and under what circumstances meat rots and becomes dangerous. And when it putrifies but remains utterly safe despite how disgusting we might react to it, and I don't know the answer to that. We really need some cross-disciplinary interaction to try to understand when botulism is a threat.

Jeremy: That's one unanswered question. And there's another to do with Professor Speth's original idea that maybe Neanderthals and early humans weren't in the least bit disgusted by putrid meat. That's a question for Paul Rozin.

Our disgust — Western. I don't know even what to call people, mostly — but the disgust that seems to be fairly common for putrid meat, is there any way to think about when it might have arisen in in human history and human evolution?

Paul: Well, no, that's a really good question. We really don't know the answer to that. And of course, putrid meat and putrid things can be rather safe to eat. And certainly in the case of food shortage is better than nothing.

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