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PROGRESS IN PREVENTIVE MEDICINE

Editorial

Viva Europa, a Land of Excellence in Research and Innovation for Health and Wellbeing

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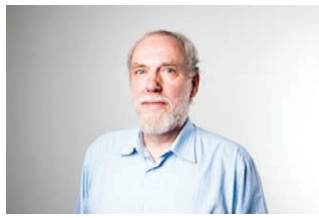

Charles Auffray, PhD



Michael Sagner, MD

Our colleague Herman Goossens pointed out that "millions of Europeans are questioning what the European Union does for them" and invited the community to "shout about the European Union's successes" (Nature 542:273). A short answer was given by the Nobel Committee in 2012 when it awarded the Nobel Peace Prize to the European Union that "for over 6 decades contributed to the advancement of peace and reconciliation, democracy and human rights in Europe." As a matter of fact, great contributions to science and society have been made in Europe, for example, by CERN through advances in particle physics and the development of the World Wide Web, the Groupe Spécial Mobile, to develop the GSM telecommunication standard, the combination of which enabled the widespread use of the Internet and mobile telephones, by Ariane with rockets for the exploration of space, or Airbus with aircrafts for airline transportation, to name only a few.

In turn, Carlos Moedas, the European Union Commissioner for Research, Science and Innovation, stated "As a paradigm of excellence, the European Research Council should act as a model in other areas" on the occasion of the 10th anniversary of the ERC supporting basic research conducted by outstanding investigators (Nature 543:465). Complementarily, in recent years, the Innovative Medicines Initiative, the world's largest public–private partnership supported by the European Union and the European Federation of Pharmaceutical Industry Associations has started to tackle the big challenges and hurdles faced in developing safer and more efficacious drugs for the many disorders that affect human health globally.[1]. Europe is thus in an ideal position to take a leading role in the formation of a World Alliance for Health and Wellbeing.

Indeed, we live a historical moment, witnessing a true metamorphosis from a reactive to a proactive practice of medicine: for the first time, humanity has the ability to follow proactively the health of the entire population by combining Participatory Prevention and Personalized Prediction (P4 Medicine) of disorders across the entire health spectrum.[2,3] We cannot afford to continue reacting too late, once symptoms have appeared and diseases have manifested themselves, since the poorly efficient and increasingly costly management of diseases is the source of growing inequalities leading to impoverishment of the vulnerable populations and crashing of health-care systems.

To implement the systemic approach underlying this proactive practice of medicine, the time has come to focus on the scientific definition of wellbeing.[4] Indeed, it is essential for each individual to know her/his state and trajectory of wellbeing to enable the prevention and the management of chronic diseases (cardiometabolic, neurologic, respiratory, cancers, and so on) as well as infectious diseases (bacterial, parasitic, viral, and so on). This requires the collection, analysis, and understanding of the processes occurring in the human body on time scales ranging from fractions of a second to many years, with the active participation of each person.

For this purpose, we can now use the methods of "advanced intelligence"[5]: the cross-disciplinary integration of human expertise with the technological innovations of artificial intelligence and complexity sciences within an European Union action plan.[6–9] This enables us to make sense of the vast amounts of functional information on the human body extracted from data collected in biological and clinical assays and in real time through mobile and connected devices for the monitoring of environmental and lifestyle exposures (nutrition, exercise, sleep, stress). These technologies should produce major discoveries, trigger the development of more effective medicines, and empower drastic reduction of health-care costs with the active participation of citizens through social networks.

In the short term, the goal is to develop a prototype of an innovative Systems P4 Medicine center, grouping under the same roof all necessary medical, paramedical, scientific, societal, and technological competences to allow the monitoring and follow-up of 1,000 proactively involved participants, generating actionable recommendations, providing new opportunities for each person to manage her/his health and wellbeing. This will provide the basis for the much-needed transformation of training curricula of a new generation of scientists, engineers, coaches, healthcare, social, and wellbeing professionals.

In the middle term, each hospital center should include an Institute of Systems P4 Medicine, making it possible to monitor and follow-up tens of thousands of individuals and to renovate the local and regional health-care system, providing individuals with the means to take active control of their health and wellbeing while ensuring and preserving their privacy and intimacy.[10]

In the long term, the global deployment of Systems P4 Medicine on the planet would take place under the aegis of a World Alliance for Health and Wellbeing. To be successful, this Alliance will have to promote and be the custodian of a universal standard for communication of health data similar to the GSM standard that enabled the widespread use of mobile phones. This will trigger the creation of a whole industry for the production of thousands to millions of functional units and their installation in the field, in close proximity of the end users.

This Alliance will need to involve all stakeholders concerned through international forums in developing and developed countries: foundations, governments, and the relevant organizations of the United Nations such as UNESCO and WHO, non-governmental organizations, civil society, and patient organizations, cooperating closely with economic and industrial actors in various sectors, including biotechnology, health care, insurance, logistics, nutrition, pharmacy, sport, telecommunication, and wellbeing.

The challenges are considerable and the outcomes will not be minimal either. What is at stake is to better manage trillions of Euros of annual expenditures dedicated to health, our common good, unequally throughout the world, and to a large extent in a wasteful manner. The full implementation of proactive medicine will allow similarly large savings and their reuse in the prevention for maintenance of wellbeing of each human being.

Let us all become together the promotors and actors of this major transformation for the future generations!

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