



# American Healthcare Professionals and Friends for Medicine in Israel

2001 Beacon Street, Suite 210, Boston, MA 02135

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**D**r. Oren Gordon puts pins in mice knees.

Then he induces *peri-prosthetic knee joint infection* and studies new approaches to medication therapy. This is a very hard infection to treat, he says. "We try to use medicine we already are using, but try to optimize the way we use it. We try to balance toxicity with efficacy."

The 2018-2019 APF Fellow in pediatric infectious diseases is studying at Johns Hopkins University. He is doing both clinical work and research. And his major research project, indeed, concentrates on joint infection after replacement surgery. (The tiny Titanian pin simulates the hardware of a replaced joint.) Specifically, he is examining the bacteria *Staphylococcus aureus*.

Gordon is a true physician/scientist. He has an undergraduate degree in biology, a master's in genetics and a PhD in molecular biology, in addition to his MD.

A career in pediatric infectious diseases gives him the chance to utilize all that, he says. "This field is ideal for me. It combines clinical work with a research-based profession. You're the critical link between the actual bedside work of getting the history, getting the correct clues to the diagnosis and the research work of incorporating your knowledge about infectious diseases and the different ways we can test for them and treat them.

"A lot of epidemiology and biology goes into that, so having a strong background in biology is very helpful. You can understand disease mechanisms, the best way to test for a disease and the way drugs work."

Gordon says the diversity of the field always keeps things interesting. He gets to work with all disciplines involved in children's care and all sorts of conditions. "I get to work with surgeons, urologists,

orthopedists, cardiologists, oncologists and more. Every specialist working with kids has, at some time, concerns about infection. So it's a lot of different things we participate in.

"Some things are more common like healthcare-associated infections. Others are rare diseases we don't see very often such as those that come with returning travelers."

The Jerusalem native didn't jump into medical school after completing IDF artillery service even though he'd been interested in the sciences for many years. "The evolution of living organisms has fascinated me ever since I was an adolescent," he says.

"I found it exhilarating how clear-cut scientific logic could put in order the enormous diversity I was witnessing in nature. So I started my bachelor's in biology at Hebrew University and immediately joined a basic research lab. There I learned how to phrase a scientific question and how to plan an experiment that could support or refute it. I continued to a master's degree in genetics, still working in that lab."

During undergraduate and graduate school Gordon also spent two summers working at European Molecular Biology Laboratories in Heidelberg.

"But about a year into my master's I felt something was missing. I guess I wanted something a bit more concrete, something that translated what I did into medicine and into people's lives.

"So I applied to Hadassah and got in."

To continue research he found a Hebrew University lab that featured basic and translational (animal models for human disease) work. "I was happy with that, seeing how things you do in the lab can translate directly to the clinic.

"Aiding patients gave me direction and fulfillment during my years working in research in medical school."

It was during his sixth year of medical school that Gordon decided on pediatrics. "I was choosing between internal medicine and pediatrics and during my last pediatrics rotation I made my decision. Pediatrics was a lot more fun. Kids are fun, great; I just love playing with kids!"

"Being in that environment and caring for kids is very meaningful to me. It was one of the smartest decisions I've made."

He notes that pediatricians are known to be happy about their work and he found that to be true on his various rotations throughout medical school. "I would always look at the senior physicians in the departments because they spend the most time with students. And the most smiles I saw were from pediatricians.

"It's a very different environment. These are kids. And when they are very sick it's very very sad. But they are still kids; they still want to play and laugh even in their hospital beds. That's very inspiring.

"And most kids will fully recover from their infections."

At 26, Gordon entered medical school later than most of his friends. But the now 40-year-old believes having "great kids and a great family of his own," and having come to his profession older and a little more mature, has given him greater perspective on medicine and deeper empathy for his patients and their families.

"It helps me connect to the kids and their families. Parents are, understandably, very anxious, wanting to know what it is the doctors know, what they are planning and how it will affect their child."

The Gordon family: Dad; Mom Yael, 38, an occupational therapist; daughters Tamar, 11 and Zohar, 4 and son Gilad, 8 arrived in the United States last July. They live in the Baltimore suburb of Pikesville and will stay three years for Oren's work.

After his pediatrics residency Gordon chose a fellowship in infectious diseases over rheumatology, endocrinology and nephrology. He also spent two months doing research at Emory University.

"Infectious diseases is fun because we have drugs that actually work very well," he says. "But we're also in the business of antibiotics stewardship. We're looking into what cultivates resistance and trying to preserve these great drugs that work so well and minimize the chances of the appearance of 'super bugs.'

"A lot of our efforts are to help choose the right antibiotics at the right time for the right patient."

Gordon enjoys being the "interface" between lab and physician. And he's pursuing a more sophisticated version of this relationship.

"A lot of times we rely on history and physical exam. But rarely do we get a very clear diagnosis." In the laboratory of Dr. Sanjay Jain, a Hopkins pediatric infectious diseases specialist, Gordon is now working on nuclear medicine technology that would be non-invasive and specific for various pathogens.

"We like to have a culture for a pathogen, but usually we need some invasive procedure for that culture and that involves some risk for the patient and some cost.

"The same way we try to grow cultures in petri dishes using a special medium for particular bacteria and then gram stain the bacteria – the lab work in at Hopkins is trying to develop bacterial-specific imaging tracers."

In a nutshell: Gordon and other Hopkins researchers are working to be able to analyze, with imaging technology and new "tracers," the nature of a strain of bacteria and its progression under drug therapy - a PET scan for germs and their treatment. Nuclear imaging produces pictures by detecting radiation from different parts of the body after radioactive tracer material is administered. It's called *in vivo* gram staining, meaning that it's done with living tissue. Patients receive a series of scans monitoring the progression of a disease and the effectiveness, or lack thereof, of a chosen drug.

"This can guide your choice of drug and how long you use it. A lot of times we use antibiotics longer than we need to because we don't know when an infection is over. These tools may help our decision-making and limit the potential for developing drug resistance.

"I'm working on what I hope will be the clinically relevant animal model used to test these imaging traces – a rabbit model."

Also, Gordon serves as the lead collaborator between two Hopkins laboratories with overlapping projects, working, as well, in the lab of Dr. Lloyd Miller, who has appointments in both dermatology and orthopedic surgery.

Gordon is very interested in chronic infection and hard-to-treat infections that develop from the presence of "hardware" in the body including: metal screws, plates, rods and joint replacements, particularly joint replacements.

Back to mouse knees.

"It's hard to learn to do the surgery to insert the pin and to cause the infection," he says. "We use the mouse model to learn new approaches to drug therapy. We try to use medicine we already are using but try to optimize the way we use the drugs, with different considerations. As I said before, we try to balance toxicity and efficaciousness as well as avoid resistance."

Right now, with a special combination of higher doses of the antibiotic rifampin (commonly used to treat tuberculous, leprosy and Legionnaires' Disease) and the current standard of care, other more commonly used antibiotics, the team is hoping to lower the use of antibiotics from six weeks to three or four after post-knee replacement infection.

Gordon had already published 13 research projects before coming to Baltimore and had registered one U.S. patent (concerning biomarkers for heart disease). At Hopkins, he's currently working on a research manuscript and two additional projects that eventually will be published. He is also writing a review on pathogen-specific molecular imaging.

## **DID YOU HAVE TO LEAVE ISRAEL FOR THIS EXPERIENCE?**

"YES."

## **WHY?**

"This fellowship gives me great opportunities to do research that is not currently done in Israel. Particularly, molecular imaging of infectious diseases with PET is not done anywhere in Israel."

## **WHAT WILL YOUR JOB BE WHEN YOU RETURN?**

"I will be a pediatric infectious diseases specialist at Hadassah."

## **HOW HAS THE APF GRANT HELPED YOU IN THE U.S.?**

"Coming here with my wife and three children, we had to give up one salary. And, for example, we wanted to enroll the kids in Jewish day school. Moving from Israel to Baltimore for three years is a huge financial burden. But it's very important to the Israeli medical community that these APF grants have been established to enable physicians to come to the leading medical facilities in North America and learn from them and then take all of that back to Israel. "I'm very grateful to APF for this grant."

## **WHY DID YOU CHOOSE HOPKINS?**

"I chose Johns Hopkins for its diversity and endless research opportunities. For example, here I get exposure to pediatric infectious diseases rarely found in Israel, including HIV and tuberculosis.

"Also, very few labs in the world are engaging in the infection imaging modalities I want to study and Hopkins is one of them.

"It is an enormous university with leading scientists. One of my mentors, Dr. Jain, is a pioneer in the development of bacterial-specific PET tracers for molecular imaging. And Dr. Miller is known worldwide for his research on immunological response to *Staphylococcus aureus* infections, including orthopedic-related infections.

"Both their labs are state-of-the-art and they are both great mentors."

## **ANY MORE MENTORS?**

"In Israel – Dr. Dan Engelhard, now-retired head of pediatrics at Hadassah, is an amazing person. He's the one who accepted me into the residency program and I admire him greatly for many reasons.

"He treats medically but also has a very wholistic view of the patient. He takes into account the family, the social environment and more -- all the factors that would change a child's life, that would make him/her better from the disease and the infection.

"Dr. Engelhard was also head of pediatric infectious diseases and the HIV center. And he established, at Hadassah, this program where professional medical clowns visit every pediatrics department, helping children deal with procedures. I think that's just a wonderful approach to help kids cope from their own perspective.

"He also has a project in Ethiopia for HIV orphans. He has taken a lot of volunteers to these children and has actually established some of the orphanages there.

"Dr. Engelhard still has a position at Hadassah and I keep in touch with him."

#### **WHAT'S YOUR TIME LIKE THIS FIRST YEAR OF YOUR FELLOWSHIP?**

"This year clinical service is about 50 percent of my time, typically two weeks per month, with research being the other two. During the next two years clinical will drop to about 25 percent of my time and research will be about 75 percent.

"My day starts at about 7:45 a.m. and ends at about 5:30 p.m. most times. During clinical days I get consult requests from different teams including: pediatric intensive care, neonatal intensive care and pediatric oncology. I meet the patient, get a full history, do a physical exam and review all the labs. Then I come up with a differential diagnosis and think of additional tests necessary to verify the diagnosis. I decide on a treatment course (usually antibiotics) and follow the patient during treatment.

"I'm on call 24 hours a day when I'm on clinical service, but that's usually just over the phone outside of office hours. One weekend a month I'm on call and may need to get to the hospital.

"In addition to laboratory and clinical work, as part of my fellowship I attend conferences and lectures across campus and take in-training exams for certification by the American Academy of Pediatrics."

#### **WHAT ABOUT WORK/LIFE BALANCE? HAVE YOU ENJOYED ANY TRAVELLING?**

"Fellowship is less intense than residency. But, as in residency, I always take the time to be with my wife and children. Moving to a new country has been challenging for all of us, having to learn a new language and culture. But this experience has brought us together as a family, even more than before, and we enjoy this time of togetherness.

"We have enjoyed getting to know the natural wonders of this part of the world. We have been to many national and state parks in Maryland, Pennsylvania and Virginia and have visited some fascinating cities such as Washington and New York."

#### **WHAT DO YOU PLAN TO DO BACK IN ISRAEL WITH YOUR FELLOWSHIP EXPERIENCES AND HOW WILL YOUR FELLOWSHIP YEARS BENEFIT HEALTHCARE IN ISRAEL?**

"Further honing my ability to diagnose children with infectious diseases will enable me, I hope, to combine my passion for basic science and clinic practice so that I can better help my patients as their clinician, and shape their course of treatment as a researcher.

"Also, I'm hoping to establish this rabbit model to be able to take it back to the research lab in Israel and continue to optimize treatment for these kinds of infections. I want to continue to develop these kinds of imaging modalities that are not being done in Israel right now. I think Israel can become one of the world leaders in this area. It's very novel and very few labs in the world engage in this."

## **American Physicians Fellowship for Medicine in Israel**

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P: 617-232-5382 • F: 617-739-2616 • [info@apfmed.org](mailto:info@apfmed.org) • [www.apfmed.org](http://www.apfmed.org)