

No guts, no research glory

Eran Elinav is an immunologist at the Weizmann Institute of Science in Rehovot, Israel. He has earned many distinctions, including being named a Howard Hughes Medical Institute and Bill and Melinda Gates Foundation research scholar in 2017.

Eran Elinav

Eran Elinav, as told to *Shraddha Chakradhar*

I never thought that I would become a scientist. I didn't come from a family of scientists. My mother taught Hebrew literature. My father was a banker. And even though I became very curious about the workings of the human body, these were the curiosities of a child, and I didn't hold any notions of becoming a scientist.

Following the mandatory army service that's required in Israel, I entered medical school at the Hebrew University in Jerusalem. There, I came to appreciate the human body as a machine: how it worked because of its different parts, how its different systems interacted with one another and how one system malfunction may impact many others in causing disease. After medical school, I did my internship at the Hadassah tertiary medical center in Jerusalem, followed by a residency in internal medicine. During this very hectic clinical period, I developed a passion for science and found myself trying to pursue research at the hospital, at many times at hospital labs after completing a night shift at the ER.

Following completion of my residency in internal medicine, I was accepted to a gastroenterology fellowship. As a fellow, a big part of my day involved performing endoscopies on patients, and, from doing this over and over, I realized that the technical procedure was less interesting to me. What I was looking at in my patients, however, was just becoming interesting to the world. I was interacting with the microbiome on a daily basis, but this was in 2005, before we even knew that the microbiome was important. I was very frequently encountering inflammatory bowel disease (IBD), but we knew very little about the link between IBD and the microbiome. I remember wondering at that time whether fecal matter and gut luminal content—which we regarded just as a waste product—was something that could actually be important in helping us better



Credit: Weizmann Institute of Science

understand human health. Treating many patients suffering from IBD, viral hepatitis or fatty liver disease, illnesses that had no good cures, made me really want to engage in deeper learning of basic science.

I thus decided to change course. I took a leave of absence from the gastroenterology fellowship and joined a PhD program at the Weizmann Institute of Science, one of the leading research institutions in the world. At the time, there was no formal program for physicians who wished to engage in basic science, so I created my own little program by combining graduate studies with a new role as a senior physician and small-group PI at the Tel Aviv Medical Center Institute of Gastroenterology. These were busy but fascinating times—I was a graduate student during the day, and a PI during the night. This crazy but highly fulfilling period made me come to the final decision that my passion lies with science. I decided to take a complete break from any clinical practice and performed a postdoc in Richard Flavell's

lab at Yale, where we started studying the microbiome. During this time, I was also able to collaborate with Jeffrey Gordon, the 'grand-daddy' of the microbiome field, at Washington University in St. Louis. My timing, it turned out, was good. At the beginning, the fact that we were studying communities of microbes rather than focusing on a single microbe (as had been the case with 'classical' microbiology) raised a lot of eyebrows. It took time to convince the medical community of the influence of the microbiome.

After three very fruitful years of working with Richard, I have gone on to establish my own lab at the Weizmann Institute of Science, Israel.

We continue to be very surprised and often shocked at some of the things we find in the lab, such as how noninfectious diseases can be transferred from mouse to mouse through microbes, how microbes residing in one body region may profoundly influence other distant cells and organs, and how nutrition can impact an individual's microbiome and through their microbiome shape their metabolic health. We also realize that the many challenges we face, such as moving from descriptions and correlations linking microbes to human physiology to actual mechanistic evidence explaining how the microbiome impacts human health and disease. As with any field, we also frequently encounter failures. I have to keep reminding myself that, unlike in medicine, where the reward can be instantaneous as you treat a patient and hopefully see them recover, the rewards in bench science take much longer to reap. Whatever the future may bring, the one thing I can say for certain is that microbes are bound to keep us busy for many years to come. □

Eran Elinav

Department of Immunology, Weizmann Institute of Science, Rehovot, Israel.

e-mail: eran.elinav@weizmann.ac.il

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