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Why vaccines?

This supplement, *Nature Medicine*'s first, is dedicated entirely to the subject of vaccines. Of course it has been known for decades that a single vaccine can save more lives and more money that just about any other medical intervention. So why focus on vaccines now? On examining the manuscripts submitted to the journal and keeping an eye on the opposition, we noticed a spate of vaccine research activity, ranging from new initiatives for the well recognized infectious diseases to new projects on vaccines to prevent and treat autoimmune diseases and cancer, for example. This activity embodies a move towards a better mechanistic underpinning to vaccine design and a greater realization of the importance of government and public awareness and acceptance of vaccines. Given this encouraging yet challenging climate, we thought that a vaccine supplement would be timely and well received.

As the issue took shape, three themes that seem to embody the challenge of vaccines have emerged. The first is, not surprisingly, biology. When a new vaccine is no more than a glimmer of hope, the first step is to sort out the biology—what is the agent that causes the disease or condition and can a suitable model system be developed in which to study and characterize the agent; does natural immunity ever exist and, if so, what defines it; can immunity be generated *de novo*; upon whom should trials be conducted and what is the minimal result that would constitute success; can adjuvants improve performance? As the articles in this issue illustrate, for some vaccines it has been possible to follow a relatively empirical research path and develop very successful products with only a minimal understanding of the immunological mechanisms at work. For others, past failures have suggested that only a very thorough understanding of the biology will suffice, and this can take many years of research. Malaria vaccines might now be emerging from such a struggle. HIV vaccines are just starting on that road.

The second theme to emerge from this supplement is money and lives. It goes without saying that vaccines are all about saving and improving lives and therefore it may seem odd, even a little callous to discuss vaccines in terms of money and lives. Yet there are two critical issues that make money so important to the success of vaccine programs and whereas neither is unique to vaccines, the huge scale of most programs serves to highlight their importance. First, for companies to stay in business, they must be profitable and to be profitable they need a product that people want and are able and willing to pay for. Vaccines are such a product. In fact, in the richer industrialized countries, people are willing to part with large sums in an effort to improve or guarantee their health. As Peter Goodfellow (Director of Discovery Worldwide at SmithKline Beecham) memorably remarked at a *Nature Genetics* conference: Rich societies have struck a deal with pharmaceutical companies in which society agrees to pay the pharmaceutical companies very large sums of money in return for products that, by and large, keep us disease- and pain-free. It is a good deal—as long as you have the money. Which brings us to the second reason why money is such an integral part of any vaccine initiative; most people in this world do not have two pennies to rub together. Many readers of this supplement live in countries that, according to the World Bank's 1998 Development Indicators report, spend $1,000–4,000 per person per year on health. It is perhaps easy to forget that for low income countries the equivalent figure is $18. This is why money is perhaps the biggest issue when it comes to human life.

Cooperation is the third major theme to emerge from this supplement. There probably is not a single article in this issue that does not mention the importance of cooperation at some level. Those discussing the biological barriers of vaccine development consider how best to divide and coordinate their research efforts. The economists puzzle over how international non-governmental organizations can work with poorer countries to help them build sustainable programs (rather than simply offering handouts). Representatives from government and industry discuss how cooperation on pricing policies will better serve vaccine research, development and implementation. And those concerned with the big picture of getting vaccines into the arms (or mouths) of millions of children around the world plan how to make financial institutions, global health agencies, governments and local health authorities all pull together.

Fortunately for the vaccine community, there are a number of stunning precedents of how effective cooperation can be—consider the two national vaccine days in India in 1996, during which 121 million children were vaccinated against poliomyelitis, or indeed the total global eradication of smallpox. But there are many examples of all the necessary pieces not coming together. HIV, malaria and tuberculosis are all without a vaccine, each missing a different and crucial component of the requisite cooperative package. Better cooperation at all levels would achieve a lot.

The Children's Vaccine Initiative estimates that improved implementation of existing and new vaccines currently close to market, could save 12 million lives per year. For wealthier industrial countries, new vaccines to tackle non-infectious disorders can add to the impact of vaccines. These are the challenges facing the community. As Sir Gustav Nossal says in the foreword on the next page—let's hope we are up to the challenge.

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