



## ***A World Without Microbes: An Apocalyptic Thought Experiment***

[Music playing]

**Ed Yong:** Imagine wiping out every microbe on Earth. Every bacterium. Every germ.

**Jack Gilbert:** I've done that.

**Ed Yong:** That is professor Jack Gilbert from the University of Chicago.

**Jack Gilbert:** Catastrophic ideas are exciting! Everyone loves a disaster movie.

**Ed Yong:** THIS SUMMER...

**Jack Gilbert:** As a microbe guy, you'll like this movie.

**Ed Yong:** ... IN A WORLD WITHOUT MICROBES.

**Jack Gilbert:** A world in which all the bacteria, viruses and unicellular fungi and anything which is only a single cell, right, or a single particle, all of them are gone.

**Ed Yong:** ONE MAN WILL ... wait, that, they're all gone?

**Jack Gilbert:** We wanted to think about the world in the absence of any microbial life.

**Jack Gilbert:** A world without microbes means a world without microbial disease, without the bacteria and the viruses, and the protozoa that infect us and make us sick.

**Ed Yong:** An ideal world for germaphobes.

**Jack Gilbert:** It would be an amazing world for germaphobes.

**Ed Yong:** Right, because you wouldn't even need antibiotics. You could do surgery in a barn and you wouldn't get an infection.

**Jack Gilbert:** And in fact, there would be no sexually transmitted diseases.

**Ed Yong:** Hm ... no gonorrhea, no syphilis, no HIV. Happy days.

**Jack Gilbert:** Very happy days.

**Jack Gilbert:** But we wouldn't be able to make any more beer. We wouldn't be able to make any more wine. They're virtually impossible to synthesize without the presence of microbes.

**Ed Yong:** And microbes are really important for digestion. They help us to break down the food we eat. So whatever food we still had, we'd have trouble digesting it.

**Jack Gilbert:** There're also some bacteria in our gut that produce compounds, chemicals, vitamins that, uh, we need, that we find it hard to get from our diet. So, without those present, we would start to suffer from malnutrition.

**Ed Yong:** And the problems don't stop at digestion.

**Jack Gilbert:** Your microbiome actually can affect your endocrine system, that's the hormones inside your body. And you always know if your hormones are out of balance, you feel kind of quirky, right? Um, it can also regulate the neurotransmitters that are produced in your brain, which can affect things like depression and anxiety.

**Ed Yong:** Wait, but that's just a hypothesis, right? You don't actually have any experimental evidence of how a germ-free person would behave or feel.

**Jack Gilbert:** That experiment is impossible to do. Uh, to grow a germ-free human, uhm, would be unethical.

**Ed Yong:** Right, you're not raising germ-free humans in the basement of your lab?

**Jack Gilbert:** I wouldn't be able to tell you if I was.

**Ed Yong:** Yeah, maybe don't reveal that.

**Jack Gilbert:** No, we're not raising germ-free humans. That would be weird.

**Ed Yong:** OK, so what you're saying is, even the good things about microbes won't matter, because our bodies won't even be able to function normally. And what about the rest of the world?

**Jack Gilbert:** We, we've started to head into horror land.

**Jack Gilbert:** So essentially the foliage on earth has started to brown. Most of the plants require nutrients in the soil which are generated by microbes. The crops would start dying. So we'd have massive food shortages.

**Jack Gilbert:** Uh, the cattle, uh, the sheep, which rely on bacteria in their gut to break down all of that cellulose, the plant matter they, they would be consuming. They wouldn't be able to get enough nutrients from their food. Most of the livestock that we rely on would have started to fall over and die. But it's the lakes and the rivers and the oceans where we would see the worst horror stories.

**Ed Yong:** Right, just as on land, microbes are a crucial part of our lakes and rivers. They cycle nutrients, they maintain animal health, so without them ...

**Jack Gilbert:** You'd have mass die-outs of fish and they'd be all floating on the surface.

**Ed Yong:** You are ... way too happy right now.

**Jack Gilbert:** Yeah. Right? (laugh) It's a great thought experiment. Nasty, but ...

I love zombie movies and, uh, disaster movies. I think we, we naturally want to see what would happen if all of this normalcy decayed, right?

**Ed Yong:** And speaking of decay, in a world without microbes ...

**Jack Gilbert:** The decomposition process would be halted. There would be no more decay. Within a few years, if we survived that long, we'd be knee deep in animal corpses and, uh, and leaf litter. So the world would just become a graveyard.

**Jack Gilbert:** Once all the animal corpses had been eaten, and we don't have many animals in the city to eat, right? Then people would start on cannibalism.

**Ed Yong:** Cannibalism?

**Jack Gilbert:** Ah, it's highly likely people would resort to eating whatever products they could get. Um, and that would likely ... because the bodies wouldn't be poisonous. Right? There'd be no pathogenic bacteria growing on them. It's a normal societal end point, ah, for starvation.

**Ed Yong:** Wait, microbes produce a lot of oxygen too, don't they?

**Jack Gilbert:** A lot of oxygen is produced by single cellular bacteria or the organisms that live in the ocean.

**Ed Yong:** So if all of those vanished, there would be much less oxygen for us to breathe.

**Jack Gilbert:** No one's done a biological survey on what would happen if the oxygen level plummeted

**Ed Yong:** I miss my microbes.

**Jack Gilbert:** I miss them too. In fact, the whole world is missing them right now.

**Ed Yong:** So what happens to me and you and the 7 billion other people on this planet when the microbes all disappear?

**Jack Gilbert:** We're talking about people suffocating and not, and not able to consume enough food.

The world is dying. It's not that just humans are killing each other but the world is dying and the oxygen is running out. Um, it's global death, right?

**Ed Yong:** And this particular horror movie has no sequel.

**Jack Gilbert:** There's no sequel. This is game over.

**Ed Yong:** Microbes are important.

**Jack Gilbert:** Without them, uh, we're doomed. Literally.

**Ed Yong:** So rejoice in your microbes, the trillions of tiny organisms that call you home. Treat them with respect and they will return the favor.

We are Ed and we contain multitudes.

**Ed Yong:** If you like today's thought experiment, you can join Jack Gilbert for a Reddit AMA coming soon. Jack will be joined by Mark Smith from our episode on fecal transplants, and together they will be answering a slew of your microbial questions. Check out the description for more details.

**END OF EPISODE**