Darwin Applies to Medical School

When George Williams and Randolph Nesse made their first pitches for Darwinian medicine in the early 1990s, they turned some heads, but not the right ones. Reviving and building on European traditions that melded medicine and evolutionary biology, the duo argued that diseases could be best understood from an evolutionary perspective. Their first meeting on the subject in 1996 attracted dozens of physicians, including the president of the Institute of Medicine (IOM). Several participants described new medical school programs at the University of Michigan, Ann Arbor.

But times may be changing. Last week, a similar meeting in Washington, D.C., attracted dozens of physicians, including the dean of Harvard Medical School and the president of the Institute of Medicine (IOM). Several participants described new medical school programs at the University of Auckland, New Zealand, and at Johns Hopkins University in Baltimore, Maryland, involving evolutionary medicine, as well as a pending textbook. “A thoughtful strategy for the future education for health professionals would incorporate a strong evolutionary perspective,” says IOM President Harvey Feinberg.

At the meeting, researchers reported headway in understanding drug resistance through the lens of evolution. Others described progress linking past evolutionary adaptations with current health problems. For instance, anthropologist Kathleen Barnes of Johns Hopkins University has evidence that for some asthmatics, this overly energetic inflammatory response may be a holdover from the body’s successes in coping with parasitic disease.

Connections. Citation maps from 1995 and 2004 (above) reveal a sevenfold increase in direct interactions between evolutionary biology and medicine.

Despite the intellectual appeal of adding evolution to the medical school curriculum, medical schools are already straining from an explosion in information and technology, and clamors for change come from many directions. “Medical schools have a lot on their plate,” says James Lupski of Baylor College of Medicine in Houston, Texas. And, notes Harvard evolutionary biologist David Haig, “Evolutionary thinking is not going to give cheap medical solutions.”

Proponents counter that evolutionary thinking can provide a fresh way of looking at the human body and a framework for organiz-

Two Sides of the Same Coin?

Scientists have long puzzled over the persistence of schizophrenia—a deleterious condition that by rights should have been pretty much bred out of the human gene pool.

At the Sackler Colloquium on Evolution in Health and Medicine held last week at the National Academy of Sciences (NAS) in Washington, D.C., evolutionary geneticist Bernard Crespi of Simon Fraser University in Burnaby, Canada, threw some evolutionary firepower at the question. He proposes that both schizophrenia and autism are disorders of the “social brain”—but at opposite ends of the same spectrum. Psychiatrist Ezra Susser of Columbia University calls it an “imaginative proposal, … although I don’t think it’s supported yet by the data.”

Last year Crespi, with Christopher Badcock of the University of Texas. And, notes Har-

That would fit with their theory that psychotic disorders—including not only schizophrenia but also bipolar disorder and some major depres-

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ing a deluge of new genomic information. Those new data are driving home how tightly disease is linked to evolution, says David Valle, a geneticist at Johns Hopkins University School of Medicine. He and others want to move away from viewing the human body as a generic, one-size-fits-all machine. Individuals vary not just in their genetic makeup but in their connections to the microbes in their gut and their environmental exposures. “All this must somehow be understood” to manage disease, says Didddahally R. Govindaraju, a Boston University geneticist who co-organized the meeting. With genomic data in hand, “medical students are much more equipped to understand the connections between all organisms,” he adds.

During her talk, Barnes presented several examples that suggest that how humans evolved to cope with past parasitic diseases has predisposed some of us to contemporary health problems. The malaria parasite Plasmodium vivax, for instance, depends on a surface protein called Duffy to gain entry into human red blood cells. In certain malaria-endemic areas, a mutation in the gene for Duffy, called DARC, leads to the loss of this surface protein, and malaria can’t gain a foothold. But Duffy also acts as a sponge to immune system messengers in check; otherwise excess immunoglobulin E (IgE), which underlies allergic asthma and other allergic reactions, may be produced. Barnes and her colleagues have found that asthma is associated with the defective Duffy gene in populations in Brazil, Columbia, and the Caribbean whose recent African ancestors lived where malaria was endemic.

Similarly, others have found asthma associated with high IgE in areas such as Egypt where schistosomiasis is common. Today, cockroach and dust mite allergens are well-established triggers for asthma, and those proteins are quite similar to the schistosomiasis worm protein troponyosin, which sets off the IgE response. People with high IgE are most able to curb parasite infection, but there can be a downside. “Individuals who are most resistant in these [worm-ridden] environments are the ones who produce the most IgE, and they are primed to respond to the common household allergens,” says Barnes. She has traced this sensitivity to some variants of the gene for the immune system messenger interleukin 13.

“She has sophisticated evolutionary thinking that she’s applied to two different medical problems, and she has not just clinical and epidemiological data, she has the genetic underpinnings. She has the complete story,” says Nesse.

Knowing these evolutionary connections could help physicians recognize who might be at increased risk for asthma and who should take precautions to limit exposure to allergens, says Barnes.

At the beginning of the meeting, Harvard Medical School Dean Jeffrey Flier called himself agnostic about the need to incorporate evolution into medical education. But now, “I want to start to influence the medical curriculum toward that,” he announced as the meeting wrapped up. “Evolutionary biology needs to get in the queue.”

At last, says meeting co-organizer Stephen Stearns of Yale University, “we’ve gotten the attention of the medical community.”

—ELIZABETH PENNISI