Since the Human Genome Project published the first draft more than a decade ago, the cost of sequencing the human genome has plummeted from US $3 billion to less than $1,000. Accompanying technological advances in other areas have further ignited discussions surrounding a ‘new era’ of personalised medicine. Originally developed in the context of genetics, this concept has recently been extended to encompass pharmaceuticals and cancer treatment, but has yet to be realised fully.

How far are we from the widespread application of personalised treatments in a clinical setting? Moreover, are medical practitioners ready, both from a practical and ethical point of view, for this new age of healthcare?
Dr Vicky Schneider (The Genome Analysis Centre, UK):

It is fascinating to see how the costs associated with sequencing the whole genome have been reduced. This explains why we are experiencing this acceleration of data production – in many different labs they can take a bug and quickly sequence the whole genome. That said, there are still many challenges when it comes to putting these organisms together. This is where The Genome Analysis Centre’s expertise is really vital, especially for non-human genomes (the Centre specialises in plants, microbes and also animals, although not necessarily model organisms).

Scientists themselves are struggling to learn everything – so, in terms of making sure the clinicians and other healthcare professionals are up-to-date, there is a huge amount of training needed, and more institutions, organisations and funders need to realise this. This is something that the Centre transmits very well by having a dedicated Head of Training and Outreach as part of its senior management team. When you have key resources in place to provide good research report services, this becomes an essential process and not just something that is done trivially or improvised by those who have other primary duties.

Dr Isaura Meza Gómez Palacio (Center for Research and Advanced Studies of the National Polytechnic Institute, Mexico):

I have conducted research examining amoebic infections and transition of epithelial cancer cells into an invasive phenotype, and the results obtained strongly suggest that an inflammatory environment facilitates the manifestation of aggressive behaviour by cells exposed to this environment. I have no idea if medical practitioners are aware of the research going on in laboratories, or how ready they are to try the innovations reported. However, in scientific literature it is clear that the intestinal microbiome has taken central stage, with many studies indicating the important role that its composition has in the human body’s wellbeing. In the case of amoebiasis, the microbiome composition seems to be an important factor in the manifestation of a light or a severe infection.

Professor Alan Christoffels (University of the Western Cape, South Africa):

There are many examples demonstrating that clinicians are increasingly buying into the idea of personalised treatments. I think it is important for genomic scientists to work more closely with clinicians to create awareness and ensure the impact of personalised medicine. In our experience, we find that clinicians are keen to add genomics as another layer of clinical investigation. On the other side of the coin, we also have to increase awareness both in the public and amongst the medical aid/health insurance policy sector, as these financial institutions are key to the adoption of ‘new’ healthcare initiatives.

Dr Andras Paldi (École Pratique des Hautes Études, France):

Phenotypic heterogeneity is a fundamental feature of living systems at all levels of organisation, whether cell, tissue or multicellular organism; personalised treatment is founded on this principle. However, it is important to keep in mind that even genetically identical individuals display substantial phenotypic differences, and that the same mutations can produce very different effects even in genetically-similar, closely related individuals. In order to be successful in personalised medicine, therefore, it is essential to go beyond genetics and understand all of the factors that contribute to the generation of heterogeneity and incorporate this knowledge into future therapeutic strategies. Unfortunately, in many cases this is still out of our reach due to lack of fundamental knowledge.

Dr Gabi Kastenmüller (Helmholtz Zentrum München, Germany):

This really depends on the area of medicine; in cancer medicine it is already a reality, but for more common diseases, such as hypertension, it is still far away. Although we already have a lot of knowledge that could be used for more personalised treatments, we can only proceed if we convince the decision makers, who have a financial perspective on healthcare, that in the end personalised medicine will be economical. For example, it will enable us to stop trial-and-error treatment and instead use research in areas like metabolomics to identify the best therapeutic option for a patient.

Professor Shamala Devi (University of Malaya, Malaysia):

From my perspective we are nowhere near this, largely due to the associated costs. Furthermore, medical professionals are not ready, either practically or ethically. A drastic change and an increased readiness to accept new ways is needed if medical practitioners and researchers are to succeed in updating themselves and realising that there is not a foolproof answer for everything.