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A 2020 vision for vaccines against HIV, tuberculosis and malaria

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Acquired immune deficiency syndrome (AIDS), malaria and tuberculosis collectively cause more than five million deaths per year, but have nonetheless eluded conventional vaccine development; for this reason they represent one of the major global public health challenges as we enter the second decade of the twenty-first century. Recent trials have provided evidence that it is possible to develop vaccines that can prevent infection by human immunodeficiency virus (HIV) and malaria.

Furthermore, advances in vaccinology, including novel adjuvants, prime–boost regimes and strategies for intracellular antigen presentation, have led to progress in developing a vaccine against tuberculosis. Here we discuss these advances and suggest that new tools such as systems biology and structure-based antigen design will lead to a deeper understanding of mechanisms of protection which, in turn, will lead to rational vaccine development. We also argue that new and innovative approaches to clinical trials will accelerate the availability of these vaccines.