The revolution is here – are you ready?

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The biological revolution in cancer is finally arriving in full force, altering how we diagnose, characterise and treat malignancy, and each of us needs to prepare for it in our own way. The signs are all around us, with a continuous stream of literature documenting great biological diversity among patients within the historically defined cancer classifications [1]. Furthermore, accumulating evidence suggests that characterisation of this diverse and complex biology is increasingly necessary for optimal treatment of an individual patient.

Whether the result of DNA analysis, RNA-based gene expression studies, proteomic characterisation, or some combination of these, the message is similar - understanding an individual patient's tumour biology is critical for optimal clinical treatment. Yet, despite the promise, success stories about the value of biological characterisation in the more rational use of cancer therapy have to date been relatively few and are oft-repeated, the trastuzumab/HER2 and the EGFR inhibitor/KRAS stories being prime examples. Nevertheless, these show the potential power of this approach, and I would argue that the process to develop this next generation of 'companion diagnostics' is accelerating. The pieces necessary are falling into place. Many of the cellular signalling pathways relevant to disease pathophysiology have been identified, and targeted therapeutics are in various stages of development against most of these pathways. The catalytic critical next steps involve the association of complex biological characterisation with individual patient treatment outcome as a matter of clinical development strategy. This is now happening, and is leading to the emergence of highly predictive tests to guide the biologically-informed rational management of cancer treatment at the individual or 'personalised' level.

What does the possibility of biology-driven clinical decision making mean to each of us? We must each understand the implications from our own perspective, and act accordingly [2]. If you are a patient, you take advantage of the educational information provided by institutions and patient-oriented organisations. Educated, you should expect your physician to be aware of the relevance to you of the availability of new predictive tests, and of the clinical implications of emerging biological information. You should agree to cooperate with clinical investigators, participating in their correlative biological studies. You should also talk with your physician about banking some of your tumour tissue for future biological study. Ultimately you should expect more effective and less futile treatment.

If you are a drug developer, you should be banking tissue from patients entered into your studies as a matter of development strategy. Where possible you should be incorporating some of these new biological tools into the design of your trials, for risk-managed and more efficient drug development. As a corollary to this, if you are a regulator, you should be requiring that this information be available as 'companion diagnostics' for the rational use of the drugs. In recent years European regulators have shown themselves very open in this respect, willing to incorporate patient selection biological information in their regulatory consideration, and unwilling to approve agents effective only in a minority of treated patients and without patient selection information.

If you are an insurance payer with the ultimate expectation of more cost-effective treatment from this new approach, you should support development of companion diagnostics, particularly for already-approved agents.

Healthcare providers, your world is changing, affecting how you characterise your patients diagnostically, choose initial therapy, follow them over time, and characterise them upon progression or relapse in consideration of next therapies.

All of these steps will be greatly affected by the emergence of new biological diagnostic tools, finally allowing accurate characterisation of your patients. You should educate yourself about this biological revolution, understand the tools as they emerge and the implications of this new information for the optimal care of your patients.

Challenges and opportunities for us all – welcome to the revolution!

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