Bret and Heather 65th DarkHorse Podcast Livestream\_ Because ...

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**SPEAKERS**

Bret, Heather

**Bret** 00:10

Hey folks, welcome to the Dark Horse podcast live stream number 65. We believe we have a lot of new people joining us today. And so we're gonna have to figure out how to intermingle and get the people who know how we think on board and get the people who haven't experienced much yet onto the same page. If you are new, there are drinks and snacks on the back wall and the engines are in the freezer, actually in the freezer. Yeah, the

**Heather** 00:36

freezer moved yourself.

**Bret** 00:37

No, no, it's it's over that way. All right. So in order to get us onto the same page, we are going to have to introduce some some concepts that we use here pretty regularly. And we're going to give you a little thought experiment, and we will return to it later in the podcast. So we want you to think about this question. You walk into a house, there's a gun on the table, you pick it up, put it to your head, pull the trigger, and it goes click was your behavior safe? Alright, we will come back to that. And you will see the relevance of it in the context of our discussion of viral virology, vaccines, etc.

**Heather** 01:15

Okay, top of the show, I thought we were going to just do a few logistics. So let's just get those out of the way here. We're thrilled to have the new viewers that we know we picked up some from our bill maher experience last night, which was wonderful. And one of the things we want to do is thank Bell and the whole real time team for for the opportunity. So for those who have not been here before, and for those listening, you'll have to skip, you have to switch venues in order to make this happen. We do a we do this live stream once a week. And we take a 15 minute break or so after an hour, hour and a half. Sometimes it goes longer. And then we come back and do a live q&a. And the questions come from you through Super Chat at this point, we're working on a different platform. But at this point, it's through Super Chat. And so if you put Super Chat questions into the queue now, we we will see them we never get to all the questions we make no promises that we get to them all. And then questions that you asked in the second hour. We We also prioritize in the order in which they come in. So if you're interested in that, stick around, and if you're interested in asking us questions, go for it. And if you are interested in a more intimate q&a, we actually do once a month a private q&a for members of my Patreon. The questions have all been asked for this at this point. But it's tomorrow at 11am Pacific. And so if you are interested in in getting even more from us on a smaller platform where it's intimate enough that we can actually watch the chat and sometimes engage with it. Go to my Patreon how they're hiring and and join there. So that's that's logistics. You gave the teaser you're going to give Yep. And let's just let's just launch right in that. All right. So like I said, gratitude, to Bill Maher, and the whole and the whole team there. I'd also like to offer an apology. Why exactly did I not answer

**Bret** 03:17

his question? I know why you didn't answer this question. You do? And you

**Heather** 03:21

could answer this. Yeah, let's we'll talk about this just a little bit. So Bill asked me a few times, if I wouldn't be more comfortable taking the AstraZeneca vaccine than either than already vaccines? And the fact is, he knows the answer to this because we ourselves had discussed this on I think it was Episode 58, an episode that we devoted to largely to talking about the vet the different vaccines and and what the various risks of them were. I didn't respond directly. Either either or any of the times. I'm not sure if he asked me two or three times. And here's why. So you know, the fact is yes, the answer is yes, I would prefer to take the AstraZeneca vaccine to either the mRNA vaccines that are currently on on the market. Why not? Because AstraZeneca is a traditional vaccine. It's not but it has a more traditional a more established delivery mechanism than the mRNA vaccines do. So what that means is it's not a traditional it's not traditional vaccine does not have an attenuated actual virus associated with that, right. It's actually a DNA vaccine and the mRNA vaccines are obviously RNA vaccines. What it has though, is an adenovirus associated with it which is its delivery vehicle and and there are a number of gene therapies that have used and you know, viruses in the past. There have it's been fewer and more recently that they've been begun to be used in vaccines. There's an Ebola vaccine is being to use it. We have a visit from one of our podcasts you guys may see shortly. So The adenovirus delivery mechanism is somewhat new. But Dino viruses have been part of the human selective experience our evolutionary environment for presumably millions of years. Whereas the way that the mRNA vaccines get into you and the cells as they're coated in what are called lipid nanoparticles, LNP is and so you'll sometimes see them called mRNA dash LNP vaccines. And, and those are brand new to the human evolutionary environment, we just, we simply have no history with them. And they might work, they might be awesome, we're like, everyone who makes any sense is praying that they are hoping that they are thinking these mRNA vaccines might be the future of vaccine technology, because one of the things they have going for them is their very rapid development possibilities, as we saw with these two, but because the LNP is the lipid nanoparticles are brand new to human to human evolutionary environment. We just can't know yet. And so the risk seems higher. So that's why I didn't answer your question directly. Bell, and I apologize for it. But yes, I prefer the AstraZeneca vaccine.

**Bret** 06:11

All right. So this actually brings us back to the thought experiment, right? And we will link the two up here. So you recall, the thought experiment is you walk into a building, there's a gun on the table, you pick it up, put it to your head, pull the trigger, and it goes click, now, was your behavior safe? Now, obviously not, that's an incredibly reckless thing to do. Were you harmed? No, you weren't harmed. So when we say that something is unsafe, we are talking we are including the question of uncertainty about harms that may come from something. And so the question about the various vaccines comes down to harms we know about because they have shown up in the phase three trials, and harms that are emerging in what's referred to as phase four, which is where we are now where a large population is being vaccinated, and we're tracking events that may or may not be related to those vaccines. But what we don't know is anything about what happens three years down the road, five years down the road, there may be nothing, there may be something. And frankly, it could go either way. So the point is, there's a lot to say, knowing nothing about the long term implications of these things. Would you bet that a vaccine that is built out of a viral delivery mechanism that is similar to viruses that human beings have been dealing with, for probably, as you say, millions of years? Or would you go with something where the delivery mechanism is entirely novel, we have no evolutionary history with it, and so no information about how the body deals with it. Now it could be and there are reasons I could make the argument why the mRNA vaccines stand a chance of being safer in the long run, they don't interact with the nucleus, a lot is going to come down to differences in the cell nucleus, right? So the mRNA is delivered by these lipid nanoparticles into the cytoplasm of the cell where the ribosome is then translated into spike protein, which then shows up to the immune system effectively gets displayed on the surface of the cells in which the vaccine has entered and the immune system recognizes it is foreign, which is how vaccines work.

**Heather** 08:20

Go, I have one more thing to say about this, okay.

**Bret** 08:23

So it is possible that the bypassing the nucleus has some benefits, it is essentially certain that there will be different affinity for different cell types between the different vaccines. And that may have a lot to say about what risks do and do not exist down down the road from here. But the basic point is we are stuck in the present with no information about the long term impact of any of these vaccines, we have some basis to guess on the dino virus vaccines, we have no basis to guess for the mRNA vaccines. And so given that, if you had to pick, what would you do? This is a relatively simple question. So

**Heather** 09:01

it's basically precautionary principle, right? You prefer the technology or solution that's been around for longer, all else being equal. And you know, there's a ton not equal here, but it's in so far as we can tease away all the other variables. There are some clear ways in which the AstraZeneca vaccine has a more established history, it's elements of a more established history in the human body.

**Bret** 09:23

Right? And so if you think now back to this little thought experiment and the conclusion that putting a gun to your head and pulling the trigger is definitely unsafe, but not necessarily harmful. Therefore, safety is about risk, then the question is, well, what is the risk? Now, the harms could go the other way for there's so much complexity here. So there there it is very easy, we could put together a dozen scenarios in which the actual harm that we would know about 10 years 20 years down the road, would go the other way if it shows up at all. So the problem is very hard to get all of that nuance into a very tight discussion complex to something like that. Yeah.

**Heather** 10:02

So I guess actually one more thing, as long as we're talking, once again about vaccines, which is not mostly where we're going to, we're going to spend time today. It occurred to me Actually, when we were down in LA before we went on realtime last night, you know, you and I were both reading up some more on some of the literature that's out there. And you know, what, something that many people will have heard is that both the Pfizer and the Madonna vaccines need to be stored at extremely low temperatures. And most people will not have stopped to consider why that might be in part, maybe in entirety, at least in large part, it's because RNA is very, very susceptible to decay. And that you can basically stall the decay out by keeping it in such low temperatures that it that it can't, but not only is it susceptible to decay. But once it gets into the, the space between the cells in the body, you have ribonuclease bases all over this all over the place, that are just waiting, primed to destroy RNA. And so this the lipid nanoparticle coding the vaccine is basically a way to sneak the RNA past the interest intercellular space into the cells. And what what all of that means one of the implications, I think, and I don't think I've seen this anywhere else, is that if there is an error in, in transportation, in storage in taking too long after you've taken out of the freezer, and gotten it into your arm, it is likely actually I would think that these vaccines actually lose efficacy. And so you are going to get something close to a binary situation of this vaccine is either as effective as it can be. And it might even this might mean that it's actually the our mRNA vaccines are actually really close to 100% effective, because what you have sometimes is a failure to keep the vaccine cold enough such that the RNA is already completely degraded by the time it gets on to you such that it's not effective at all. And so what you might expect with the mRNA vaccines, this is a prediction I'm making is extremely high variance, actually that you don't have that you will be less likely to have some protection within an individual rather, you would have like this worked because the vaccine did what it was supposed to because it was kept at the storage in the storage way that it was required to or it wasn't and therefore it was just getting a placebo effect as

**Bret** 12:31

well. So I don't see any reason to expect a binary I agree with your prediction about the variance. But in effect, there's some threshold we're shooting for ideally, with a virus, you want to see cellular immunity emerge, that is to say, T cells that are responsive, in this case to the spike protein that is being encoded by the mrnas that we're delivering to the cells, you want to see T cells that react with that would tend to give you a good lasting immunity, which is of course the objective of the vaccine. And so there's a question about how much of how much of the mRNA has to actually survive to get into cytoplasm to be displayed to the immune system. To get that response, there will be individual variation, there will be individual variation, for reasons that probably have to do with variation in individual immune systems, there's also going to be a certain amount of luck, which cells actually get reached by this, you know, this slurry that's going to be injected into people, it's going to hit some cells, and it's going to enter them and how well it is displayed to the immune system will matter. I also wonder how this interacts with prior exposure to COVID. Right? So the fact that this spike protein is something that some immune systems will have seen, and some immune systems will not have seen, raises questions. So anyway, I would expect a lot of variance. And the degradation basically, if you know, just simple chemistry tells us that if the low temperatures are necessary in order to keep these molecules viable in order that they make it into the cells, that those that have been kept out of the freezer too long, and we've heard multiple stories now of, you know, what's the word? Some group of vials is warming up and vaccines are delivered to people so they don't go bad. But you would imagine that there would be intermediate cases and what will those look like and how will we recognize them in in a data

**Heather** 14:36

set? Yeah. Now in this case, I would I would not imagine that as they warmed up that they would become dangerous, they're just going to become not effective.

**Bret** 14:47

I agree. first pass, I guess the same but I'd love to know. And, you know, hopefully, hopefully what happens is they the stray mRNA is do just get chewed up in the normal course. of the interstitial space being being cleared.

**Heather** 15:04

So for those of you new here, our producers, our 16 year old son, Zack, Zack, can you show my screen? Do we have that capability at this point? Cool. So I just want to read one paragraph. This is a paper in actually, this is a news article in the journal Nature biotechnology, which is one of the nature group journals from the end of November 2020, which was, at that point, a perspective imagining looking forward and saying, what are the vaccines that are likely to be out there? And how do they compare and what are the risks? This is actually an excellent paper and I'll I'll put it in the show notes. But I just want to read one paragraph from it, which I've highlighted here we go. Still much about the vaccines efficacy and safety. And here she is talking about the mRNA vaccines in particular, still much about the vaccines efficacy and safety biological details that could shape the course of the vaccines impact on contain the pandemic remain unknown. Quote, personally, I'm waiting for further data concerning T cell responses and duration of the antibodies says Stanley Plotkin, a pioneering vaccine ologists and former pharmaceutical executive who now consults for vaccine manufacturers. And while acknowledging that the data reports data are, quote, very encouraging, Plotkin is reserving judgment on the mRNA vaccines until more results become available from late stage trials of the many other experimental vaccines now moving their way through clinical development. Later in this news article, I believe it's him who says, by the end of next year, meaning at that point, by the end of 2021, we should have enough data to actually compare both efficacy and safety, at least through you know, a year ish of the various, the various vaccine platforms that people are now getting throughout the world. And, you know, he as everyone should be is very much looking forward to seeing what those data look like.

**Bret** 16:48

Yeah, I think it's important. We've already seen some changes, of course, for example, cautions about pregnant women not getting vaccines that,

**Heather** 17:02

yeah, although on that one, yep. So the who, and the CDC seemed to be in disagreement, they were, and now they've both they've both gone back to the party line at both saying there's no reason to think that the vaccines should should harm pregnant women. Now, as far as I know, they haven't those trials don't exist. They're just sort of saying, again, we don't think it's going to be harmful. I would be I would be very cautious if I was pregnant, about getting anywhere near a very newly developed vaccine.

**Bret** 17:35

I agree. And you know, it cuts both ways. COVID is liable to be consequential for pregnancy. So you know,

**Heather** 17:43

we are be even more careful about lockdown and, and masks and social distancing.

**Bret** 17:48

Yeah, so we are not we are in a very tough puzzle effectively, we are all guinea pigs in a couple of experiments running in parallel one having to do with vaccines, the other having to do with this novel virus, and it is very difficult to juggle the competing hazards. And there are clearly short term very large hazards that come with coming down with COVID. And then we have to compare that to all of the unknowns over in vaccine space. And it's not an enviable position we find ourselves in

**Heather** 18:20

Yeah, no, it's really not. So we've got to do at the top of the hour, just a mention of where we're hoping to go, I think maybe is now is a good segue to talk a bit about consensus science. And then we'll talk a bit about some of the interesting emerging work on the impact of diet on COVID outcomes. And maybe just finished with a little marine segment talk a little bit tuna, maybe and sea stars, which we've promised the sea stars thing, just just a little true. anecdote about cs dishon anecdote, a deep phylogenetic history about sea stars. Yeah, so that some people may find interesting

**Bret** 18:57

to our sea star enthusiastic fans will point you Today we will we will get over definitely getting there. I believe we are getting to Okay, now that you've said that I already have Do we have no choice? I have no choice. Okay. So consensus science. All right. So, let us distinguish first between two kinds of scientific consensus. On the one hand, we have scientific consensus that surround things like whether the the living creatures of the earth are the result of a Darwinian evolutionary process. There is a consensus around this. Now those of us who are directly in this field, disagree over some of the details about how that might work. But there is no substantial disagreement about whether or not a fundamentally Darwinian paradigm explains the existence and diversity of those creatures. Now, it is always because it's scientific, open to some revolutionary discovery that would lead us to understand that we had gotten it wrong. It could be something like were we to discover that we were in a simulation, and that the simulator started with all of those creatures finished. And the fossils were integrated into the simulator in order for us, you know, to see what we would think about it or something like that, or to ensure that we came to a particular conclusion. Okay, well, that would have been Darwinism. But nobody spends their time worried about this, because what we have is a universe that appears to be real, and the overwhelming evidence of, of a Darwinian explanation for life. Likewise, the earth goes around the sun, HIV causes AIDS, these are plate tectonics, plate tectonics, these are places where we can legitimately say something about settled science, no science is so settled that it couldn't be unsettled by a later discovery, but you don't spend your time worrying about it.

**Heather** 20:53

But one thing that is notable about all of these examples, is that consensus, true consensus consensus that does appear to reflect underlying reality about what is going on in the universe takes time. It never happens overnight, you don't, a pattern does not come to exist in the world. And immediately we know and everyone agrees and to consider any other possibility is to is to be a conspiracy theorist or unscientific. No, quite the opposite.

**Bret** 21:18

Well, alright. In general, that's going to be true. And I bet that's always true in in our quadrants, a counter example with, you know, in complexity space, yep, this is probably a given. I'm thinking in particular, of gravitational lensing. And Einstein's insight that given relativity, that a massive object, like the sun would appreciably bend, starlight such that it would be visible from Earth.

**Heather** 21:51

So there's I don't know enough about the history of what people were thinking, though. So in that case, there there was an opportunity due to an astronomical event that allowed that idea to be falsified or not, right. And so there was a moment before and after which you could say, there it is, this prediction was, was risky. And we saw it, and there we have it. But it advance of the observation. I don't know, I don't know what the collection of scientists were thinking this is.

**Bret** 22:23

Yeah, I'm not an expert on it either. But I would say, we know that there was at least diversity of opinion, and that the idea of space time where gravity is actually a warping of space was certainly not thoroughly accepted. But my point is that you get effect in physics, you can get turning on a dime. And so what happened for those of you who don't know the story is that there was a total eclipse of the sun, you can't observe gravitational you need an object really, because gravity is so weak, you need an object that's really large to bend light enough that it can be easily detect in the sun qualifies, the sun is big enough, but the problem is the sun put out a lot of light of its own. Yeah, it creates the impossibility of seeing the stars behind it, right. So what you need is an eclipse that hides the sun's direct light and allows you to see where the stars are, and the stars move based on the gravity or basically the space bends or the gravity bends the the light. So but the point is there was a famous excursion to go view the total eclipse and the point is the result of that was resulted in, I believe, a very rapid transition in people's acceptance of this idea.

**Heather** 23:34

Well, and so you know, you said in complexity space, what I had said about consensus takes time is going to be true. And you know, physics is fundamental space, rather than emergent or complexity space. Generally. I wonder if another the analogy that could lay directly on top of that almost like an imperfect Venn diagram overlap and would be sort of population level thinking that your work that requires population level thinking, which is to say, a recognition of a variance within a population, and you can in your immediate your, your little clues to figure out if the kind of work you're doing you're interested in thinking about requires that is, are you going to need statistics in order to figure out whether or not you've got a pattern that is real as opposed as opposed to you've convinced yourself because your biases are strong, right? And all of our biases are strong. That's that's what science is for is are in order to reduce the power of our biases and allow us to see reality. So you know, population level work, work that requires statistics in order to determine whether or not the pattern you think you see is actually a pattern that is different from what you would expect by chance is very different from Einstein saying, if this is true, then I am right. And he in his and his logic was perfect. The scientific logic was perfect and all it took was one event because gravity isn't very And in the way that the behavior of bonuses, right, right. Okay, or the behavior or, or the evolution of viruses highly variant, right? We're going to have variable outcomes,

**Bret** 25:11

right? Okay. So you've got examples of what I would call natural consensus where the consensus arises out of the fact that the evidence is overwhelming. And it eventually persuades everybody who is paying attention to the evidence and knows how hypothetical productive work is done. And then you have this other phenomenon, which is the rush to consensus, for some reason. And it's not going to be obvious to people on the outside. But in effect, the idea that our most powerful notions are the result of demonstrations that produce a consensus means that it is a tantalizing goal to be able to claim that that is what has happened in this case, this case is important to me. And it also has a consensus. And so, what we see in the case of for example, the the question of the origin of SARS, co v. Two is a rough to claim that there is a scientific consensus that this could not possibly have come from a lab and it must have come from nature. And that consensus, which was widespread in certain circles, was completely unnatural. And it was not based on the evidence being compelling in as a matter of fact, most of the elements of the hypothesis that was put in front of us as to how this emerged from nature, most of those elements have since been falsified, and nobody believes them anymore, the wet market was not part of it. pangolins were not part of it. And so the the consensus was about something else. And I want to try another just simplifying. It's not really a thought experiment. But I want to just try to lay out where I think we find ourselves with respect to what it is that the people best positioned the virologists and epidemiologists epidemiologist, how it is that we might have arrived at consensus here. And I just want to draw this picture, one of two things must have happened. Either the people who warned us that there were diseases in nature, just waiting to find their way into humans. And one could cause a terrible pandemic that would grind the world to a halt, either those people were right. And their plea to engage in a rapid program of studying really dangerous viruses by enhancing their pathogenicity was not early enough. But it was the right idea, in which case, we should presumably be greatly increasing the amount of resource resources we throw at gain of function research, or these people caused a research program that enhanced the virus that then escaped. And we are now suffering the terrible consequences of the research itself, in which case, the belief system of the same group of people has caused all of this harm. And so I just want to say, when we say well, there's a consensus among the people who are best positioned to know where this virus might have come from. We are talking about people who are hovering between two interpretations of what has happened. If this is a natural virus, then they were prophetic. And they are the best hope for preventing this from happening. Again, if this is laboratory and origin, they are responsible. Now I want to be I'm not arguing for moral responsibility here in the sense of if this is a lab leak, it's a massive error in judgment. It is an international error. But I do not believe it is the result of bad people. I believe it is the result of bad judgment. And we must learn the lessons. All right,

**Heather** 29:04

and just asterisk there. If it's a lab leak. The evidence suggests that is a lab leak that is due to a collaboration explicitly between a lot of scientists, at least in the United States and China, and presumably other places as well. But but specifically the US and China, there's no, this isn't the China virus. This isn't right, none of that, right.

**Bret** 29:25

It's the US and China and a community of scientists who were very good at what they did. And our government funding structures, all of these things are involved. Now, I will say more like I want to

**Heather** 29:39

push back on your binary though I don't think that's I don't think that's a fair characterization of you know, what you said was either or either. zoonotic diseases are a rising threat of zoonotic diseases being those that have been endemic in some species and they jumped to a new species and generally it's only when it jumps to a human species that we tend Think of them and call them zoonotic. But you know, any, any cross species transfer could be as a notic disease, I think that may be a semantic thing. Either that's true, or gain of function research and serial passage and research have been, have become dominant in the sort of public health vaccine development research game on viruses. And tonight diseases despite the fact that there is little chance of zoonotic diseases emerging in this way, which is, as you said, on Mars, it's unusual for, for a virus to jump and immediately be able to be both highly infectious of an individual into which it jumps and be able to move quickly between hosts of its new species, it usually takes some time to adapt. And the serial passaging research that is, we know is being done in various labs in the US in China elsewhere. Exactly would facilitate the virus viruses to be able to do such things, but I don't think it's an either or. Right. So actually, I'll let you get back to where you're going in just a minute. Zach, if you would just show my screen again. Again, I'll put a link up to this for people who are interested in pursuing it very interesting, I find article from I forgotten when 2013 sometime 2012 called ecology as you know, sees natural and unnatural histories. And it goes through exactly, you know, it's not it's, it's on time lab like this is 2012. But it goes through how changing you know, human use of habitats, how changing population densities, how changing diet, how all sorts of things that we are doing in the world can change the chances that a news and otic disease will arise. And this is the kind of analysis this work right here by koresh and Andy Dobson and and many, many more is the kind of theoretical work the you know, the review of what is known and what the kinds of parameters might be that we should be considering, as we think about whether or not you know, are so not exist, it's just on the rise, and there's nothing we can do about it. Well, if they really are just on the rise, what is different from now than when they weren't on the rise? Right. So I just, I just wanted to caution there as an either or I think both can be true,

**Bret** 32:31

both could be true, it could be that this is a lab leak. And it is also true that there are viruses hovering out there ready to turn into a pandemic, that that is true. And I thought about how to do this, to include that. And it's to complexify. Because even if this is the case, right? If it is a lab leak, then the fact is, what we have done is increased the chances of facing a pandemic by solving a problem that most viruses cannot solve, right? How to get into a new species and spread within it is a difficult puzzle, not impossible, but difficult. And so still, from the point of view, I mean, remember my point here is really about human beings, and how they are likely to decide what has happened based on either being the villains in a story, or the heroes of the story. And again, I do want to say also, I think that this is, you know, as I said on Maher last night, and as I will go into later here and probably will talk a little bit about the probabilities. But I think this is highly probable that this came from a laboratory, it was the result of gain of function research, the instinct to do that research, I believe to have been a massive error. The culpability goes to the collective that decided to allow this if this is what has happened. This changes, though, at the point that the obviously viable hypothesis that this disease has emerged from a laboratory is shut down with false consensus, right, that we actually have a right to know. And even if that right to know involves a completely open investigation of the lab leak hypothesis that proves it didn't happen, right? We have a right to go that route, rather than have this shut down so that we know how to protect ourselves going forward. And at the point that you block that conversation and you demonize people who would start it. Now you do have culpability and the fact that life and limb is riding on this means that those who are blocking the conversation to the extent that they are aware that this is actually much more plausible than they are letting on. They are taking responsibility for the deaths that happened that could have been prevented if we had simply been allowed to investigate this question.

**Heather** 34:55

Absolutely. I 100% agree. Before you talk A little bit about where you arrive at your estimates of probabilities which you were also doing on you know we started this this live stream back in late March when very recently at that point the who and the Surgeon General were advising everyone not to wear masks and we had been wearing masks in public before anyone else was in feeling kind of awkward about it but obviously if it's a respiratory disease that's what you should do to stop the spread

**Bret** 35:25

was the bandit of our local hardware store the

**Heather** 35:27

bandit of the

**Bret** 35:28

Logan factor after everybody started wearing masks people would comment when I came back and you were the guy who came in here wearing your bandana back and nobody else was

**Heather** 35:36

excellent. So let me just in service of there are some voices in the in the scientific establishment who have been saying this is what we are not hearing for the most part is these voices in the media. So Zack I just want to show a couple of papers from my screen again. Here we have a nature paper from 2015 engineered bat virus stirs debate over risky research lab made Coronavirus related to SARS can infect human cells. That was in 2015. Okay, and then just two for now there's there are a lot of these, here we have Proceedings of the National Academy of Sciences in 2020, this is November of 2020. Just you know, two months ago opinion to stop the next pandemic we need to unravel the origins of COVID-19. Here we have finally and increasingly scientists in the establishment with you know, with faculty and research positions saying Actually, no, this consensus was arrived at far too fast without sufficient data. And not only is that unscientific, it's dangerous.

**Bret** 36:43

Yes, and we should also point I we will never probably know but we are have arrived at the place where we can now begin to have this conversation in public without the stigmas that come back having a devastating effect. We have arrived there in large measure because of the so called drastic group who organized on Twitter. Some of these people are known, some of them are anonymous, but this is a group of very dedicated scientists who have doggedly chased down all of these leads and unearth important pieces of information that we now have at our disposal. And so anyway, there's a lot more to be said about the drastic group and how they accomplished what they did. But for the moment, let's just say we owe them a huge debt of gratitude and I hope that the full impact of their hard work is is ultimately understood in this story.

**Heather** 37:40

Very good. All right. So whenever you want I'll talk about diet but I think you have some of the things you want to do first yeah all right. So it looks like you've been colonized though.

**Bret** 37:49

Yes, I have been colonized by this is fine feel it. Zack Do you want to put up the diagram I sent you? So I just wanted to show so my statement last night that in June it turns out to have been may but I said on Maher that I thought as far back as June I had rated the chances of a gain of function lab leak as 90%

**Heather** 38:13

and this is something you would have shared on whatever episode that was Yeah, I did share it in this I absolutely

**Bret** 38:18

put it up so this is my flowchart It was my attempt to label all the major possibilities for how covid 19 pandemic could have begun including things like the Wuhan wet market which is on there

**Heather** 38:35

so these are these are your estimates These are my essence you know he he gives us no receipts here.

**Bret** 38:41

Yeah, well I mean you know, any one of these things could be

**Heather** 38:45

but let's just pick one or two and let me out you know, how do you you know, how do you arrive at I don't even know which which one would you like me to which one would you like to explain how you arrived?

**Bret** 38:57

Let's talk about the one on the far right over there since Bill mentioned it last night, intentional release. Yeah, intentional release of the virus, I have it at less than 1%

**Heather** 39:08

probability for those of for those of you who are listening rather than watching, this is again a a flowchart that Bretton made, where you start at a wild Coronavirus, and you end up at the covid 19 pandemic and he has various probabilities your estimates in between that include bat to human v intermediate, such as a pangolin. Then through human Are we on seafood market or directly something that happened in the in the labs based on pure research or bio weapon research or, you know, or was a lab late versus intentional release. So those are sites I'm not going to be able to describe the visual, right for those who are listening, but I attempted

**Bret** 39:52

to put a pathway up here that covers all of the plausible explanations. There's not really creative stuff, the virus didn't come from space, we don't have to worry about that. So those things aren't on here. But every plausible thing is embedded at least on one of these paths. And so the reason that intentional release is down below 1%, but it's on here is that it's very hard to distinguish a gain of function, virus of virus that has been enhanced or gain of function research for weapons purposes, from one that was done for biomedical purposes. And in fact, the research has arguably dual purpose, right? So we don't know who funds it, why what's going on, we don't know what we don't know. And so let me just say, I have seen zero evidence that there is a

**Heather** 40:48

dual purpose, meaning defensive against a presumably naturally emerging zoonotic disease, and potentially then also useful as an offensive weapon.

**Bret** 40:58

Right. Now, we've set up upfront when this is a much newer pandemic, that this didn't, this virus did not appear to behave in a way that it would be a highly effective weapon, obviously, it has created a huge amount of economic chaos. So who knows what who might be thinking, but anyway, the intentional release. If it happened, if somebody had enhanced the virus somewhere, they might have released it in Wuhan so that the Wuhan Institute of virology would take the blame, they might effectively have framed the Wuhan Institute, very hard to falsify that notion that would explain the Wuhan Institute's reaction, which is we were shocked and worried when we saw this virus showed up. But now we know it had nothing to do with us. On the other hand, they haven't behaved in a way that of lab that had nothing to hide would tend to behave lab it had nothing to hide would tend to say, Hey, take a look at our books, take a look at our freezers. Right, this wasn't us. We know how it looks. But you know, you're welcome to check our notebooks. And that is the opposite of what has happened. So in any case, I would say there is one weird fact that showed up very recently, just one. Well, there are many weird facts. And there are many percentages here on this chart that I would change now. But the who commission looking into laboratory origins a commission, which clearly has conflicts of interest, based on Peter Dashwood being on this, this panel has said something to the effect of it's too early to even say that the virus started in China. Now, I don't know what the hell they're talking about. But if they have something of that nature, you know, I don't I don't know what to make of but I must say I'm everything I hear from this panel is going to be taken with a grain of salt until they establish they can do the work honestly,

**Heather** 42:50

likes, like so many of these statements, you know that that could be exactly the kind of due diligence that you want from a team of international researchers who are trying to figure out this thing that has decimated life's lives and economies? Right, right. Or it could be a faint, and sort of you know, this is this is a Potemkin panel that does isn't actually interested in figuring out what, where, where this thing started for Why? We may never know,

**Bret** 43:16

right? They they could be trying to get ahead of the story, they've clearly lost the ability to shut down the discussion about Black Lake, you know, they only got away for so long with accusing us of being conspiracy theorists. And now that's that that accusation has just lost its thing. So who knows you're being wielded? Of course? Well, of course. But the point is, people are listening less and less because there aren't enough credible voices saying actually, you know, there are four different kinds of evidence that are pointing in this direction.

**Heather** 43:44

So I do wonder, I do wonder those who have been you know, shouting loudest about those of us who've been talking loudly about being conspiracy theorists, are they if if if lab leak turns out to be something that is discovered to be true, and you know, whether or not that therefore is, you know, something of a cover up on the order of like Chernobyl, right? If, if lovely turns out to be true, how many of the people who have been saying, not only is lab like not true, you are irresponsible to talk about it? How many of them are actually going to own up to the anti scientific rhetoric that they engaged in?

**Bret** 44:28

I don't expect that at all. And frankly, the typical thing would be even people who saw the story for what it was and who were falsely demonized will not have the reputations resurrected. So there's some you know, obviously something Eric has talked about extensively, but the distributed idea suppression complex, what he calls the disc, is a very effective mechanism for deciding who gets to speak on issues and the who gets to speak isn't really about who turned out to be right in the end. Right, it's a lot about power. So anyway, I would say, you know, this chart was obviously done back in May, the idea that the wet market was involved was still alive idea that idea has now been falsified by the Chinese. Many of the initial cases who had no connection to the Oregon seafood market. So interesting

**Heather** 45:24

that you had that five times higher than the idea of an intentional release.

**Bret** 45:29

Well, the thing is an intentional release, an intentional release would have to be one of two things, I think, or some version of it either would have to be the Wu Han Institute, in which case, they wouldn't release it in Wuhan. That might be insane. Right? Or it would have to be somebody framing the Wu Han Institute. Yeah, in which case, I would want to see some kind of evidence of that before, you know, worrying about it. So anyway, less than 1% is meant to indicate it's very hard to falsify this idea, but there's no positive evidence for it. And until there's some positive evidence, it's just not you know, it's on the chart. You just

**Heather** 46:05

have to leave it up there as a possibility. Yeah, yeah.

**Bret** 46:10

So Alright, so anyway, I would actually say the chances of a lab leak has gone down very slightly, even though the evidence for lab leak has gotten better and better and better over time. what's what's that about? Well, it's about the possibility that there's another route that would have done the same thing. So like I said, there are multiple kinds of evidence pointing in the direction of a lab leak, some of them having to do with, you know, circumstantial evidence of the way the lab behaved. The deletion of databases the bizarre relabeling of sample for 991 is our ATG 13. There's all sorts of stuff that makes the lab look suspicious. There's phylogenetic evidence. There's molecular evidence, there's epidemiological evidence that point in this direction.

**Heather** 46:59

point of order, though. Yeah, I do. I don't know where you're going in terms of why you think even though the evidence is growing, the chances that it's a lab leak have actually gone down slightly. That's an that's an amazing sentence. The phylogenic evidence to which you just alluded, is if if memory serves that there was this virus found that infected six minors in province almost 1000 miles away in 2013, you know, right. And that it is something over 90%, somewhere like 96%, similar or something, I don't have the numbers in front of me to SARS, cov. Two, and the fact that it is so to us, and to many people who are thinking about this carefully and have an evolutionary framework that seems like that, that that provides some evidence that this that is that was the sort of the backbone virus, on which some serial passage research from Ghana functional research was done. And you would expect the result and virus to be very similar, and then quite different at a few notable spots. Right. And I have heard mainstream virologists, epidemiologists claiming that the fact that it is not identical to SARS, cov. Two is in fact, the phylogenetic evidence against a lab leak. So I just like so this point, I think is fascinating because exactly the same data are being interpreted by us and others as that is that makes it at least possible and perhaps probable, that that was the backbone on which Ghana function research was done, hence the differences and is interpreted by others. As see there is no possibility that this escaped from a lab because it's not identical to the virus that was discovered in 2013. Right? So it's just like, this is sometimes how science looks. I'm not I'm not saying that everyone involved here is acting in good faith and with complete honor. I hope that they are I don't know that but sometimes you have exactly the same data and wildly opposite interpretations.

**Bret** 49:08

Yep. That was not really the phylogenetic evidence I was I was pointing to I would say, you know, the failure of the overall SARS Coby to virus to settle at one position in the phylogeny that it has, you know, overwhelming similarity in one way to other beta coronaviruses. And then it has weird spike protein stuff from somewhere else but don't belong in beta Coronavirus at all. Well, there's the first insight which doesn't belong in beta Coronavirus is where it's literally never been seen in nature and yet here it is,

**Heather** 49:37

and so that's been found, it develops in serial passage research and things like mink, right, probably ferret, although ferret and ferret or mink, very, very, very close related. And then it also the frankly which sites have developed in poultry farms, so in in basically domesticated agricultural situations and in research labs, but Never in the wild.

**Bret** 50:01

Right? So anyway, it's a phylogenetic anomaly. Is it impossible to explain it through some natural pathway not impossible, but it's a it's going to be difficult. And what we would need to see is some evidence that actually there was something capable of doing the heavy lifting, right? Because we cannot just, you know, phony up a pangolin. And you know, imagine that that explains anything because it turns out it doesn't Yeah, they get saucy when you do that, too. So the the one the reason that I think there's a slight decrease in the chances of gain of function research at the Wuhan Institute being responsible is that the chances that So, back in May, we didn't know anything about outbreaks in MCs. Okay, we've now seen that minks get and transmit the disease. So there have been these little mini epidemics inside these mink farms. Lots of minks have been destroyed. Okay, that is in and of itself. Very interesting, right? There's a perfectly natural way that could arise out of gain of function research in which ferrets or minks had been used for serial passaging, which is that the virus is not new to this clade. So for those of you who aren't mustelid experts, I realize most of you are you'll just have to, you know, maybe take a pee break or something. But then the

**Heather** 51:13

people who aren't mustelid experts, experts mustelid being that clade of organisms that includes MCs and ferrets, yes,

**Bret** 51:21

the weasel Clayton. So that clade and minks and ferrets are I believe, sister,

**Heather** 51:27

they're very close it was closest extent relatives. I think I'm not I'm not sure I believe that's right, I

**Bret** 51:32

believe that there's also the possibility of interbreeding which would again, say, very close, but nonetheless, the idea is if a virus can get into a creature that it's not been in, but very typically when it gets in it has very low capacity of any capacity at all to get between individuals, right? You can get sick from a wild animal, but it's not the same thing as saying you're going to get sick and everybody you know is going to get it too because the chances are the virus won't know how to get out of you and into them. But in the case of minx Wow, right? Now we've seen others we've seen other stuff like caps big and smells big

**Heather** 52:07

and small gorillas right in the zoo in zoos anyway.

**Bret** 52:10

Yeah. Now the cats, as far as I know, can't transmit and get sick. But there's no evidence that they can transmit it. Same goes. I think there's some cases of dogs. So it's the case that you would expect which is the viruses infective

**Heather** 52:24

you can leave but then it can't, it can't leave again.

**Bret** 52:27

Yeah. Okay, so

**Heather** 52:29

anyway, spill over to use the language

**Bret** 52:31

right now, I'm a little bit concerned saying this out loud. But I think it's better just to say it out loud. And let's have a completely open discussion about it. The reason

**Heather** 52:41

you still want your screen up as it's been a long time,

**Bret** 52:45

take the screen down. So the reason for my slight adjustment to the lab leak explanation is that the possibility exists for some story to have had a bat infect minx in a mink farm. This would still be a self inflicted wound in the sense that the way we farm minks would open the possibility of an accidental natural passage experiment in minks that were housed very densely that could have explained the evolution of certain characteristics that we now see very hard to distinguish between that having happened on a mink farm versus having happened in a laboratory. Wouldn't explain it all. But anyway, I think the past the fact that there are mink farms, apparently, in China, and that there's some story like that that could happen. Yeah, is worth attaining as a person

**Heather** 53:40

that's interesting. And I happen, I happened to have a paper relevant to that cued up to that I wasn't going to talk about but you can just show it briefly. This is another 2012 paper from PNS from the proceedings National Academy called zoonosis emergence linked to agricultural intensification and environmental change. So this, what you just suggested is basically adding the caveat and that's adjusting your probabilities based on the new evidence that you didn't have in May, that you that there are outbreaks and make farms.

**Bret** 54:12

Yeah. So not expecting So anyway, most of the most of the probability that I would put on something like that is borrowed from the collapse of, of the wet market, explanation, pangolins, etc. But nonetheless, so we're still at a very high percentage. And you know, look, that high percentage is not a scientific conclusion in the sense of it is not the result of the scientific method is the result of something like a Bayesian analysis of the various probabilities. And, you know, the way the scientific method works, we put the hypotheses on the table, and we attempt to falsify them and at the point all have fallen, but one, that one becomes a theory. So this is the reason we are sticklers Around here to say that the lab leak hypothesis is a hypothesis and not a theory, I should say. Bill Maher and his people who have a, a wonderful well oiled machine of a, an organization, they put up a clip of us, and they had labeled it unfortunately, something like lab leak theory. And I asked them if they could change a diet pa thesis, and they were right on it. So I think the YouTube clip has been changed, and the others, it's gonna have to wait till Monday. But anyway, thank you very much for, for adjusting that it really helps us keep the discussion, careful to be vigilant about the distinction between theory and hypothesis.

**Heather** 55:44

Yeah. All right, should we talk about diet a little bit?

**Bret** 55:48

Let's do it. Let's

**Heather** 55:49

do that. What are we at? We're at closing in an hour at this point. Okay, so there are four papers or so there were more than that. But you know, it's early yet. And there are four papers that went looking at whether or not you might explain something about about the covid 19 pandemic, in terms of both likelihood of people getting infected, and people do get infected, whether or not, you know, how sick they get, if diet has any effect on those things. So if diet could mitigate the severity of your symptoms, and might actually change whether or not you get it at all, and of course, at this point, you know, a even if we had the resources, this is not the sort of thing you're gonna be doing experimental work on probably. So it's purely correlational. And it's basically looking at, you know, widespread, like what kinds of diets do people in, you know, different parts of India eat and in different parts of Europe. So the two big studies that I've spent some time with, again, big correlational. So suggestive, but not not decisive by any means. That we're largely looking at differences in in COVID-19, rates of diagnosis and outcomes for those who got sick across Europe. And in India. One of these papers is called, oh, no, it, it dropped me out. That's not nice of it at all. There it is. Okay, so one of these papers is from July of last year, by I'm probably gonna mispronounce her name. Busquets. Bousquet, all published in allergy, I think, unless I've got that wrong. Yeah, allergy, cabbage and fermented vegetables from death rate heterogeneity in countries to candidates for mitigation strategies of severe COVID-19. Interesting paper, this one, and I want to just walk us through a little bit of table one in here, and then talk a bit more broadly about some of the findings from the other papers. So we have here this is, again, this is they've done a good job of not pretending to quantify when they really had no ability to so this, this kind of looks like you know, they have given one to four pluses here to try to give an estimate. But it's kind of like, you know, it's kind of like what you did with your flowchart. Like, you know, what, based on the available evidence, this is what I think is going on. And so they've said, based on the available evidence, what do each of these risk factors possible risk factors? How are they going to explain geographical differences in COVID rates and outcomes at both the individual level, and the country and region level, and I'm not going to spend any time really talking about the distinction there. But you know, right. And it's more or less organized, excuse me, organized from you know, most most intensive effects to least so conduct with the SARS Coby, to infect an individual that is likely to do it, right. If anything is that's gonna do it. intensity of social contacts, intensity of occupational contact, and confinement, with with such people, all of these things are high. And this is no news to anyone watching this right? We move down a little bit, and then they've got diet and food, and long food chain supply and traditional fermented food as the things that they begin to talk about newly Oh, but before we even get there, vitamin D. So something you and I have been talking about for a long time, probably since March on this on this podcast is other viruses seem to do more poorly in humans, not all of them. Some other viruses seem to do more poorly in humans, the course of the disease is lessened, the severity of the symptoms are lower when those people are able to get out in the sun. So yes, you can get vitamin D in a pill form. But for all of these things, it is almost certain that if you get it in the form that you know it comes to you in the form of food or in the case of vitamin D in the form of sunlight. It's probably going to be more efficacious and so they They revisit the vitamin D question they find when they're just mapping diet on to on to COVID outcomes that low prevalence in Asia and Africa both suggests a role for diet and specifically they find in the next line here with regard to food that fermented food and this is this shows up twice here that fermented food is for for a number of reasons and again I think at this point we don't really have time to get into the into the diet science too much.

**Heather** 1:00:37

may well be protective against it may be both getting and extremity of disease at E ology in COVID-19 So specifically, they talk about both raw cabbage interestingly, ferments like sauerkraut and kimchi yogurt and so within Europe they found I think it was like Turkey and the Balkans which have a lot of of of yogurt consumption and then a lot of parts of Germany which have a lot of ferment consumption having lower rates than the areas around them which also have different cuisines and then and this was this is one of these things that you and I would refer to as obvious in retrospect it had never occurred to me before but as soon as I saw this in in this paper I thought yeah that that makes sense. Long food chain supply seems to be

**Bret** 1:01:28

long supply chain for your food yeah

**Heather** 1:01:31

and I just read that off here and I realized that's not actually that's that's not organized the right way long supply chain for your food meaning that it took more steps and probably came from farther away from where it was initially grown to get to you is is known from other research to be associated with metabolic disorders. Okay, so that is fascinating and obvious because you know, what does a long How do I order it the right way supply chain for food tend to mean it's about food being highly processed, having some of its parts taken out and then maybe added back in as if those nutrients were always there so it's pieces parts, it's reductionist and it ends up being shelf stable maybe freezer stable it is it is very much not often representative of what the original food was and what we will see and you'll maybe this is actually the moment to switch society if I can have my screen back from some of the other papers is that specifically plant based diet high fiber diet high ferment diet and and one more thing that I'm not going to mention yet while we're just talking about all this all seem to be correlated with negatively correlated with obesity with metabolic syndrome with long supply chain for food and with positively correlated with good outcomes for COVID so you know, if you're looking for sort of diet advice, you know, we know that obesity is one of the main comorbidities for COVID-19 and we don't get to talk about it because we don't want to be fat shaming, which is ridiculous pretending that something is isn't good for you is not going to make that thing go away. We do not actually live in a socially constructed postmodernist universe so well

**Bret** 1:03:29

what's more we're denying people a honest to goodness proper incentive to get to get in charge of their weight on the basis that Yes, okay, obesity is bad for you. It's especially bad for you in light of something like COVID and to not talk about the protective aspect of being at a reasonable weight is you know, you're hurting the people that you're trying to protect by not shaming them so it just makes

**Heather** 1:03:59

it makes us It makes no sense and we have I don't remember which paper it's in talks about the inflammatory properties of things like red meat you know we're not vegetarians we eat red meat so there's you have this is not about saying you need to adopt this diet and you know, we're perfect here

**Bret** 1:04:14

eat vegetarians for breakfast,

**Heather** 1:04:16

I don't, I don't eat breakfast. So red meat. Gluten, largely in wheat and alcohol are all understood to be inflammatory and background inflammatory inflammation seems to be contributing again to things like metabolic syndrome and weight gain. And once you have weight gain, you have obesity so there's, you know, there's at least one through line one direct line to from some of these things to Okay, maybe modifying your diet, have you know, you've, you've always wanted to, and here you go. Like this may actually help you stay safer in an era of, you know, who knows emerging Like diseases or diseases created for us by people interested in doing research. Regardless, they're out there, this one's out there and there will probably be more and how is it that we should be trying to keep ourselves safe? One more thing. actually know two more, two. Couple more things. Here's a quote from a different Bousquet, all paper. So same lead author. This one titled his diet partly responsible for differences in COVID-19 death rates between within countries. They say, foods with potent antioxidant or anti Ace activity, like uncooked or fermented cabbage are largely consumed in low death rate European countries, Korea and Taiwan and might be considered in the low prevalence of deaths, again, correlational there's no ability to establish a causal relationship here. And then, just to go back to the supply chain issue, quote, the increasing availability of foods from big retail is a revolutionary event that has impacted crops, favoring those that have the best ratio of effectiveness over costs of production, and health at a population size level. In particular, such a change in food availability has altered elementary habits, promoting sugar enriched vitamin depopulated foods, and has become one of the causes of the obesity epidemic, especially among adolescents. These foods come from centralized farms and selected areas of the world that are distributed around the planet, elongating the supply chain of food, the impact of long supply chain of food on health is measurable by an increase in metabolic syndrome and insulin resistance. So the one more thing that we haven't mentioned yet that these papers suggests, might might be implicated as a useful dietary tool to avoid or mitigate the impact of COVID is intermittent fasting. Interestingly, so a different paper Rishi it all diet, gut microbiota, and COVID-19 says, intermittent fasting which includes alternate day fasting or time restricted feeding has been reported to favorably influence the gut microbiota by increasing the abundance of beneficial akkermansia muciniphila and bacteroides fragilis In fact, various animal trials and some human intervention studies have clearly demonstrated health benefits associated with if and people with underlying diabetes, obesity and cardiovascular ailments. And these authors if memory serves specifically find pockets, demographic pockets of people who were effectively forced into intermittent fasting because they didn't have enough food due to the epidemic due to the pandemic who had better outcomes when they did end up getting the disease so again correlational we can't know for sure but super interesting and suggestive and for those who have never heard of intermittent fasting before you know it can be anything from you eat only for eight hours a day and not at all from for 16 to you don't eat anything for two days a week you know lots of different options All right,

**Bret** 1:08:00

well that is quite consistent with what what we've been seeing so the the upshot is diet especially short supply chain fermented foods. Go outside get your vitamin D make vitamin D while the sun shines as they never say

**Heather** 1:08:18

That's right. They don't say it and what that also means is if you're outside and you're not around anyone else, get the smile on your face You don't need to be wearing a mask if you're outside not around anyone else and it's it's been shocking to us from the beginning that outside areas were shut down and it's one thing if you really can't control the density and people are crowded really close to one another but so far so far even these new variants don't seem to be spreading outside

**Bret** 1:08:47

okay all right. Well, it seems to me that we've arrived at

**Heather** 1:08:52

You promised the stars dude I did yeah, we've arrived sees

**Bret** 1:08:55

Oh, is that what I was? Oh, Horace. I wasn't gonna leave the podcast covering this

**Heather** 1:09:00

okay, but no the segue to see stars though, is through a different marine. Marine element. We're gonna go tuna first. Okay, can we go tuna first? Yep. Okay, so just the wapo article Washington Post. subways tuna is not tuna but a mixture of various concoctions a lawsuit alleges so really that's that's we just need the headline that's that's kind of all you need. Yeah, it's just just been taken to court we don't know for sure all those some independent analysis found that the tuna in the tuna is not tuna. Why should we care? What like we should care Yes, we should care I think we should but why should we care? So most people I think will have this reaction like that's not okay. But why like what why should we care? Well,

**Bret** 1:09:49

a you, you have a right to know. And you know, as I've discovered as someone who has apparently a severe wheat allergy you is hard enough, even if people attempt to report what's in food to avoid this thing that does substantial harm to some of us, because of, you know, small bits of contamination, but if people are actually distorting what it is that you're eating, then your ability to detect what hurts you, and your ability to police your own diet just drops to, to zero. And I remember it, I mean, my guess is this is going to be a whole suite of stories. Ultimately, this turns out to be true, and the tuna really isn't tuna. It reminds me of the story, where supermarket honey turned out most of it to be unrelated to honey, it was some sugar concoction. And the way this was detected was that it is impossible to produce honey without getting pollen in it. And so by buying supermarket, honey and testing for pollen and discovering that a large fraction of it had no pollen whatsoever in it was discovered that it was synthetic. So anyway,

**Heather** 1:10:59

it's another Incidentally, it's another risk of a longer supply chain for your food that if you if you don't have a close relation, you know, having a close relationship to the people who are producing your food or producing your food yourself preclude some of these eventualities?

**Bret** 1:11:14

Absolutely, and you know, so this is, again, a place where the precautionary principle is everything, you know, it seems like well, I source my food, you know, at the supermarket rather than the farmer it's only a couple miles away, right? It seems similar. But the fact is, it's all the difference in the world because all of the things that a what, in order to get you an apple from across the country, right, the Apple has to be a different Apple effectively. Yes. And so you know, the food has been selected for this at the expense of that trade offs are ubiquitous. And so in order to get it, you know, you end up with a Tommy Atkins mango,

**Heather** 1:11:51

exactly where I was gonna go like our experience having spent a lot of time in the tropics during research is like I I never understood why people like bananas until we started doing research in the tropics and I had you know what, I think it was real bananas and of course they're still not because you know, vivir noticed that bananas don't have seeds. So you know, the modern banana is a human concoction, but the bananas that are growing down in at least in the near tropics, the little tiny bananas are so much more flavorful as are the mangoes that you get straight off a tree in you know in in the near tropics,

**Bret** 1:12:26

mangoes and all and if you know if the only mango you've ever had is a Tommy Atkins mango which was specifically selected to endure transport i think is god awful right it's not a good mango and

**Heather** 1:12:38

the it doesn't you are you are going to anger the Tommy Atkins mango enthusiasts.

**Bret** 1:12:42

Oh they can go straight to hell because now there are no Tommy Atkins manga no grow Tommy Atkins.

**Heather** 1:12:49

No, I don't I don't think that's true because I think there are plenty of people who have been introduced to mangoes in American supermarkets and have never had what we think of as I'm comfortable calling a real mango so you know you get if you I mean I love mangoes but you really love mangoes yes I do and I feel like if you would only if you had never traveled if you had never done research all the places you've done research that we've done research you might well tasted kamiak ins mango just you know in the in that season when yes it's been bred for transport but it's actually available and think Yeah, I really like this fruit.

**Bret** 1:13:28

Well All right, I want to take my go straight to health because I thought you were gonna say that people who grow Tommy Atkins mangoes were the people that I was going to anger and you know they can't go to hell but but people who like them if you haven't had the chance to have another than I would just advise you can now get good champagne mangoes. I'm blanking on the name of the other one, it'll come to me But anyway, there are good that mangoes that have no red on them that you know they look more boring, they're smaller, but really good flavor have have those and have them ripen. It's a whole different ballgame from that time.

**Heather** 1:14:01

And I mean part of excuse me part of your far afield from tonight here but part of the issue also with long supply chains for your food, and buying everything under wrap and pre processed in the supermarket is that you lose a sense of the seasonality of food and of life and of everything that's going on outside your climate controlled home. And if you start if if you start to realize that actually, peppers are a summer fruit, as are stone fruits, and yes, you can probably get stone fruit in January if you're having them shipped from Chile or I don't even know where you know South Africa, maybe somewhere in the southern hemisphere where the seasons are opposite. You You can get them they're never going to be as good. your supply chain for your food just got way long. And it's actually in my experience, super pleasurable to have as some part of your sort of weekly and seasonal rhythm going off, it's soon going to be citrus season it's soon going to be strawberry season, spinach season, whatever right? And, and you're having that to look forward to and then you know, eating eating the food at its peak when it is locally most delicious. And obviously this doesn't work as well for everyone depending on where they're living. But also means that what you what you get when you go for those, for those three, four or five, depending on the year, weeks that the Pacific Northwest has the June bearing strawberries and they are the best food in the universe. We're here in Portland, Oregon, and those strawberries are out of this world. And the strawberries,

**Bret** 1:15:43

very durable. So we can't they you know, they don't get shipped off because they don't survive, right and

**Heather** 1:15:47

the strawberries that you get from the same farms growing strawberries right next to those June berries in August, using the same techniques, same soil, you know, same terroir, just don't compare because in everbearing plant has been selected for something else. And it can't maximize both everbearing and flavor at the same time. And this is you know, this, this is this is the evolutionary lens, right, like trade offs and everything.

**Bret** 1:16:10

All right. So we want to pair these two things, though. There's something to be said for eating stuff at its peak, right? That's locally available. And there's something to be said for eating the stuff that humans have cleverly figured out how to preserve, right? Yes, is the permit stuff? Yes. So the fact is, we have all of these things that we modern people think of as, you know, aesthetic in nature, I think I could go for a pickle, right? But the pickle is a mechanism for taking a a non durable bit of plant and preserving it so that you can eat it when you're going to need it rather than when it's, you know, ripe on on the vine. And, you know, we could say the same thing about you know, cheese and you know, sauerkraut and kimchi. As you mentioned before all of these things were developed as a way of stabilizing these fresh foods by spoiling them in a way that is particularly healthy. And the fact is they have extra benefits as you point to paper about

**Heather** 1:17:12

computer blogs and less to Oh sure, sure does. So anyway, Interestingly though, you know, other thing that belongs on the list of amazing techniques for preserving food, and thus being able to eat your calories after the food would have spoiled his beer, which is liquid bread. And you know, we know that gluten is you know, even if you're you know, even if you're like a lot of us who don't seem to have a particular gluten sensitivity, unlike you, gluten is inflammatory. And it doesn't seem to you know, just be the glyphosate for instance, right? But But beer is fully nutrition full of calories, because it's it's drinking your bread.

**Bret** 1:17:47

Yeah, just to be clear, I don't think the glyphosate is the thing that we react to Yes, it causes something that then makes us sensitive to wheat. So it is clear from my own experience that I have a reaction to organic wheat, it doesn't help me at all that it's organic, and therefore presumably free of any glyphosate whatsoever. I am now sensitive to molecules in wheat, however that happened. Yeah. But alright. It seems to me that we still maybe I missed it in there somewhere. But I know that we were going to talk about sea stars, where are we? I think we were okay. All right. Why don't you start since you know what the topic is? No, it's

**Heather** 1:18:25

really, it's really just a tiny little thing. And, you know, maybe later we should revisit behavior and see stars and other things. And, you know, we've actually been, when we've been doing other research, we've been able to see some pretty amazing amalgams of sea stars in places, but no, I was going back through and doing some of the just deep history fact checking for the chapter of our book hunter gatherers guide to the 21st century. That goes back through the entire history of life on Earth. It's just one chapter that that is like that. And, and see stars, which are kind of terms are the closest relatives of granites, vertebrates, basically. And one of the distinguishing features of vertebrates is that we have bilateral symmetry, right? We have you know, there's, there's an axis of symmetry and you can roughly we're not exactly symmetrical, but you know, along that, that that sagittal axis Now, that's a no it's not, that's not sagittal axis. Yeah, I

**Bret** 1:19:23

think it is. Yeah, point Sure. sagittal crest. Yeah, and I'm not actually

**Heather** 1:19:27

I you know, I used to teach comparative anatomy and know this stuff really, really well. It's been a few years at this point, along that sagittal axis, you could basically fold us in half and get mirror images right and this is true for for all vertebrates. So, I was thinking and I really should have known better but I was thinking up bilateral symmetry evolved at the level of vertebrates, because look at our closest relatives, the see stars, they clearly have radial symmetry, right, you have a point out from which you have a radiation and the symmetry is in that in those directions. As a To along and access. But no, there is of course, the much bigger and older group, the bilateria, where bilateral symmetry originated. And the sea stars have reversed, they've given it up. And they haven't given it up entirely because their larva are still bilaterally symmetrical. So seastar larva still have a left and a right. And then as adults, they just say screw this, I'm done. I'm going radial symmetry. And just, you know, developmental biology is still in some ways in its infancy, some of some of the really important early stuff happened 100 years ago, but there's still so much that we don't know and even even things around axes formation is super hard for us to muster grok but for me, you know, in no way being a developmental biologist, the idea of a larval form going from bilaterally symmetrical to radially symmetrical is, you know, almost enough for me to have a religious revelation. It's kind of amazing,

**Bret** 1:21:00

great. It's pretty interesting. So Alright, so evolutionarily bilateral, bilateral symmetry has been lost, it has evolved away in this highly successful group of creatures. Yeah, that's fascinating and unexpected. At least to me. I would say the lesson for our viewers is bilateral symmetry, use it or lose it, right? Yes. Oh, definitely want to remain bilaterally symmetrical, at least in you know, the long haul, then I would say, you know, do stuff that uses that, and that'll potentially preserve it. Like

**Heather** 1:21:38

lamarckian bilateral symmetry.

**Bret** 1:21:40

I'm struggling to find a lesson that will be relevant to our to our audience that may not have been such a good one. But on the fly, I feel like it was

**Heather** 1:21:48

not sure this is a usable piece of information. It's just fascinating. If you're the kind of person who's fascinated by these things,

**Bret** 1:21:54

can we agree that it won't hurt us? It goes through bilateral symmetry, take a run, it's not gonna be bad for them. They'll get out in the sun that makes some vitamin D, so we'll use it or lose it better safe than sorry. Yep. Yeah, makes sense. Yep.

**Heather** 1:22:07

And if you find yourself doing cartwheels you might be tending over towards radial symmetry. Boy,

**Bret** 1:22:11

that's a point. Yeah, that's why I never took up cartwheeling. Is that why? It's one of the reasons I also never managed to complete a full cartwheel

**Heather** 1:22:19

didn't want to be mistaken for a rotifer, maybe didn't want

**Bret** 1:22:21

to hurt myself. I would love to be able to do a cartwheel It looks like a tremendous amount of fun. But there's, I'm courageous about certain things. Yes, you are. That's not one.

**Heather** 1:22:33

Okay. Well, did we want to show the so we've got a thumb, we've started to thumbnails now of photos that we've taken the previous week, as opposed to shots of us and whatever cat has wandered by. So this is a this is a picture I took in a storefront in the pearl district of Portland earlier this week, and it struck me it's obviously you know, appealing a little bit as appropriate, given the context of our conversation around consensus science, that many people now are saying trust the science, follow the science. And you know, because science and we are here to say, in part, absolutely try to engage in scientific thinking and scientific problem solving as much as you can in the world. And guess what, trusting authorities is actually antithetical to that process.

**Bret** 1:23:31

Yeah. I was thinking about this a bit on the plane and I should say, this was our first plane flight in some time and

**Heather** 1:23:38

we've already in Yeah, almost almost a full year you had flown down once before in like June to do to do Joe Rogan.

**Bret** 1:23:46

Yeah, but before COVID You and I were we had gotten very good at getting on planes getting places you know, we know how to pack and all that stuff. And all I can say sickly forgotten, if you are if you are like us, and you know you had that dialed in and you haven't been doing it for the last year, your next trip, you may want to budget a little extra time, just so you don't forget any I think one or two extra days would be sufficient to make sure you don't forget anything. But the number of mistakes we made in traveling was spectacular. But all right, back to you about each other. Yes, no. When something terrible might have happened.

**Heather** 1:24:20

I literally walked off the plane without my bag. never done that before.

**Bret** 1:24:24

Yeah. locked off totally unlike you. Yeah. Okay. So in any case, I was thinking on the plane about trust the science and there's something about it. It's like, what do the data say? data is king, data driven science where these things sound so right. But then it turns out that they are actually battle cries of affection that's actually undoing something important

**Heather** 1:24:47

and interested in rapid consensus, right? Yeah. For us. The

**Bret** 1:24:50

science sounds so right. But the problem is the right it's like the last day in magga. The interest the science is the place Where the, the ill deeds are done. And the point is, if you said trust science, I'd be on board because what that means is the method, if you've come to a bad conclusion, the cure for bad science is more in better science. Trust science. Yeah, I do trust science. It doesn't mean I inherently trust scientists. I would like scientists to be better than average, but

**Heather** 1:25:22

or scientific results. Right? And so what you're saying is science refers to the process process science is the scientific process science is not the results of the scientific process, or the people doing it,

**Bret** 1:25:32

or Well, okay, I want to I want to fix that a little bit, okay, you can't trust any given result, right? That requires that the experiment was done well, and you're almost never going to be in a position to know. But over time, good science will drive out bad science, good conclusions will replace bad conclusions. And the the idea the whole purpose of this clumsy, difficult endeavor that we call science is to ultimately converge on models of the universe that are so highly predictive, that we can call them theories, that they become the closest thing to a truth claim that we can make. Yep. And so in any case, trusting in that process over very short timescales is bound to be dangerous, trusting in that process over the long timescale is the best hope we've got. And so anyway, trust science, I would say and if you hear somebody say, trust the science, you might mention that they're making a little error.

**Heather** 1:26:33

And probably don't make a friend doing so.

**Bret** 1:26:36

Well, engaging social distancing, as you're mentioning this, that'll give you, you know, start zone. Yeah, you'll have a head start. Yeah, if you need to flee.

**Heather** 1:26:44

Alright, well, we will finish with a few announcements here. We're gonna take a 15 minute break. For those of you listening on the podcast. We'll be back next week. As usual. For those of you watching on YouTube, we encourage you to take take that break with us and then come back with our live q&a. We'll be answering questions that you've posed during the Super Chat, we prioritize questions from the first Super Chat on monetary basis. And in the second Super Chat, we answered them in the order in which they come in in the second half of the live q&a. You can become a dark horse member at my Patreon, Heather Hines, Patreon. The Private q&a for next month, we have a two hour private q&a, as I mentioned at the top of the hour, hour and a half, but we're now which is always the last Sunday of the month at 11am. Pacific is tomorrow. The questions have already been posed for this month, but but it's it's smaller, we can pay attention to the chat. It's a lot of fun, we encourage you to join us. You can also at either of our patrons get access to the discord server, which is a lively conversational mill you at your Patreon you have the higher price point, a couple of conversations a month on the first Saturday and Sunday.

**Bret** 1:27:56

So that's next week, we'll be having a conversation on state and the fate of the world and what we might do about it. That's the Saturday conversation and right before our livestream Sunday, we talk evolution. And anyway they're both great conversations. There's some long standing people in it quite a number of new people. And anyway, they're very, very lively and fun.

**Heather** 1:28:16

Wonderful. We do have stuff for sale. mugs, t shirts, stickers at dub dub dub dot store dot Darkhorse podcast.org. And there is a 10% sale all weekend by blues all caps BYEBL UEs is the code.

**Bret** 1:28:35

So if you find that you don't have enough stuff, this is one way to do

**Heather** 1:28:41

it, which is definitely most of our problems. Yes. You can email our moderator, Darkhorse dot moderator@gmail.com for any logistical questions, like how do I pose a question? Where was the store again? What's the code? And yeah, maybe that's it. I guess, you know, once again, we want to thank Bill Maher and his whole crew and, and we'll be back in about 15 minutes. In the meantime, go outside.

**Bret** 1:29:07

Yep. Thanks, everybody. We will see you shortly.

1:29:09

Right