



My Sixty-Six Years of Medical Research

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In preparing this presentation, I was encouraged by our Chancellor who thought that health and healthy aging are relevant to the notion of sustainability. Most of my research over more than six decades has been in the field of proteins and protein models, namely polymers of amino acids, and all of it was related to medical research. Later on I worked mainly in immunology, where I was responsible for the creation of the notions of the immunogen and of immunogenicity; on a more applied level, I developed the first synthetic antigens and their use as drugs. Thus I found myself in what is now called translational research. My perspective on sustainability thus is founded on my experience in science in general, and in immunology and health in particular. Sustainability, in my view, relates to the individual, to the scientist, and to humanity – the beneficiary of science.

First, let me tell you my essential advice to a young scientist, but which is actually valid for any scientist, and indeed for the sustainability of any creative individual.

First of all curiosity. My definition of happiness is the capacity to be curious. If you lose curiosity, you become a vegetable. Optimism. You have to believe and to be enthusiastic about what you believe. Perseverance. Not always everything works well. Your optimism will help you to persevere, even though things look grim. A sustained effort is essential. Truth. Stick to it, because the alternatives are more dangerous and end in catastrophes. Strive for excellence. You must believe in what you are doing, and set your goals at the highest level.

For most individuals, after many years of research, publication in an impressive journal seems the end of the road, but this is not true, certainly not in translational research, because the next step – the development of the fruits of research – is most important, and you must follow it closely. But when your study reaches a product, my advice is: remove yourself from the financial aspects, because others understand them much better than you.

The translation of research into products is important both for the individual and for humanity as a whole.

Unfortunately, it is becoming more and more difficult and prohibitively expensive to reach new drugs: there are two ways to consider.

Try to apply known drugs to new uses: drugs that have been successful for another indication, and even candidate drugs that were not successful for the purpose for which they were created. What people call: “New tricks for old drugs”. When two drugs, each used separately, have only weak effects, their combination may have a strong synergistic effect. Indeed, my laboratory has succeeded in this regard in developing three successful drug combinations against three different cancers. Nevertheless, I hasten to stress that these are successful treatments in improving quality of life, but none of them is a cure.

I would like to distinguish between discoveries and inventions.

The above-described treatments of different kinds of cancer are discoveries – both the relevant antibodies and the chemotherapeutic drugs existed before we learned to exploit them for new uses. In another case, the drug against multiple sclerosis, denoted Copaxone, is an invention, as it did not exist before our research, until it was synthesized as a copolymer of amino acids.

Let me now turn to the sustainability of the human species. Crucial responsibility for the sustainability of mankind and on this planet is healthy aging. In recent years, there has been a tendency to define aging as a disease, with all the advantages the definition brings to the patient in terms of drugs and treatments. But aging has a serious impact on the sustainability of society: as the percentage of older people increases continuously, and the elderly become a burden on society, their health must be improved, first of all for them individually, but also for society as a whole. Thus, global health becomes a significant problem even as we discuss sustainability as a whole.

Many ways can help humans and human society to sustain health, like diet, physical exercise and sports, a frugal lifestyle, etc., but I want to mention here – specifically – some dramatic improvements in fighting diseases by using immunology, and I refer both to neuroimmunity, and to immunotherapies against cancer. These are

not only in individual cases, but may improve the outcome for a healthier and longer life, influencing positively the sustainability of mankind on this planet.

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