Malaria update

Background and epidemiology:

In November 2004 the Public Health Agency of Canada released a travel health advisory warning of the risk of malaria in the Dominican Republic after receiving notice of 3 laboratory-confirmed cases of *Plasmodium falciparum* malaria in Canadian travellers who had visited the country within the previous month. *P. falciparum* is a mosquito-borne parasite that, through successive stages of its life cycle, invades the liver and then erythrocytes of infected humans. The infection can be fatal if it progresses to severe anemia or cerebral malaria (through the adhesion of infected erythrocytes to cerebral capillaries).

Malaria used to be endemic in Canada. During the building of the Rideau Canal in Ottawa in the 1820s, more than 500 workers and countless other settlers succumbed to infection from the temperate species *P. vivax*. Today, thanks to environmental and infection control interventions and changing local ecologies, the threat of malaria in Canada has been reduced to an international travel-related illness. This is not the case for much of the rest of the world, where malaria continues to threaten nearly 40% of the global population, accounting for 3–5 million deaths and 300–500 million new cases annually. In recent years global resources have been mobilized to fight malaria in the very poor countries of the world, mostly in Africa and Asia, through initiatives such as the Global Fund to Fight AIDS, Tuberculosis and Malaria, and the Malaria Vaccine Initiative.

Clinical management: The 3 recent cases of malaria in Canadian travellers returning from the Dominican Republic serve as a strong reminder for Canadian

physicians to take a systematic, comprehensive approach to the investigation of fever in the international traveller, such as that outlined by the Committee to Advise on Tropical Medicine and Travel (www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23sup/acs1.html). The “gold standard” for diagnosis of malaria is the thick and thin peripheral blood smear, stained with Giemsa stain. The rapid malarial test provides a simple alternative, with overall sensitivity and specificity levels of about 90%, which fall dramatically with low-level parasitemia.¹ Treatment of malaria may be oral or parenteral and depends on the infecting *Plasmodium* species, the geographic area of acquisition and the severity of infection.¹

Prevention: Environmental measures to reduce mosquito breeding sites, personal protective measures to reduce the risk of mosquito bites and chemoprophylaxis appropriate for the geographic area of potential exposure remain the mainstays of prevention.¹ Malaria vaccine development has seen a surge of activity in the last decade or so, owing largely to the mobilization of global funds and the advances made in the field of genetic engineering and biotechnology.² The 3 immediate goals of vaccine research are the induction of strong, strain-transcending, durable immune responses; the identification of protective antigens for immunity at specific stages of the parasite’s life cycle (pre-erythrocytic, erythrocytic and sexual); and the successful combination of candidate immunogens.³ Several candidate antigens that induce immune responses in the pre-erythrocytic stage (e.g., circumsporozoite protein and the thrombospondin-related adhesive protein) and the

erythrocytic stage (e.g., merozoite surface protein) have been identified, and vaccine trials involving humans and primates are underway. However, beyond the identification of immunogenic antigens, further considerations

challenge vaccine development. They pertain to technical issues, such as determining the form and delivery of the vaccine (e.g., synthetic peptide, recombinant, DNA plasmid) and understanding and effecting T-cell protection, and to logistical issues such as combining vaccine development efforts, licensing vaccines for use in very young children, acquiring informed consent in communities with low levels of literacy, and predicting and controlling costs.

Optimists in the field of malaria vaccine development suggest that, with sustained funding and dedicated cooperation, an available effective vaccine formulation is about 10 years away.³

Erica Weir
CMAJ

References

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