

## **Immune Memory: the Key to Vaccines**

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Memory is a key feature of the immune system. It has an ancient origin and an exceptionally complex but elegant molecular and cellular basis. I will discuss current understanding of how the immune system responds to infectious challenges to not only combat the invading microbes but to also create specific memory that allows a greater and more rapid response on re-exposure.

Such immunological memory is central to the action and great effectiveness of one of our most powerful biomedical interventions – vaccination. Vaccines save millions of lives each year and depend on humoral and cellular immunity for their durability. Some vaccines provide immunity for life and others lose most of their efficacy in a year. For a small number of vaccines limited memory may even be deleterious allowing unhelpful enhancement of infection by specific pathogens.

I will discuss examples of vaccines which induce exceptionally durable protection and others which provide very limited memory, and describe some requirements and approaches for enhancing the durability of the next generation of vaccines. Many of these vaccines are of considerable current interest – for example, malaria, Zika, dengue, HIV and pertussis – and try to tackle diseases that represent substantial global public health problems with high levels of morbidity and mortality.