Episode Book

EPISODE #6231

Why a Cold Makes Your Whole Body Ache

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SYNOPSIS

You caught a cold in your nose — so why do your legs ache like you ran a marathon? This episode unpacks the biology of sickness behavior: how cytokines like interleukin-6 and tumor necrosis factor turn a local respiratory infection into whole-body exhaustion, fever, and pain. We trace the signaling routes from airway to brain, explore why your muscles actually change during illness, and ask the uncomfortable question of whether any of this suffering is doing you any good. Plus: a caller who believes fruit stickers are cytokine beacons.

TRANSCRIPT



Corn

Daniel is aching all over today without having done anything strenuous. A sore throat and a stuffed nose have somehow recruited muscles that weren't involved in either activity. He wants to know how a local infection becomes that whole ensemble of exhaustion and pain, especially when the most demanding thing you've done is change position on the couch.



Herman

Your legs feel as though you took them up a mountain, while your actual expedition was to get a tissue. The important clue is that respiratory viruses can produce that feeling without having to infect every aching muscle.



Corn

Unearned exercise soreness. They've removed the achievement.



Herman

The immune response can change pain sensitivity, brain activity, temperature regulation and muscle metabolism. Those changes arrive together, so you experience them as one condition called feeling absolutely rotten.



Corn

Ezra starting gan has made this particularly immediate for Daniel. The colds and stomach bugs keep coming through, and the puzzle is why an infection with a fairly specific entrance seems to acquire jurisdiction over the entire body.



Herman

Location matters much less once the alarm signals travel. Your airway can be where the infection starts, while your brain and muscles respond to messages coming from there.



Corn

I suspect you're about to describe a beautifully coordinated system. Please remember its current output is Daniel feeling dreadful.



Herman

Coordinated doesn't mean comfortable. It means the changes reinforce one another. What we call sickness behavior includes sleepiness, reduced appetite, less interest in exploring or socializing, difficulty concentrating and increased sensitivity to pain. Your priorities change before you've consciously decided to change them.



Corn

That distinction matters. People treat fatigue as a shortage of determination, as though the rest of you is ready for work and one lazy department has stopped answering.



Herman

During infection, the brain is receiving biological instructions that alter what feels worth doing. When I was practicing pediatrics, the change parents often noticed first wasn't a cough. It was a child who stopped playing. That wasn't a diagnosis by itself, but it told you something had changed beyond the nose.



Corn

Adults disguise that by continuing to open spreadsheets.



Herman

Poorly. Attention and motivation can both deteriorate. Corn, when you're ill, does your usual reading feel difficult, or does it just stop seeming attractive?



Corn

Both, but differently. I can understand a paragraph and still find the prospect of the next paragraph unreasonable. That's not quite the same as being sleepy. There's a strange shrinking of ambition. The kettle becomes a project.



Herman

That captures the motivational part. The machinery for reading hasn't necessarily stopped working. The perceived cost has risen, and the reward has dropped. Inflammation can alter those judgments alongside producing fever and discomfort.



Corn

You're going to bring my napping into this.



Herman

Only to say that your normal baseline makes the change harder to detect.



Corn

My clinical presentation is consistent.



Herman

Your defense is consistent. The useful distinction is between ordinary preference and a change imposed by illness. Sickness behavior can conserve resources and reduce activity, but that doesn't make every symptom beneficial at every intensity. An excessive response can harm you. The virus also causes real injury in some infections. We shouldn't erase that just because the immune contribution is so substantial.



Corn

Especially with flu, where saying it's all just messages would make it sound as though the infection itself was a clerical misunderstanding.



Herman

Respiratory cells recognize pieces of a virus, and resident immune cells respond. They release cytokines, signaling proteins that change what other cells do. Interleukin one, interleukin six and tumor necrosis factor are important members of that response. They help organize defense, but they also influence temperature, appetite and pain.



Corn

They're issuing instructions, not floating around as microscopic bits of soreness.



Herman

Correct. A cytokine binds to a receptor and alters cellular activity. Interleukin six is strongly associated with muscle and joint pain during viral illness. Tumor necrosis factor helps restrict viral replication, while also contributing to fever, weakness and loss of appetite. There isn't one molecule doing the entire job.



Corn

No single employee available for a complaint.



Herman

You would demand a named contact.



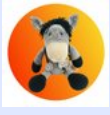
Corn

I would demand that my calves be removed from the mailing list. The sore throat I understand. They're physically at the scene. My calves have an alibi.



Herman

Signals released in the airway can enter the circulation. Immune cells recruited into the response produce more signals. That allows a relatively localized infection to influence distant tissues without the virus traveling to each of them.



Herman

Actually, localized needs a little care there. The infection's distribution varies with the pathogen. The point is that widespread symptoms don't prove widespread viral invasion.



Corn

That also explains why feeling worse doesn't necessarily tell you where the virus is. A terrible headache wouldn't establish that it's sitting in your brain.



Herman

Nor does a mildly sore nose reveal how much tissue has been damaged. Experimental rhinovirus infections have produced miserable cold symptoms with remarkably little visible structural change in sampled nasal tissue, apart from increased inflammatory white cells. Ron Eccles discusses that in his review of cold and flu symptoms. The irritation can be substantial even when the surface isn't visibly being demolished.



Corn

The nose is intact. Its customer service has collapsed.



Herman

Local chemicals still matter. Bradykinin contributes to throat pain and nasal congestion. Blood vessels change, tissues swell, sensory nerves are stimulated. Then cytokine signaling adds the systemic component. Those processes overlap rather than waiting politely for each other.



Corn

Daniel's progression from throat to whole body sounds sequential because that's how he notices it. The underlying responses might already be running together, just at different strengths.



Herman

They can be. Crossing a threshold in temperature or pain sensitivity can make the illness suddenly feel different. There's no requirement for the infection to finish with the throat before your legs receive the news.



Corn

How does that news get into the brain? I assume these proteins aren't all simply wandering across the blood-brain barrier.



Herman

Several routes. Circulating inflammatory signals act at interfaces around the brain, including blood vessel cells, which generate further messengers. Peripheral nerves also relay information about inflammation. The brain can detect the immune response without every cytokine freely crossing into brain tissue.



Herman

Temperature regulation is one result. Changes in appetite, alertness and pain processing are others. The same general immune alarm produces a collection of outputs rather than a single symptom.



Corn

Hm.



Corn

I buy the coordination. I hesitate at calling the aching useful. Resting because you're exhausted seems sufficient. Why also make the mattress hurt?



Herman

Pain sensitivity can rise during illness. The technical term is hyperalgesia. A pressure or movement that would normally be tolerable can become unpleasant. Immune signaling affects peripheral nerves and pain processing in the spinal cord and brain, including supporting cells called glia.



Corn

So I haven't necessarily acquired a hundred new injuries. The existing inputs are being treated more urgently.



Herman

That can account for part of the soreness. Not all of it, and not in every infection. Heightened pain encourages less movement, which conserves energy. Would you accept that as a useful response if it stopped you from spending the afternoon doing something strenuous?



Corn

Yes, with a complaint about the user interface. I can accept that a behavior helps recovery without believing every degree of discomfort has been exquisitely selected. Biology also seems willing to use excessive postage.



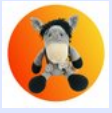
Herman

Fair objection. Calling a response adaptive describes a broad evolutionary function. It doesn't certify that every person's response is optimal. Fever is energetically costly, though. A one degree Celsius rise can increase energy requirements by roughly ten to fifteen percent. Staving warm above your usual temperature takes work.



Corn

A heating surcharge, paid in naps.



Herman

Increased sleep and reduced exploration can help meet that expense. Appetite suppression is more complicated, because prolonged poor intake plainly becomes a problem. These behaviors evolved together, but the costs change with the duration and severity of illness.



Corn

You sound less delighted with the design now.



Herman

I remain delighted with being able to understand parts of it. Different enthusiasm.



Corn

The aches during a cold, then, are largely coming from immune signals coordinating the response, not the virus chewing through each muscle. Also, that caller is back. Does our screening process have an unlocked window?

v

Vex

Listen, I have the receipts on those little stickers on fruit. You think they're just for checkout? No! Every sticker is a tiny cytokine beacon, and the produce industry has been coordinating with the brain's sickness response for decades.

v

Vex

That sore throat turns into a whole body ache because the sticker on your apple is signaling your immune system to remodel your muscles. I have done the research, people! It is all connected!

v

Vex

You need to look into the sticker conspiracy right now, before we all turn into aching zombies!



Herman

Fruit stickers do not produce cytokines.



Corn

The experimental distinction I care about is whether inflammation causes those behaviors or merely arrives alongside them. You could have fever, cytokines and fatigue together without one explaining the others.



Herman

Giving inflammatory cytokines can induce sickness responses, and blocking their actions can reduce those responses in experimental settings. That's why the immune-to-brain literature treats them as causal mediators. A PNAS review describes them as potentially necessary and sufficient for sickness, although that's a statement about particular responses and experiments, not a universal claim about every infection.



Corn

That narrows it usefully. Turning down an alarm might stop the noise while leaving the reason for the alarm untouched.



Herman

It might also interfere with defense. Symptom intensity and success at controlling infection aren't interchangeable measurements. You can't rank people's immune competence by how miserable they look.



Corn

That retires a surprising amount of competitive suffering.



Herman

The next complication is that muscles can change as tissues, beyond a change in how strongly their nerves report discomfort.



Corn

I was about to argue that soreness doesn't establish damage. You agree, but you're taking away the comforting implication.



Herman

Influenza experiments at UConn found increased activity of genes associated with muscle breakdown and decreased activity of genes associated with muscle building in leg muscles. Walking and strength were affected too. Those were animal experiments, so we shouldn't turn them into a precise account of what's happening in Daniel's legs today.



Corn

Still, the muscle is participating in the illness. It hasn't merely been assigned an unusually pessimistic narrator.



Herman

Muscle metabolism responds to inflammatory and hormonal signals. Infection changes resource use throughout the body. Muscle proteins are continually being broken down and replaced, and illness can shift that balance.



Corn

Does that mean the soreness tells you how much muscle you've lost?



Herman

No. Pain, weakness and loss of muscle mass are related possibilities, but they aren't equivalent. Someone can ache intensely without significant muscle destruction. Someone else can lose strength during a prolonged illness without dramatic pain.



Corn

Useful distinction, because the phrase muscle breakdown makes every ache sound like a structural inspection has failed.



Herman

Severe muscle injury does happen with some infections, but ordinary viral aching doesn't automatically mean that. The common experience involves several contributors. Altered pain sensitivity, inflammatory effects in tissues, changed activity, sometimes shivering. We don't have a complete molecular chain that predicts precisely who will ache and how much.



Corn

The gene changes also wouldn't prove that remodeling itself generates the pain. They could share an upstream cause.



Herman

Yes. I nearly folded those together. Muscle remodeling can help explain impaired function and slow recovery, but it isn't a complete explanation for the sensation of myalgia. Interleukin six is an important suspect, not a solved murder.



Corn

You brought a suspect board to a cold.



Herman

You asked why your calves had an alibi.



Corn

They retain counsel.



Herman

Aging changes the consequences. In the influenza work, younger animals recovered muscle function more readily, while older ones had more persistent deficits. In people, older adults can have less reserve before an illness begins. Losing some strength can therefore make walking or getting out of a chair substantially harder.



Corn

That's a different outcome from merely waiting for the nose to clear. If you measure recovery by respiratory symptoms alone, you could miss someone who is no longer coughing but still isn't steady.



Herman

Precisely the practical issue. Well... I should say it more narrowly. A lingering reduction in strength can matter even after the acute infection has improved. Less movement, poorer intake and preexisting frailty can add to it. You don't need one dramatic injury for everyday function to deteriorate.



Corn

Nor should every younger person with a tired afternoon conclude they're on that trajectory. The starting condition and the duration change the meaning.



Herman

They do. Corn, would you think differently about recovery if the fever had gone but climbing stairs still felt unusually difficult?



Corn

I'd stop using the thermometer as a certificate of completion. I'd also distinguish being reluctant to climb them from actually finding my legs weaker. Both are real, but they're not the same observation.



Herman

That distinction helps. Fatigue is a sense of reduced capacity or increased effort. Weakness is reduced force. Sleepiness is the tendency to fall asleep. They overlap during infection, but using one word for all three makes the mechanism harder to discuss.



Corn

Meanwhile, chills are actual muscle work. That's the exception to Daniel having done nothing strenuous. You can be lying still and running the least scenic exercise program available.



Herman

Fever raises the temperature your brain is trying to maintain. If your current temperature is below that new target, you feel cold. Blood vessels constrict to reduce heat loss, and shivering generates heat through repeated muscle contractions.



Corn

Burning up under a blanket while insisting you're freezing is internally consistent.



Herman

The comparison is with the regulated target, not just the temperature outside you. Shivering and sustained tension can add soreness. When that target drops again, feeling hot and sweating help lose heat.



Corn

But aches without chills still fit the inflammatory explanation. Otherwise we'd have smuggled fever back in as the sole cause.



Herman

You can have muscle aches without a measured fever. The pathways overlap, but they aren't locked together. Likewise, a high temperature doesn't tell you exactly how much pain someone will experience.



Corn

I also wouldn't use the strength of the ache to identify the virus. Flu has that flattening reputation, but plenty of infections can supply the same muscles.



Herman

Respiratory viruses share enough host responses to produce overlapping symptoms. Bacterial infections can trigger similar systemic signaling. Even among people with the same virus, severity varies with immune history, age, underlying health and timing.



Corn

Timing is awkward in a household where infections keep arriving. You feel better, then worse, and assume the first virus has become ambitious.



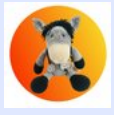
Herman

Consecutive infections can look like one uninterrupted illness, especially around childcare. Adults commonly get roughly two to five colds a year, while schoolchildren may get seven to ten. Those are broad averages, not a quota a family can spend and then declare finished.



Corn

Gan does not honor the annual limit.



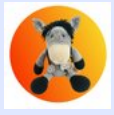
Herman

Symptoms often worsen over the first few days and then improve over about a week or longer. Some linger. A later bout of fatigue could be residual recovery, a new infection, or another process. The pattern matters more than declaring a fixed deadline.



Corn

This is also where the adaptive story needs an expiry clause. An acute response that keeps you resting for a few days is one proposition. Months of symptoms are another.



Herman

Persistent sickness signaling is one framework for thinking about long COVID and ME/CFS. Immune activation may outlast the initial acute illness or keep interacting with other disturbances. Viral persistence, autonomic changes and metabolic dysfunction may



Herman (continued)

contribute in different patients. We cannot reduce those conditions to a cold response that forgot to switch off.



Corn

Nor does saying the brain helps generate fatigue mean it's imagined. The brain is also involved in thirst. Nobody tells a dehydrated person to develop a more positive relationship with water.



Herman

Persistent symptoms deserve that same physical seriousness. The challenge is identifying which processes are active in whom, rather than assuming one inflammatory molecule explains everyone.



Herman

What would make resting easier for you, Corn, if the soreness made lying still uncomfortable too?



Hilbert

...a wider surface, with no buttons in it. I've settled that in the last eighteen minutes. I rang my aunt Mavis when you got to increased pain sensitivity. She's got my twelve-foot convalescent chaise bolted across her landing. It won't fit through the door, and she won't have it in the sitting room because it faces away from the television.



Corn

Twelve feet permits some fairly ambitious convalescence.



Hilbert

The pamphlet said to give aching limbs adequate support. I ordered enough for all eventualities. Mavis has had a cold this week, so I asked her to lie on it while I timed the result. She said no. She's using it to sort envelopes. I asked whether she'd at least move



Hilbert (continued)

the envelopes and test the middle. She said the middle was second-class post.



Herman

Pressure from buttons or seams could certainly make a tender muscle more uncomfortable. A different surface wouldn't switch off the inflammatory response.



Hilbert

I agree with the immune part, Herman. You made that quite clear before Corn's calves requested representation. I'm disputing the upholstery. The furniture people call those buttons decorative. They're little pressure points sold as craftsmanship. Anyway, Mavis put the phone down, then rang back. She'd lain across the envelopes for four minutes. Said her shoulders still ached, but she'd stopped holding herself rigid. I told her the chaise had finally done its job. She said the envelopes were now in postcode order.



Corn

She may have improved the discomfort by relaxing, without changing whatever was generating it. You were testing whether she felt better, not whether she'd recovered.



Hilbert

Yes. She still sounded stuffed up. I let her finish telling me about the stamps. She'd saved the blue ones for me. The four minutes included that.



Herman

A useful direction for future treatment would be separating relief from restored function more precisely, especially when infection leaves older people weaker or produces persistent symptoms. Feeling comfortable and being ready for normal activity needn't arrive together.



Corn

Thanks to Hilbert Flumingtop for producing today's episode and keeping the sound in order.



Herman

For more along these lines, there's episode four, If Your Voice Ages, Does Your Fine-Tune Become Useless. This has been My Weird Prompts, the human-AI collaboration podcast. Daniel's unearned soreness has a physical explanation in immune signaling, altered pain sensitivity and sometimes changes in the muscles themselves, even while the exact contribution of each remains unfinished work.



Corn

If you enjoyed listening, leave us a review. It helps other curious people find the show.



Herman

I'm Herman Poppleberry.



Corn

I'm Corn. See you tomorrow.

SOURCES

What the research for this episode read before the script was written. Primary sources first.

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