CHAPTER II

REVIEW OF RELATED LITERATURES

Immunisation against parasitic helminths has been considered in recent reviews (O.A. Clegg and Smith, 1978). In general there are three approaches with regard to the antigens applied:

- irradiation - attenuated live helminths
- somatic extract of helminths
- metabolic of excretory/secretory (E/S) antigens produced by in vitro cultures of helminths.

Additional aspects include the use of various adjuvants as potentiators of the immune response, and the different routes in immunisation of the development of protective immunity. Progress with vaccination against nematodes has been based largely on direct empirical attempts to protect laboratory animals with antigen preparation derived from whole parasites or their secretions (Soulsby, 1966, Ogilvie 1976).

1. Vaccination whole worm material

A classical study was done by Sprent and Chen (1949) who did not detect any resistance against Ascaris lumbricoides in mice following vaccination with homogenates of adult worm tissues. Benkov (1981) immunised pigs with somatic antigens on L2 and L3/L4 larvae as well as adult worms. She observed a significant decrease in numbers of migrating larvae in the lungs particularly when L2 antigen was used via intramuscular injections in

combination with an AL-Span oil adjuvant. Stromberg and Soulsby (1977) did not observe significant protection in guinea pigs when the applied somatic antigens from L2, L3 and L4 larvae, however adult worm extract did show a protection. Bindseil (1969) was not able to show a protection in mice using whole worm extracts. Arean and Crandall (1962) used lyophilised L2 larvae to immunise rabbits. An intravenous injection with alive L2 larvae resulted in the capture and degeneration of the larvae in lung capillaries, whereas in the non-vaccinated rabbits the larvae readily penetrated the interstitium and the alveoli. Khoury, Stromberg and Soulsby (1977) injected guinea pigs subcutaneously with embryonated eggs of Ascaris suum. They obtained strong immunity against a challenge infection with 10.000 embryonated eggs given orally. They were able to passively transfer the immunity with serum and various lymphnode cells to recipient guinea pigs.

2. Vaccination with secreted antigens

The idea that functional antigens of parasitic nematodes might be present in secretions derived considerable support from the early observation that immune serum precipitated at the mouth, excretory pore and anus of Nippustrongylus (Sarles, 1938). Very variable results have been reported in experimental vaccinations with secretions of larval stages of Ascaris suum. Soulsby (1963) compared secretions in culture fluid from L3 larvae with homogenates of these larvae and found a significant reduction in the numbers of larvae in the lungs seven days after challenge with infective eggs in guinea pigs with either antigen.

Guerrero and Silverman (1969) found that secreted antigens of L3 larvae were more protective than extracts of the larvae after vaccination of mice. However, in another study (1972) they found that metabolic antigens only obtained from a longer lasting in vitro culture (> 16 days) did induce protective

immunity (measured as degree of pneumonia at 7 days post challenge). It must be mentioned that after 14 days of culture only 30-40 % of the larvae survived. Crandall and Arean (1965) found that secreted antigens form L2 larvae, maintained 24 hours in Hanks solution gave quite high levels of protection (75%) in mice. Stromberg and Soulsby (1977) prepared E/S antigens from L2, L3 and L4 larvae and did not show any protective immunity in guinea pigs. However, the culture fluid of the migrating larvae from 3th to the 4th stage did induce some protection. Matoff and Teryski believed that the presence of metabolic products in organs with large numbers of migrating larvae might be immunogenic. They fed guinea pig with such material (liver and lungs), They did not observe any protection.

The variability in the results seen in these experiments is probably associated with factors such as different culture conditions, variation protein concentrations used for the immunization, variations in immunizing schedule and the use of different laboratory animals.

3. Vaccination with ascaris enzymes

A variety of enzymes derived from Ascaris have been employed for immunisation

- Malic-dehydrogenase (Rhodes et al., 1965) caused some protection in guinea pigs but not in swine.
- Aminopeptidase from intestinal tissue of Ascaris induced a moderate protection in guinea pigs (Ferguson et al., 1969).

Aldolase from Ascaris body wall in combination with Freunds adjuvant caused a decrease in numbers of migrating larvae in the lungs of pigs (Mishra and Marsh, 1973). Although there is no direct evidence that the enzymes are

actually secreted by the migrating larvae, immune serum from pigs (or IgG alone) inhibited the Arcaris aldolase for 98% (Mishra and Marsh, 1973).

4. Vaccination with heterologous antigens

From a practical standpoint heterologous immunization is preferable if large quantities of materials are needed when the large quantities of materials are difficult to obtain. Stromberg and Soulsby (1977) found that guinea pigs could be effectively protected against Ascaris suum by pretreatment of the animals (intravenously) with embryonated eggs or larvae from Toxocara canis or larvae of Ancylostoma caninum. Landall et al (1966 and 1967) showed resistance to a subsequent A.suum inoculation in mice after a previous Schistosoma mansoni infection or Nippostrongylus brasiliensis infection. Also Eriksen (1981) showed a cross protection in mice due to a previous N.brasiliensis infection.