Doctor at large

A brilliant young scientist is proposing an entirely new way of looking at illness and disease. In New York, Liz Thomson meets Dr Sharon Moalem

Sharon Moalem must have been an infuriating child, for every sentence he uttered surely began with "why?" Now a tousle-haired 33, Moalem laughs into his Coke. "I guess I was quite a handful. I was very hyper, and I must have been very annoying to my teachers because I was never satisfied with any of the answers they were giving me… My mother says I went through life backwards – I was born very serious. But I worked as a professional clown for 10 years. That put me through college, and provided a balance."

Moalem already holds a doctorate in neurogenetics and evolutionary medicine, and, in a little over a year, he will be, as he puts it, "a doctor squared", for he is studying medicine at New York's Mount Sinai School of Medicine. "I decided I want to be able to apply what I'd learned and to treat people, so I went in to this thinking I wanted to be a doctor. But the clinical and medical parts will open me up to research I wouldn't have been able to do before." So, for the moment, Moalem is living a somewhat schizophrenic existence, on the one hand a medical student, on the other a researcher at Mount Sinai's Hospital. In his spare time, he's raising funds to launch a biotechnology company based on evolutionary principles. "I don't sleep much – I get some exciting idea and I'm up till three or four in the morning." Which is doubtless when he wrote his engaging and accessible book, *Survival of the Sickest*.

Dr Moalem is less concerned with individual illness than with what causes illness in particular population groups and whether those illnesses were at some stage in our history the key to our survival. Take Type 1 diabetes: "I was at a conference and it was very cold, so people kept having to leave the room. The speaker said, 'I'm sorry – I know everyone has to pee when it's cold'. And I thought: *why* do we pee when it's cold? I took it for granted doctors would know the answer to such a basic question." In fact, they didn't, so Moalem began to consider it. "How do plants and animals deal with the cold? I came across some research about a frog that can freeze solid in the winter – its heart and brain stop – and it does this by getting reversible diabetes every year but without seeming to suffer the ill-effects of the sugar like people. So I wanted to know, how is the frog managing its diabetes? I contacted the researcher, who is now funded by the Diabetes Association." He turns to the plant kingdom, and the grape used to make Ice Wine, which is dry. "It manages the cold by becoming *sweet*; its sweetness is its antifreeze." If plants and animals share two of diabetes' most significant characteristics – high blood sugar and excessive elimination of water – in order to survive the cold, what might we learn from that? Questions, questions.

Moalem was 15 when he first asked a seriously *big* question. His grandfather suffered from hemochromatosis, a genetic disorder resulting in an excess of iron, and he became sick with Alzheimer's. "He absorbed too much iron, which gets deposited in the organs, and I worried that it had got deposited in his brain and caused the Alzheimer's. I had this *theory*, but everyone said I should go back to high school." In those days, it was thought that hemochromatosis was a rare condition but, 10 years later, research showed it to be the most common genetic mutation among Western Europeans – "30% of them carry it, in Ireland 40%. Having it gives you a risk factor for liver cancer, diabetes… But why would a third of the population be at risk? It doesn't make any sense, so I started wondering: is this a trade-off, what could it have protected against? I knew from research that the mutation occurred in the last 2000 years, so what happened in Western Europe that happened nowhere else that could have caused this?" Bubonic plague. Essentially, what Moalem discovered, along with the fact that he, too, has this genetic snafu for which he is bled every 56 days, was that hemochromatosis made people resistant to TB, salmonella, typhoid fever – and plague. "So it was a sophisticated survival method." As for Alzheimer's, hemachromatosis *is* a factor, "but Alzheimer's is more a syndrome than a disease, so there are many different causes".

Moalem grew up in Toronto, the son of a Baghdad-born biomedical engineer who designs pacemakers and artificial hearts, and a Transylvanian-born, artistically inclined mother – a left brain/right brain mix that he believes explains his creative approach to science and medicine. A liberal arts undergrad, he toyed with the idea of a pre-med programme but opted instead for research that would show what happens to plants and animals when they get sick, "because I wanted to understand human health in a very different way". Among other things, he discovered that honeybees deal with whatever's attacking them by making their own antibiotics, and that these antibiotic compounds find their way into honey. Hence, Manuka honey is effective in treating ulcers because ulcers are caused by bacteria, and Manuka honey is from tea tree.

Such research throws up endless conundrums: Sunlight converts cholesterol into vitamin D, so is *that* why a high-fat diet in cloudy northern Europe is more likely to cause a heart attack than in the sunny south? Sunglasses protect our eyes from harmful rays, but do they confuse the hypothalamus and so short-circuit the brain's hormone-producing protection mechanism, making sunburn more likely? Are post-menopausal women prone to heart disease because without a monthly bleed they are too iron-rich?

"The point of this book is that all the common diseases might once have been protective", concludes Moalem, with whom one feels in the presence of true genius, possibly even a future Nobel laureate. "When you look at disease in a new way, you open up new avenues of research… What's always bothered me is the 'war' metaphor: we've declared war on cancer, war on MS without understanding them so we've created a bigger problem… Instead of sending in the troops, we should ask the big questions. I hope my book will open up the discussion."

Survival of the Sickest is published by HarperCollins on 4 June, price £16.99

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Moalem: We have declared war on enemies we don't understand
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