

Paradigm shifts

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Clinical breakthroughs seem to come along sporadically, often after many years of incremental scientific discoveries. However, only occasionally does a paradigm shift occur. What we thought we knew is then re-examined in the light of new information and possibly recast in an entirely different way.

The strength of western clinical medicine is its scientific underpinning through a robust knowledge of anatomy and pathophysiology. Correspondingly, Australian research institutes use a 'bench-to-bedside (and back)' approach to deliver meaningful health outcomes. Examples abound: a personal favourite is the human papillomavirus (HPV) vaccine developed from the work of Queensland researchers Ian Frazer and Jian Zhou.¹ Medical practitioners process their patients' symptoms and signs through their framework of how the body works, what can go wrong in disease and which therapeutic approach may best help. Has western medicine been mistaken before? Certainly. And it definitely will again. But the ability to critically appraise ideas, even those that have historically proven helpful, is a key strength. Taking the time to prioritise revisiting the fundamental sciences may be ploddingly slow, but in the long run is most effective.

We acquire skin and gut microbiota from our environment. These vast numbers of organisms are essential for healthy functioning and implicated in illness.² Where once a clinician may have primarily thought of eliminating infectious colonies of bacteria, we now consider antibiotic resistance and the existence of a negotiated symbiosis.

After successfully incorporating surgery, chemotherapy and radiotherapy in cancer treatment, immunotherapy³ is now emerging as a fourth treatment modality. Approaches include harnessing the tumour microenvironment to amplify the response of our immune system to cancer. This area of active research, with promising new treatments, sprang from early cancer immune-editing hypotheses, which were preceded by earlier-still observations that some infections seemed to slow the growth of tumours.⁴

Other findings, in genetics and genomics, have been potentiated by advances in technology and resulting decreases in costs.^{5,6} Vast amounts of data – base pairs, syndromes, proteins – are collated and statistically correlated by computer software faster than the human brain, and hardware outstripping our capacity to store information. Bioinformatics extracts knowledge from data, and experimental verification – the gold standard of proof – is underway.

Medicine today continues the traditions of the last century, using an empirical approach based on shared experience where large groups of randomised patient results and responses are rigorously examined for confounders and other forms of bias. General practitioners are familiar with these important trials and the latest evidence-based guidelines they inform. Together these have created the health outcomes we enjoy. However, when a patient asks 'how is this treatment personalised to me, and not my statistical group', we cannot as yet provide a specific answer.

Cutting edge developments point towards stratified medicine where certain biomarkers are used to predict that person's unique response to specific

therapeutic interventions. The frontier, where precision medicine will provide treatments tailored to every individual's cellular biology, is perhaps closer than we think.

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