



THE MICRO-SCOOP

Newsletter of the University of Maryland School of Medicine
 Department of Molecular Microbiology & Immunology



SPOTLIGHT ON FACULTY:
DR. JAMES KAPER
 BY SMITA CHANDRAN



James Kaper earned his Ph.D. in Microbiology from the University of Maryland, College Park. A cruise on the Chesapeake Bay to collect samples for his thesis work in Microbial Ecology

turned out to be quite a life-changing experience. An unpleasant bout of seasickness steered him (literally!) into accepting a Post-Doctoral Fellowship in Bacterial Pathogenesis at the University of Washington at Seattle. After two years in Seattle, he moved back home to Baltimore to join UMAB as Assistant Professor of Medicine and Chief of the Bacterial Genetics Section in 1981.

His twenty-five year academic career has been replete with increasing responsibilities including the positions of Associate Director for Laboratory Research at the Center for Vaccine Development and Co-course Director for Host Defenses and Infectious Diseases at the School of Medicine and Professor of Microbiology and Immunology. He has published prolifically in esteemed peer-reviewed journals and has co-authored several books and book chapters. He has trained many graduate students and post-docs in our department and has taken active interest in

conducting lectures as well. Over the course of his career, he has traveled to developing nations like Chile, Bangladesh and India to give lectures and consult on the use of DNA probes as novel diagnostic tools for epidemiological studies. His major research interests lie in the development of live oral cholera vaccines, evolution of pathogenic bacteria as well as the molecular pathogenesis of *V. cholerae*, enteropathogenic *E. coli* and enterohemorrhagic *E. coli*.



Apart from his successful scientific career, he enjoys canoeing and kayaking with his family at their home by the water in Arundel County. Dr. Kaper also sang for the Baltimore Symphony Chorus for fourteen years until it was disbanded three years ago and he is actively involved in the preservation of undeveloped land in the Chesapeake Bay area. The latest feather in his cap was his appointment as Chairman of our Department of Microbiology and Immunology. Congratulations Dr. Kaper!

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**SCIENCE IN THE PUBLIC
INTEREST: ANCIENT
ORGANISMS WITH
CUTTING-EDGE
APPLICATIONS BY NICOLE
AMMERMAN**

Dr. Shiladitya DasSarma from the UMBI Center of Marine Biotechnology (COMB) met with Nicole Ammerman to explain how members of an ancient kingdom of life can have modern medical and research applications. Dr. DasSarma is a faculty member in the GPILS Molecular Microbiology and Immunology Program.



Nicole (NCA): Could you talk a little about the work in your lab?

Dr. DasSarma (Dr. D): We work on extremophiles. These are organisms that grow in environments that you wouldn't think of as being able to sustain or support life, for example, high temperature or anoxic environments. The organisms that we work on grow in hypersaline environments, and they're called extreme halophiles. They are members of the third domain of life, the Archaea, and they have a lot of features that are eukaryotic. The research in our lab is focused on this particular class of organisms, and we use them as models for transcription and DNA replication in higher organisms.

NCA: Can you describe some of the unique features of the *Halobacterium* studied by your lab?

Dr. D: I think one of the most interesting features is that they are tolerant of multiple extremes. Most extremophiles have evolved to handle one extreme, like high temperature, but haloarchaea can handle a lot of different extremes like high salinity and slightly elevated temperatures, but they can also grow anaerobically, are resistant to extremes in pH, and also can tolerate very high radiation intensities. So, they are resistant to many different extremes, and that's what makes them interesting models, especially for transcription, because they have to respond to many environmental stresses.

NCA: What makes these halophilic archaea a good model system?

Dr. D: First of all, they serve as models for fundamental eukaryotic processes. I like to think of them as "junior" eukaryotes. They have a smaller genome than yeast, and their transcription and replication systems are simpler than either mammalian or yeast systems, so that's one reason. Another reason is that we have an inventory of all of the genes, and *Halobacterium* processes look like they're stripped down versions in eukaryotic organisms. The third reason is that they're very good genetic systems; we can knock out genes at will, so we can study functions of these genes *in vivo*, which is pretty unusual for organisms of this type.

NCA: Are there biotechnological applications for this system?

Dr. D: They could potentially be used as cell factories for expression of foreign genes. For example, large salt ponds support very large blooms of *Halobacterium* (as you can see on the cover of the current issue of American Scientist), so we have an excellent system for scaling up to produce large quantities of recombinant proteins. A second project

that we've worked on for some time is on biotech applications of gas vesicles, the organelles which allow these phototrophic organisms to float to the surface and get closer to light. These vesicles are genetically engineerable, similar to a phage display system, but the gas vesicles are like viruses without any infectious properties, empty shells with a protein coat. We have a collaboration at the CVD to use these vesicles in vaccine development.

NCA: But aren't these vesicles inside the organism?

Dr. D: They are, and you can easily release and purify them. The cells lyse if you dilute them with water, and then the vesicles float to the surface, which allows us to make large quantities of vesicles.

NCA: So, the idea is to potentially inject the vesicles into people, to use the vesicles as the vaccine?

Dr. D: Yes, we've done some animal studies in mice, and the vesicles are non-toxic and they are self-adjuvating. You don't need to add any adjuvant probably because they are very stable and particulate in nature, and they appear to be quite active in eliciting various types of immune responses.

NCA: Do the gas vesicles need to be maintained in a saline solution, as do the *Halobacterium*?

Dr. D: No, they don't; they're incredibly stable. They're almost impossible to solubilize, and that's why people haven't really studied them in as much detail as other organelles. We're still working on the basic aspect of how cells produce vesicles.

NCA: Is there anything else about your work that you'd like the readers to know?

Dr. D: One last point is that *Halobacterium* gives us a way of thinking about microbial life which is different from the ordinary microbe. We're using this microbe for teaching concepts of microbiology to high school and early college students. Because of the potential dangers of working with many microorganisms, we think it is important to provide safer alternatives to students. We think this system is safer because the media in which it grows doesn't support most other microorganisms. It's nice to give students a real microbe that they can do experiments and research on. Students can do inquiry based lessons to better understand important concepts of microbiology. I think that's an important component of what we're doing right now.

MEETINGS AND POSTERS

Chun Tan, Dr. Laurel Burall and Dr. Jan Peters (Bavoil Lab) each presented posters at the Third Meeting of the Chlamydia Basic Research Society in Louisville, KY (March).

Zach Roberts (Vogel Lab) presented his work in the Basic Science 1 session of the Graduate Research Council for which he received first place (April).

John Teijaro (Farber Lab) was an invited speaker at the Keystone Symposia Immunologic Memory and was awarded the Keystone Santa Fe New Mexico March 3-8 Scholarship. He will also be giving a presentation at the American Association of Immunologists in Miami, FL in May for which he received a travel award.

Dr. Martin Flajnik was an invited speaker at the Marine Genomics Meeting in Sorrento, Italy (November, 2006). He also gave a talk at the University of Cologne in Germany in March. He

rounded out his travels with a talk at the Scripps Research Institute in San Diego, CA (April).

Kelsy Smith (Oram Lab) presented a poster at the Graduate Research Conference at the University of Maryland, Baltimore in April.

Rebecca Brady (Shirtliff Lab) presented a poster at the Graduate Research Conference at the University of Maryland, Baltimore in April.

Maura Strauman (Kaper Lab) presented her work at the Graduate Research Conference at the University of Maryland, Baltimore in April.

PUBLICATIONS

Publications having department students as authors/co-authors are designated with a ♦. Bold face is used to identify department members.

Antalis, T. M., Shea-Donohue, T., **Vogel, S.N.**, Sears, C., and Fasano, A. Protease functions in intestinal mucosal pathobiology. *Nature Gastroenterology and Hepatology* (*in press*, 2007).

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♦ **Liu, Z.**, Rank, R., Kaltenboek, B., Magnino, S., Dean, D., **Burall, L., Plaut, R.**, Read, T.D., Myers, G., and **Bavoil, P.M.** 2007. Genomic plasticity of the *rrn-nqrF* intergenic segment in the *Chlamydiaceae*, J. Bact. **189**:2128-2132.

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Books

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RECENT GRADUATES

The following students recently graduated from our program: **Modesta Ndejemi**: "Control of memory CD4 T cell recall by the CD28/B7 costimulatory pathway", October 2006; **Andrew Hebbeler**: "Alkylphosphate and Tumor Recognition by Circulating V γ 2V δ 2 T cells", November 2006; **Kechang Liu**: "CD103 deficiency separates GVT effects from GVHD mediated by donor CD8+ T cells", March 2007 and **Francesca Okoye**: "Alterations in T cell receptor mediated proximal signaling components modulate CD4+ T cell effector function", April 2007. Modesta returned to Tanzania where she is working at the Ifakara Research Institute, Ifakara, Tanzania. Andrew has accepted a

postdoctoral fellowship in the lab of Warner C. Greene at the Gladstone Institute of Virology and Immunology in San Francisco, California. Kechang is a postdoctoral fellow in the lab of Gregg Hadley, his thesis advisor, at Ohio State University and Francesca is returning to the Medical School to complete requirements for her M.D. Wish them all the best in their endeavors!



CONGRATULATIONS!!

Kelly Baker placed third in the Intermediate Women's Division on her first climbing competition in the annual "Baltimore Rampage", held at Towson University. This intercollegiate climbing competition is the largest on the east coast. Way to go Kelly!

June Green's daughter, Jessica Molitor, was accepted into graduate school at the University of Maryland-Baltimore School of Social Work; she will begin classes this Fall.



BIRTH ANNOUNCEMENTS

Shane Ceraul (Azad lab) and his wife Becky welcomed Madelyn Eve into their family on March 16th. This is the couple's second daughter.



Rebecca and Sean Brady welcomed their daughter Fiona into the world at 8:19am on May 14th! Fiona is 19 ¾ inches and 8 pounds, 3 ounces. Baby and Mother are doing great!



OTHER NEWS

Please welcome our new departmental administrative assistant, Michaele ("Mickey") Witcher and the new office assistant Zenika Henry.

Melissa Hayes and Michelle Weber were elected to be the student representatives from our program at the next GPILS faculty meeting.

Rebecca Maag joined the Azad lab in November 2006. A recent graduate of Johns Hopkins, she worked in Carolyn

Machamer's lab on the role of golgin-160 in apoptosis.

The UMB Summer Softball Coed League begins play on Monday June 4th. If you're interested in joining Team Yellow Fever contact Nick Bushar (nbush001@umaryland.edu) or Khandra Sears (ksear001@umaryland.edu).

COMING SOON!!!

GPILS Explained.

Major changes: IHV's assimilation into the SOM, TIGR's move to BioPark II and what these mean for our department.

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