CHRISTIAN FLEMMING/LINDAU NOBEL LAUREATE MEETINGS

Q&A Jules Hoffmann
Fighting fit

Jules Hoffmann shared the 2011 Nobel prize in Physiology or Medicine for discoveries in the activation of innate immunity against bacteria and fungi in fruit flies. Now based at the Institute of Molecular and Cellular Biology at Strasbourg University in France, Hoffmann talks to Ádám and Dávid Tárnoki about how to use the immune system to kill cancer cells.

What is our biggest health threat today?
One of the most important discoveries in medicine was probably vaccination. For most of human history, people died from infections. This is now largely under control and average life expectancy has doubled in the past 100 years or so. However, we still do not have vaccines against a number of very important pathogens, such as HIV or *Plasmodium*, the agent of malaria, and we also have some vaccines against established pathogens that do not fully protect people. With resistance against antibiotics becoming an increasing problem, vaccination has to be improved accordingly. In addition, we now face the problem of an ageing population in which cancer, neurodegeneration, stroke and cardiovascular diseases are the major killers. Obesity is another key issue. Finally, we have to be careful about the effect of new materials or environmental toxins on our physiology in general, including our immune system, but we do not have to panic about this.

Will we eventually be able to stimulate the immune system to kill cancer cells?
This is a very important emerging field, and there is great hope that we will understand what induces an immune response against cancer cells. When you kill cancer cells using chemotherapy, those cells leak large numbers of molecules, some of which are thought to induce antibody formation against cancer cells. The immune system has checkpoints — proteins or inhibitory pathways — that prevent lymphocytes from overreacting and attacking normal tissue. The rationale here is that alleviating or inhibiting their functions in tumours will make reactions of the immune cells more aggressive and efficient. Indeed, clinical trials are underway indicating that this can be a promising avenue in curing some cancers.

What is the secret to conducting Nobel prizewinning science?
Science is a very stressful job because you have to choose the right field, get good results and then publish those results before your competitors. It demands full engagement and an enormous amount of work, so it is healthy to have other cultural interests and also a nice family life. I met my future wife when she was hired to work in our laboratory by my thesis advisor. It is very good when you have a partner who understands and shares your commitment.

Intellectual freedom is also crucial. From very basic, curiosity-driven research we ended up doing things that eventually turned out to be interesting for medicine. But we did not anticipate this when we set out. Basic science makes you ask questions and find results that suddenly open up to something that nobody knew before.

What advice do you give to your students?
I advise young students to choose a good subject and a good supervisor. In addition, I encourage them to be aware of all the progress in their field, particularly regarding techniques. For example, in our research we had to immunize 100,000 flies individually in order to identify one inducible antifungal peptide, drosomycin, whereas today 20 would be enough because the technique has evolved so dramatically. Also, I tell them not to stick to the established techniques in their field: be open and interact with other fields. I was trained as a humble zoologist, but we had to get involved with cellular biology, biochemistry, analytical chemistry, molecular biology and molecular genetics in order to achieve our research goals. Finally: work hard. My grandparents were butchers on one side and farmers on the other, and they worked very hard indeed.

Do you always think and behave scientifically?
I recently met some researchers at the Dead Sea in Israel, who had interesting results: they had cured three people with psoriasis and they wanted my opinion on it. I cautioned that because they did not have a full cohort showing the way the volunteers had been treated in the salty environment of the Dead Sea compared with a control group, they could not be sure of the reasons why the subjects were cured because of their work. This is scientific thinking, and it certainly influences the way I behave, but it's not something you have to do all of the time. Some things I do don't make much scientific sense. I choose not to drink alcohol at lunchtime, for instance, but in the evening will enjoy a good French wine. ■

SANDOR VARSZEGI

Ádám and Dávid Tárnoki are identical twins working in the Department of Radiology and Oncotherapy at Semmelweis University in Budapest. They revived the Hungarian twin registry and perform twin studies in areas that include atherosclerosis, respiratory diseases and anthropometric traits to try to understand the epigenetic background of these diseases.