Chapter 8

IMMUNE RESPONSES IN HUMANS – TRICHURIS TRICHIURA

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1. INTRODUCTION

There are thought to be over 1000 million people in the world today who have ingested embryonated *Trichuris trichiura* eggs resulting in infection (Chan, 1996). *Trichuris* eggs hatch in the intestinal tract whereupon the emergent larvae migrate to the caecal crypts and burrow into the epithelium, thus occupying an intracellular niche. Once the posterior end breaks free into the lumen, fertilization can occur allowing eggs to void with the faeces. This pre-patent period takes approximately 60 days and the adult life span is estimated to be 3 years (Bundy & Cooper, 1989). Considering the scale of this gastrointestinal infection it is surprising how little we know about the immune response to it. Perhaps there has been a tendency to overlook the disease because it does not cause sudden serious debilitating symptoms. Trichuriasis, or whipworm infection, is largely asymptomatic: the size of the worm burden determines the severity of the clinical symptoms (see Chapter 3) and relatively few individuals within a community are heavily infected (Anderson & Medley, 1985, Cooper & Bundy, 1987). However, there are several reasons why we should be interested in the immune response to this rather insidious intestinal nematode.

2. THE IMPORTANCE OF TRICHURIASIS

Trichuriasis represents a major public health problem of global significance. Although a large percentage of infected people harbour light infections, which may go unnoticed, the cost to those with heavier infections is extremely high. When worm loads begin to exceed 50 worms, abdominal
discomfort and frequent and watery stools become evident. With larger worm burdens the illness becomes so severe it is often assigned the name *Trichuris* dysentery syndrome (TDS) (Ramsey, 1962). In these cases a heavily infected person can suffer from profuse diarrhoea, rectal prolapse, finger-clubbing, anaemia and growth retardation (for a collation of relevant work see Bundy & Cooper, 1989). The latter two symptoms are particularly devastating in young children because there is a strong correlation between them and cognitive development and it is children who tend to suffer the heaviest infections (see Figure 8.1, Simeon & Grantham-McGregor, 1990; Bundy *et al.* 1987). In fact moderate to heavy infections have been shown to impair learning ability in a large group of school children (Nokes *et al.* 1992; Nokes & Bundy, 1994) (also see Chapter 4). Clearly the consequences of intense infection present both a significant health and economic impact on a community (see Chapter 5).

![Figure 8.1. Intensity of *T. trichiura* infection by age as assessed by eggs per gram. Ayéné, Cameroon, 2000.](image)

With an estimated 46 million of those infected suffering some level of associated morbidity there is a need to understand immunity in order to develop better transmission control strategies and ultimately develop a vaccine (Montresor *et al.* 1999). At present, in the absence of such a vaccine, treatment is given in the form of a multiple dose course of a benzimidazole carbamate (Rossignol & Maisonneauve, 1984). This effectively expels all worms from their intestinal niche, but within 6-9 months of living in the same endemic area a person often becomes re-infected (Bundy, 1988). The goal of controlling intestinal helminth infection worldwide by the selective targeting of treating school-aged children is becoming a reality (see Chapter