The twenty-first century has demonstrated that we can use molecular techniques to acquire detailed knowledge of a previously unknown, infectious agent in record time, as exemplified by severe acute respiratory syndrome coronavirus and Middle East respiratory syndrome coronavirus, and can then use this information for the development of candidate vaccines. The recent 2014â€“2015 Ebola epidemic in Africa demonstrated how 10 years of preclinical development can be rapidly translated into clinical evaluation with the joint efforts of funders, developers and regulators. It is no accident that the leading vaccine candidates were developed using molecular techniques with three live-vectored vaccines (recombinant vesicular stomatitis virus, recombinant-modified vaccinia Ankara and recombinant adenovirus) and recombinant subunit glycoprotein vaccines. These are all â€˜platformâ€™ technologies, and demonstrate how far vaccinology has progressed from â€˜one bug-one vaccineâ€™ to generic vaccine platforms for multiple candidate vaccines. Despite having come a long way in a very short period of time, we are yet to have a licensed human vaccine for any of these emerging diseases, although there are examples of licensed veterinary emerging disease vaccines, recombinant subunit protein vaccine developed for Hendra in Australia and recombinant vaccines for West Nile in the United States and Europe. Why are there no licensed human emerging disease vaccines? This is in part due to the transient nature of emerging diseases. The occurrence of these previously unknown public health threats prompts immediate responses from government and non-government funders; huge resources are allocated and immense efforts by academia, pharmaceutical companies, government and non-government scientists occur in a very short period of time. The good news is that we control the emerging disease; the bad news is that our successes result in loss of interest by the media and those who control funding resources as other priorities overtake the emerging disease. In this respect, Ebola in 2014â€“2015 has been replaced by Zika in 2015â€“2016. The progress on this emerging disease has been nothing short of amazing. As the first published report on Zika in May 2015, there have been over 700 papers in PubMed plus many others on non-peer-reviewed servers. From a â€˜ground zeroâ€™ where little was known about the virus or disease, there are now mouse and non-human primate models for preclinical development, over 40 vaccine candidates in discovery or preclinical development, and the strong likelihood that there will be phase I clinical trials before the end of 2016. Again, this is an excellent example of how academia, pharmaceutical companies, government and non-government scientists, plus regulators and funders are all working together.

There is no doubt that emerging diseases will continue to be public health threats in the future. Somehow, we need to avoid the â€˜knee-jerkâ€™ response. One approach would be to create â€˜international centres of excellence in emerging disease researchâ€™, with guaranteed funding, whose role would be to undertake research and development on vaccines for these diseases. Such centres would need to be publicâ€“private partnerships, rather than product development partnerships, as by definition we do not know when an emerging disease will become a public health threat, and vaccine research and development needs not only basic and applied science expertise but also the expertise of pharmaceutical companies for scale-up and manufacturing. As shown by the Ebola epidemic, there is little need for routine vaccination for many emerging

diseases, and major efforts are in stockpiling vaccines, which will be replenished at the end of their shelf life if they are not used. This approach is of limited interest to large vaccine pharmaceutical companies due to the low return on investment.

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