

MY WEIRD PROMPTS

Podcast Transcript

EPISODE #161

From Code to Cure: How AI is Redefining Drug Discovery

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EPISODE SYNOPSIS

In this episode, Herman and Corn dive into the revolutionary impact of artificial intelligence on the pharmaceutical industry, moving beyond simple automation into the realm of generative chemistry. They explore how breakthroughs like AlphaFold 3 are transforming drug discovery from a "search" problem into a "design" problem, cutting development timelines from years to months. From tackling antibiotic resistance to engineering enzymes that eat plastic, learn how the "language of life" is being decoded to create a healthier, more sustainable future.

DANIEL'S PROMPT

Daniel

I'd love to chat about an AI use case we haven't touched on before: drug discovery. It's a fascinating area when you think about how many molecules have to be sifted through to find candidates that then go through an extensive clinical trial process. I'm interested in the AI aspect of this and how it can assist in finding potential candidates for therapeutic targets and ideating new approaches. Is AI already making its impact known in drug discovery, and how can it be used to help scientists find the next generation of medicines?

TRANSCRIPT

Corn

Hey there, everyone. Welcome back to another episode of My Weird Prompts. I am Corn, and I am sitting here in our living room in Jerusalem with my brother.

Herman

Herman Poppleberry, present and accounted for. It is a beautiful day to dive into some deep science, Corn.

Corn

It really is. And our housemate Daniel sent us a voice memo this morning that really got me thinking. He was asking about artificial intelligence in drug discovery. It is one of those topics that feels like it is always in the news, but the actual mechanics of it are still a bit of a mystery to most people.

Herman

Oh, I love this one. Daniel has a knack for picking topics that are right at the intersection of high stakes and high complexity. Drug discovery is essentially the ultimate needle in a haystack problem, but the haystack is the size of the galaxy and the needle is invisible.

Corn

Right, and he specifically mentioned the ideation aspect. Like, can AI actually help scientists think of new approaches, or is it just a faster calculator? We have talked about AI for side hustles and general ideation in the past, but applying that to molecular biology is a whole different ball game.

Herman

It really is. And to answer Daniel's question right off the bat, yes, artificial intelligence is not just making its impact known, it is effectively rewriting the playbook for how we develop medicine. By now, in early twenty twenty-six, we are seeing the first wave of drugs that were entirely designed by AI entering late-stage clinical trials.

Corn

That is incredible. But before we get into the cutting-edge stuff, I think we should set the stage. Most people do not realize how slow and expensive the traditional process is. We are talking ten to twelve years and billions of dollars just for one drug to hit the market, right?

Herman

Exactly. The traditional funnel is brutal. You start with maybe ten thousand compounds. You test them in labs, then in animals, then in three phases of human trials. By the end, you might have one successful drug. The failure rate is over ninety percent. And a huge part of that failure happens because we just do not understand the biology well enough at the start.

Corn

So, where does the AI come in? Is it mostly about narrowing down that initial ten thousand compounds faster?

Herman

That is the first layer, yes. Think of it as virtual screening. Instead of physically testing ten thousand molecules against a protein, you can use a computer model to simulate how billions of molecules might interact. But the really exciting part, the part Daniel was asking about regarding ideation, is generative chemistry.

Corn

Generative chemistry. So, instead of picking from a list, the AI is actually designing new molecules from scratch?

Herman

Precisely. It is like how a large language model can write a poem. A generative model for chemistry has learned the grammar of molecules. It knows what atoms can go where and how they bond. So, if a scientist says, I need a molecule that blocks this specific protein but does not affect the liver and is easy to swallow as a pill, the AI can actually hallucinate, in a good way, thousands of new structures that have never existed before.

Corn

That is a huge shift. It is moving from a search problem to a design problem. But how does it know what will work? I mean, biology is incredibly messy.

Herman

That is the trillion-dollar question. And it brings us to one of the biggest breakthroughs of the last few years, which we have touched on briefly in previous episodes, but it is worth going deep on today. I am talking about protein folding.

Corn

Ah, right. AlphaFold and its successors. I remember when AlphaFold two came out, it was a massive deal. Where are we now in twenty twenty-six?

Herman

We are at a point where we can predict the structure of almost every known protein with incredible accuracy. But the real game-changer has been AlphaFold three and the models that followed it. They do not just predict the shape of one protein. They predict how that protein interacts with DNA, RNA, and, most importantly, small molecules, which are the drugs.

Corn

So, it is like having a three-dimensional map of the entire battlefield before the fight even starts.

Herman

Exactly. In the past, scientists had to use X-ray crystallography to figure out a protein's shape, which could take years for a single protein. Now, they can do it in minutes on a computer. This allows for what we call rational drug design. Instead of guessing and checking, you are literally building a key to fit a very specific lock.

Corn

I can see why Daniel was fascinated by this. But I wonder about the ideation part he mentioned. Does the AI suggest entirely new therapeutic targets? Like, does it say, hey, you have been looking at this protein for Alzheimer's, but you should actually be looking at this other one over here?

Herman

It is starting to. There is a field called systems biology where AI analyzes massive amounts of data from genomic studies, medical records, and scientific papers. It can find correlations that humans would never notice. For example, it might find that people with a certain rare genetic mutation are protected against a common disease. The AI can then point the scientists toward the specific biological pathway that is causing that protection.

Corn

That is fascinating. It is almost like the AI is acting as a super-researcher that has read every paper ever written and can see the connections between them.

Herman

That is a great way to put it. And it is not just reading papers. It is looking at the raw data from experiments that failed. Usually, if an experiment fails, it just sits in a notebook somewhere. But if you feed all those failures into a model, the AI can learn what does not work, which is often just as valuable as knowing what does.

Corn

That makes a lot of sense. It is using the dark data of science. But I want to push back a little on the excitement. If it is so good, why aren't we curing everything right now? What are the bottlenecks?

Herman

That is the thoughtful analyst in you, Corn. The bottleneck is still the physical world. You can design the perfect molecule on a computer, but you still have to synthesize it in a lab. You still have to make sure it does not turn into something toxic when it hits the human stomach. And you still have to run clinical trials. AI can speed up the beginning of the process, but the middle and the end are still governed by the slow reality of human biology.

Corn

Right, you cannot just simulate a whole human being yet.

Herman

Not yet. Though digital twins are becoming a thing. We are starting to see AI models that can simulate how a specific drug might affect a specific person's heart or liver based on their genetic profile. This is leading toward personalized medicine, which is another area Daniel mentioned.

Corn

So, instead of a one-size-fits-all drug, you get something tailored to you. That feels like the future.

Herman

It is the future. And it is happening sooner than people think. But before we get into the ethics and the real-world examples of where this is working right now, we should probably take a quick break.

Corn

Good idea. Let's take a quick break for our sponsors. Larry: Are you tired of your thoughts being too loud? Do you wish you could just turn down the volume on your own brain without the hassle of meditation or silence? Introducing The Muffle-Cap. The Muffle-Cap is a revolutionary headwear solution made from genuine lead-infused felt and lined with proprietary dampening foam. Whether you are trying to ignore your boss, your spouse, or that nagging sense of existential dread, The Muffle-Cap has you covered. Literally. It is heavy, it is itchy, and it is guaranteed to make you the quietest person in the room because you won't be able to hear anything either. The Muffle-Cap. Put a lid on it. BUY NOW!

Herman

Thanks, Larry. I think I will stick with my own thoughts for now, even if they are a bit loud.

Corn

Yeah, lead-infused felt sounds like a health hazard waiting to happen. Anyway, back to drug discovery. Before the break, you were talking about how AI is designing these new molecules. Can you give us a concrete example? Is there a specific drug or company that is leading the way in twenty twenty-six?

Herman

Absolutely. One of the big names that people should know is Insilico Medicine. They were one of the first to get an AI-discovered drug into human trials for idiopathic pulmonary fibrosis, which is a devastating lung disease. What is amazing is that they went from identifying the target to having a drug candidate in under thirty months. Normally, that takes five to seven years.

Corn

Thirty months versus seventy-two months. That is more than double the speed.

Herman

And it cost a fraction of the price. There is also a company called Recursion Pharmaceuticals. They use AI to look at millions of images of cells. They treat the cells with different compounds and use computer vision to see how the cells change. It is like the AI is looking for a visual signature of health. They have been doing some incredible work with rare diseases that have been neglected for decades because they were too expensive to research.

Corn

That is a really important point. If the cost of discovery goes down, we can start looking at diseases that only affect a few thousand people. The economics of medicine change.

Herman

Exactly. It democratizes the process. We are also seeing a shift in how we approach antibiotics. As many of you know, antibiotic resistance is one of the biggest threats to global health. We haven't had a new class of antibiotics in decades because it is so hard to find ones that kill bacteria without killing us.

Corn

And AI is helping there?

Herman

Yes. Researchers at the Massachusetts Institute of Technology used a deep learning model a few years ago to find a compound they named Halicin. They didn't tell the AI what an antibiotic should look like. They just gave it a bunch of data on what kills bacteria. The AI found a molecule that was originally being studied for diabetes, but it turned out to be a potent antibiotic that works in a completely different way than anything we have now.

Corn

That is the ideation Daniel was talking about. A human might never think to look at a failed diabetes drug for an antibiotic, but the AI doesn't have those biases.

Herman

Precisely. It doesn't have preconceived notions. It just looks at the patterns. And this leads to another fascinating development: the use of Large Language Models, similar to the ones we use for chatting, but trained on the language of life.

Corn

You mean like DNA sequences?

Herman

DNA, RNA, and protein sequences. There are models now, like Gene-L-L-M or various protein-L-L-Ms, that treat biological sequences like text. They can predict the next amino acid in a protein just like a chat bot predicts the next word in a sentence. This allows scientists to design proteins that have specific functions, like breaking down plastic in the ocean or capturing carbon from the air.

Corn

Wait, so we are moving beyond just medicine and into environmental engineering?

Herman

It is all connected. The same tools we use to find a drug for cancer can be used to engineer an enzyme that eats waste. It is all about understanding and manipulating the molecular world.

Corn

That is mind-blowing. But I want to go back to something you said earlier about misconceptions. I think a lot of people hear AI in drug discovery and they think the robots are taking over the labs. What is the actual relationship between the scientists and the AI?

Herman

That is a crucial point to clarify. The AI is not a replacement for the scientist. It is a collaborator. Think of it like a high-powered microscope. A microscope doesn't discover a new cell; the scientist using the microscope does. The AI provides the insights and the predictions, but a human still has to design the experiment, interpret the results, and make the final call.

Corn

So it is more like an exoskeleton for the mind.

Herman

I love that. An intellectual exoskeleton. It allows a single researcher to do the work that used to require a whole department. And it requires a new kind of scientist, someone who understands both the biology and the data science. We are seeing the rise of the bilingual scientist.

Corn

That makes sense. But what about the data itself? We always hear that AI is only as good as the data it is trained on. If our biological data is messy or biased, won't the AI just give us messy and biased drugs?

Herman

That is a very real risk. Biology is notoriously difficult to replicate. An experiment that works in a lab in Jerusalem might not work in a lab in New York because the humidity is different or the water has different minerals. This is why there is a big push for automated labs, or cloud labs. These are facilities where robots perform the experiments in a highly controlled, standardized way. The data they produce is much cleaner and more useful for AI models.

Corn

So the robots are in the lab, but they are just doing the grunt work to feed the AI better data.

Herman

Exactly. It is about creating a closed-loop system. The AI designs an experiment, the robots run it, the results are fed back into the AI, and the model gets smarter. This is how we get to those thirty-month discovery timelines.

Corn

It feels like we are entering a golden age of biology. But I have to ask about the ethics. If we can design any molecule we want, what is stopping someone from designing something dangerous?

Herman

That is the dark side of this technology. It is a dual-use problem. The same model that can design a life-saving medicine can also be used to design a potent chemical weapon. In fact, there was a famous experiment where researchers took an AI model used for drug discovery and just flipped the objective function. Instead of looking for non-toxic molecules, they told it to look for the most toxic ones. In six hours, the AI suggested forty thousand potential chemical weapons, some of which were more deadly than VX nerve gas.

Corn

Six hours. That is terrifying.

Herman

It is. And it has led to a lot of discussion in the scientific community and among regulators about how to keep these models safe. We need guardrails, just like we have for nuclear technology. It is a conversation that is still ongoing in twenty twenty-six.

Corn

It is interesting because in episode two hundred thirteen, we talked about computer use agents and how they could eventually perform tasks autonomously. If you combine an autonomous agent with a drug discovery model and a cloud lab, you have a very powerful and potentially dangerous system.

Herman

You hit the nail on the head. That is the ultimate convergence. It is why we need international cooperation and transparency. But I don't want to leave our listeners on a purely negative note, because the potential for good is so much greater.

Corn

I agree. Let's talk about the practical takeaways. If I am a listener who isn't a scientist, why should I care about this right now?

Herman

Well, the most immediate impact is going to be in the treatment of rare diseases. For a long time, if you had a rare condition, you were basically on your own because the market was too small for big pharma to care. Now, we are seeing the rise of N-of-one trials, where a drug is designed specifically for one single patient.

Corn

A drug for one person. That sounds incredibly expensive.

Herman

It is right now, but the cost is dropping. Imagine a world where you go to the doctor, they sequence your genome, they identify a specific protein that is causing your illness, and they print a custom medication for you right there. We are not there yet, but the foundation is being laid.

Corn

That is incredible. Another takeaway for me is the speed of response to new threats. If another pandemic hits, we won't be waiting a year for a vaccine. We could have candidates in weeks.

Herman

Exactly. We are building a global immune system powered by AI. And for the younger listeners, this is a call to action. If you are interested in science, this is the most exciting field to be in. The intersection of biology and computer science is where the biggest breakthroughs of the next twenty years are going to happen.

Corn

I couldn't agree more. And I think it is important to remember that even with all this tech, the core of medicine is still human. It is about alleviating suffering. The AI is just a tool to help us do that better and faster.

Herman

Well said, Corn. I think we have covered a lot of ground today. From generative chemistry to protein folding to the ethics of chemical weapons. Daniel really gave us a great prompt to chew on.

Corn

He did. And it is a great reminder that these weird questions often lead to the most important discussions. Speaking of which, if any of you have a weird prompt or a question that has been keeping you up at night, we want to hear it. You can head over to our website at myweirdprompts.com and use the contact form there.

Herman

Or just send us a voice memo if you have our number. We love hearing your voices. And hey, if you are enjoying the show, a quick review on your podcast app or a rating on Spotify really helps us out. It helps other curious minds find us.

Corn

It really does. We have been doing this for two hundred sixty-seven episodes now, and it is the community that keeps us going. We love the feedback and the ideas you all bring to the table.

Herman

Definitely. And remember, you can find all our past episodes and the RSS feed at myweirdprompts.com. We have covered everything from smart bulbs in episode two hundred nineteen to the power of the jagged profile in episode two hundred sixty-five.

Corn

There is a lot to explore. Well, Herman, I think that wraps up our deep dive into the world of AI drug discovery. Any final thoughts?

Herman

Just that the next time you take a pill, think about the incredible journey that molecule took to get to you. And in a few years, there is a good chance that journey started in the mind of an artificial intelligence.

Corn

That is a wild thought to end on. Thanks for listening to My Weird Prompts. I am Corn.

Herman

And I am Herman Poppleberry.

Corn

We will see you next time.

Herman

Stay curious, everyone!

Corn

And keep those prompts coming. Goodbye for now.

Herman

Bye!