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To thwart disease, apply now

Translational medicine is a key addition to the biomedical research enterprise. Policy-makers and research leaders now must build the infrastructure to take discoveries from the bench to application.

Molecular biology is a victim of its own success. Seemingly overnight, it has changed from a science of one gene, one protein, one molecule, one at a time, to all genes, all proteins, all molecules, all at once. Everything is now 'ome-sized. The generation and exploration of these data has become a massive, all-consuming discipline.

And yet the expected pay-off — the new therapies and diagnostics that will improve human health — has not kept pace. Researchers and funding agencies recognize this inequality and are working on a solution: translational research. The name encompasses the strategies by which the intellectual riches flooding from biomedical discovery can be converted into practical riches from which humanity can benefit. *Nature* strongly encourages this effort, which is highlighted in a number of articles in this issue (see page 839).

It is clear, however, that the success of translational research requires new experts, infrastructure and incentives. This is perhaps best explained from the perspective of a basic researcher who has a discovery that is ripe for translation. A common and mistaken assumption is that this scientist will have the motivation — and somehow acquire the luck and skill — to make translation happen with little help. In practice, this is often a recipe for failure. The relative handful of scientists who have found applications for their discoveries frequently say they did so despite the system, not because of it.

Team work

Instead, imagine that the researcher enters seamlessly into a team that is ready-made for translation. That team features experts in all aspects of clinical research, including medicine, pharmacology, toxicology, intellectual property, manufacturing, clinical-trial design and regulation. The basic researcher now has the back-up from those who can do the jobs for which he or she is unqualified.

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The team has immediate access to the necessary infrastructure for toxicology testing, for instance, or to facilities that meet 'general manufacturing practice' standards for making compounds for use in human trials. The sole aim of the team is to ensure that the researcher's discovery will help the most people possible — not to ensure that it fetches the best price when it is licensed. And, absolutely crucially, all the team members are rewarded in terms of pay and promotion just as richly as if they had produced a string of publications.

In this ideal world, translational research becomes a welcome and satisfying pursuit for all concerned, rather than a distraction or a burden. It would receive much more than the lip service that it is sometimes afforded on grant applications.

Such an overhaul of infrastructure and reward systems will take commitment and money. For example, the US National Cancer Institute's Rapid Access to Intervention Development programme, which provides such a service (massively oversubscribed), spends between US$2 million and $7 million to take a discovery through to its first clinical trial. The cost of performing those trials is even more. But institution heads and policy-makers should not baulk at the price: it is small compared with the potential benefits of more discoveries being put into practice, and more illness being treated or averted.

Two-way process

Some researchers complain that an emphasis on translation swings the pendulum too far towards applied science at the expense of basic research, but this concern has little foundation. In fact, what is worrying is the extent to which biomedicine in the past few decades has swung so far towards pure science. One attempt to stem that tide is noted in the first of a series of Commentaries on innovation (see page 853). Yes, many of the most successful medical advances came from serendipitous discoveries. But money should also be spent on creating the mechanisms to translate those findings when they are made.

This distinction between basic and applied research dissolves under close scrutiny. Translation is not a one-way progression in which research findings enter a production line and emerge at the end as drugs or diagnostics. The whole process is more fluid: experiments on human tissues and clinical trials can inspire fascinating new questions back at the bench that will, when answered, improve the human experiment in its next iteration (see page 843). That is why efforts at translation should focus on training personnel to be comfortable in this eddy of information as it circulates between the bench and the clinic.

Under the direction of Elias Zerhouni, the US National Institutes of Health is spending several hundred million dollars to set up translational research centres across the United States (see page 840). At this early stage, it's not clear whether this represents a game-changing commitment by the agency and the receiving institutions, or an attempt to mollify tax-payers who want a return on their heavy investment. Many of the aims are the right ones, and anything is better than the current situation in which an individual's publications trump real medical needs. But Zerhouni's successor in the next presidential administration must make it a priority to continue or surpass these efforts. Because translational research is a new and unproven discipline, with no 'how-to' manual, it is also important to evaluate each attempt at translation as the field takes shape.

What would a scientist looking back on a long career be most proud of achieving? For some it might be the solution to a fundamental cellular mystery, such as the way a cell's division is usurped by cancer. Better still might be that solution, and the knowledge that thousands of cancers were no longer dividing because of it. ■