

## Editorial

# Ageing populations, complex diseases and their challenge to 21st century healthcare: the focus of the European Society for Pharmacogenomics and Theranostics

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There is no doubt that the technological advances made over the past 15 years, much of them driven by the demands of the Human Genome Project, or emerging as a spin-off from it, have revolutionised our approach to biomedical research. And the wealth of information that has accumulated over that period now allows us to paint an increasingly detailed picture of disease and its classification at the molecular level. However, the hope and expectation that prevailed at the birth of the genome project that this would have a major impact on the delivery of more rapid, safer and effective medicines just has not been realised.

We are now beginning to discover it is not all just about genes. In our understandable enthusiasm for pursuing the path laid by the genome revolution, generating an ever more fundamental molecular description of human diseases, we appear to have forgotten, or at least relegated, the importance of physiology. We do not know as much about biology as we might think, at least in the sense that we lack an understanding of the dynamics of the complex interactions within the biological networks that underpin normal function, and the way these are disturbed in the evolution of disease. This reductionist agenda has undoubtedly generated invaluable information, but what is lacking is the integration of that information into an understanding of function. Without it, we cannot predict how the wider physiological system will behave in response to a challenge, whether natural or pharmacological. A consequence of this has been a disappointing return on the massive investments needed to bring novel medicines to market. Successes are few, competition is very high and costs are growing almost exponentially. Coupled with looming major patent expiries the resultant pressure on the profits and business models in the industry is increasingly great (1).

There is nothing new here. Nearly ten years ago an Editorial in *Nature Reviews Drug Discovery* highlighted the problem (2) and found little improvement five years later (3). In an analysis of these challenges in their 2004 paper, Hood and Perlmutter clearly stated that to address this problem, there was a need to generate a ‘systems view’ of biology to understand how the dynamics of network behaviour contribute to the emerging phenotype (4). They, amongst others (5, 6), have advocated a multidisciplinary approach to integrate the acquired molecular information, by bringing together biology

with mathematics, engineering and physics. The use of mathematical models to tackle network complexity and to simulate and predict function is now seen as an inevitable evolution in biology (7). Indeed, industry analysts have gone so far as to say that it is an essential component of the changes that need to take place in the current pharmaceutical industry business model if it is to survive the current challenges (8).

This integrative approach now becomes even more important. With the increasing emphasis on personalisation of therapies and the segmentation or stratification of treatment populations, the need is to improve our understanding of the connection between genetics and phenotype through a better view of system responses (9). Much of the focus on personalised medicine has been on cancer, as the assays, analyses and the ability to precisely define genetic mutations are well established and understandably, therefore, provide a viable test bed for these approaches. However, in terms of the impact on health economic budgets now and in the next 20 years, it is the complex, chronic multifactorial diseases that impose the heaviest burden. It will be here where the successful implementation of pharmacogenomics and theranostics will have the greatest population impact, but it is also where the greatest technical and clinical challenges exist.

The potential for ‘omics’ and integrative systems approaches to have an impact on 21st century medical practice is not in doubt: there are many publications clearly demonstrating this at the academic level; what is lacking is sufficient evidence of its application in the real world and its ability to be reduced to practice. The challenge that faces us now, therefore, is how to evaluate and assess the added value that these advances in science bring to existing medical practice, and then to find ways of exploiting them routinely in the clinic. This task is complex and challenging, as it is dependent more than ever on the need to bring exploratory, blue skies science and busy, pragmatic, practicing physicians together to test the potential of, and troubleshoot, unproven technologies.

In a nutshell, this is the imperative that laid the foundation for establishing the European Society of Pharmacogenomics and Theranostics (ESPT, [www.esptorg.net](http://www.esptorg.net)), and that has now become its overarching vision. As a non-profit organisation the Society will be promoting education and research in pharmacogenomics and theranostics, supporting the integration of basic multidisciplinary research approaches and facilitating their translation into tangible clinical benefits. Under its auspices, the ESPT will bring together basic scientists, clinical

researchers, pharmacologists and practitioners of any discipline that can contribute to the delivery of the objectives of the Society.

We are now opening membership of the Society and we look forward to receiving applications from representatives of all relevant disciplines. Our inaugural Symposium will be at the International Conference on Pharmaceutical Sciences, 'Pharmacogenomics: From Bench to Bedside' in Bled, Slovenia (1 October, 2011, [www.bbbb-eufeps.org](http://www.bbbb-eufeps.org)), where the Board will be formally elected. This will be followed in September 2012 with our major biennial meeting in Santorini, the theme of which will be Systems Biology and Personalised Health: Science and Translation (30 September–2 October, 2012, [www.santorini2012.org](http://www.santorini2012.org)).

We hope that you share our ambitions for the Society and its objectives, seeking to coordinate efforts in the labs and clinics to deliver tangible evidence of how cutting edge bench science can contribute to tackling the challenges of 21st century healthcare. We look forward to welcoming you in Bled and Santorini and to receiving your membership applications.

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