IMMUNOBIOLOGY OF CESTODES

Introduction

Cestodes in most of case make contact with at least two different host during the life cycle except *H.nana.* The degree of immune response in case of cestodes depends up on following factors-

1. Nature of the tissue site invaded
2. Intimacy of the host parasite contact
3. Stage of development of cestode (adult or larva)

As far as immunobiology of cestodes is concerned most of the work has been carried out on *Taenia, Echinococcus* and *Hymenolepis*

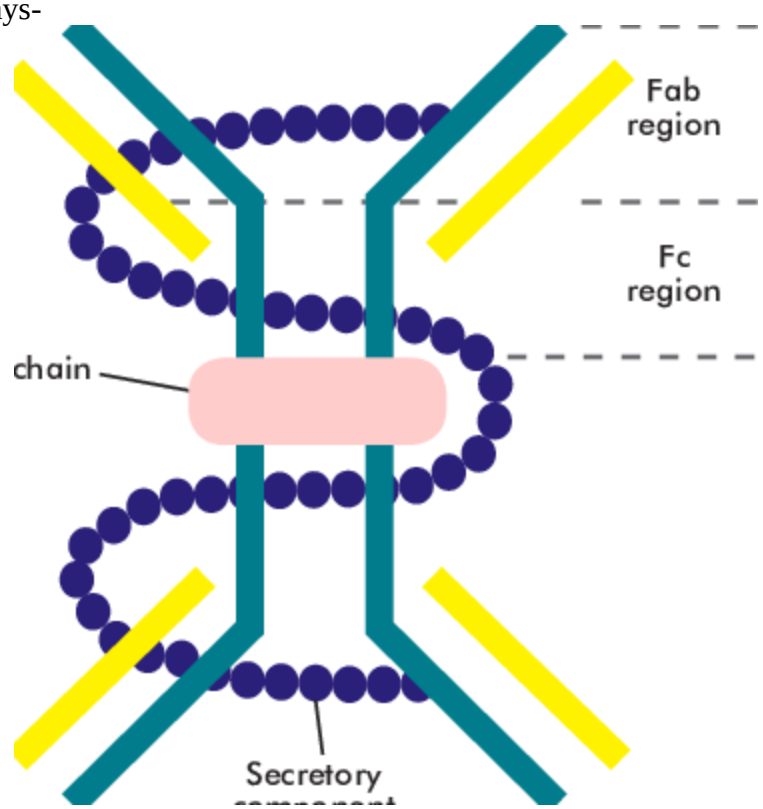
There has been explosive efforts to develop vaccines against cestodes but so far without significant success.

Immunity to adult Cestodes

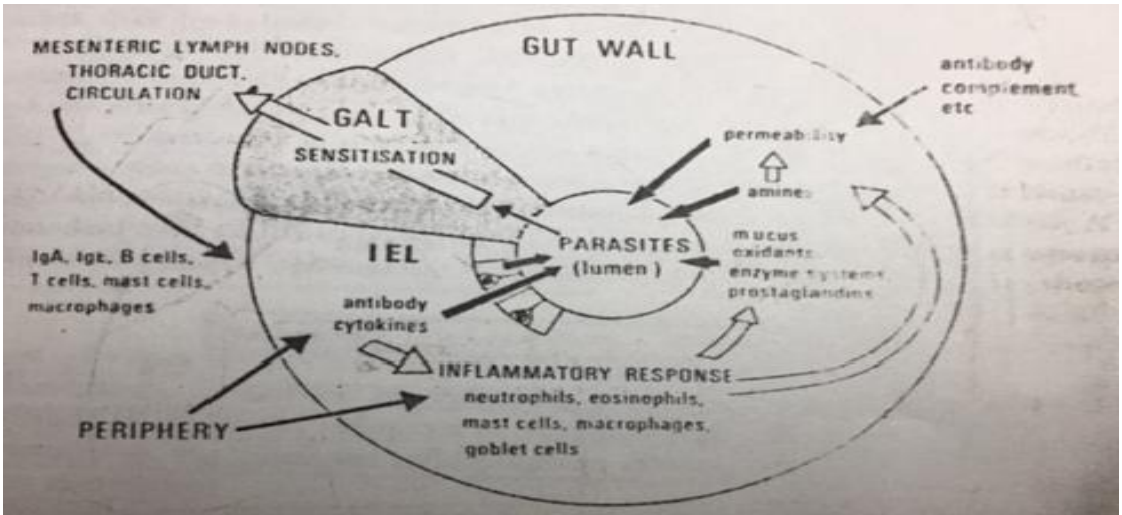
For many years upto 1987 it was believed that cestodes are either non-immunogenic or poorly immunogenic (Ito and Smyth,1987).The reason behind this assumption was that scolex with makes the contact with host use to make loosed non penetrative contact. But this assumption not continued for long and it was found that *H. Nana* having larval phase of life in man anad mice in the villi are strongly immunogenic.

Similerly Echinococcus use to disrupt the mucosal epithelium and it was found that 14 days post infection antibodies use to appear in dog serum (Jenkin and Reckard , 1987).

Immunoglobulin A is the major immunoglobulin present in intestinal secretions.Local plasma cells of the lamina proprea synthesise it and is found in dimeric state. It is transported in the intestine in two ways-



1. It diffuses from the site of synthesis into the columner epithelial cells of gut where it forms a remarkable complex with protein originally known as Secretory component (sIgA1). This complex is transported across the epithelial cess in vesicle and exocytosed in the intestinal lumen.
2. The second pathway of sIgA is via bile which has been confirmed in animals only not in man



11.2. Summary of the host responses to mucosal parasitic infections. Sensitisation occur
lly in gut-associated lymphoid tissue (GALT); various cells of mucosal or peripher
n are recruited largely by thymus-dependent mechanisms; the inflammatory response
rated produces an environment hostile to the continued survival of the parasites. Heav
arrows denote possible sources of effector molecules; IEL, intraepithelial lymphocyte
of which are granulated, and probably natural killer cells. (After Befus & Bienenstock
with permission from S. Karger AG, Basel.)

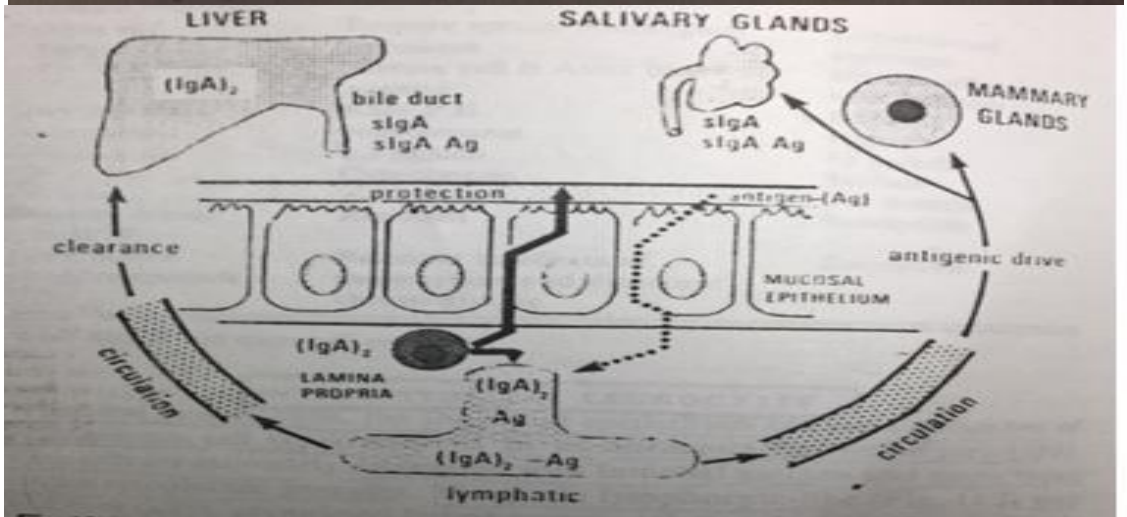
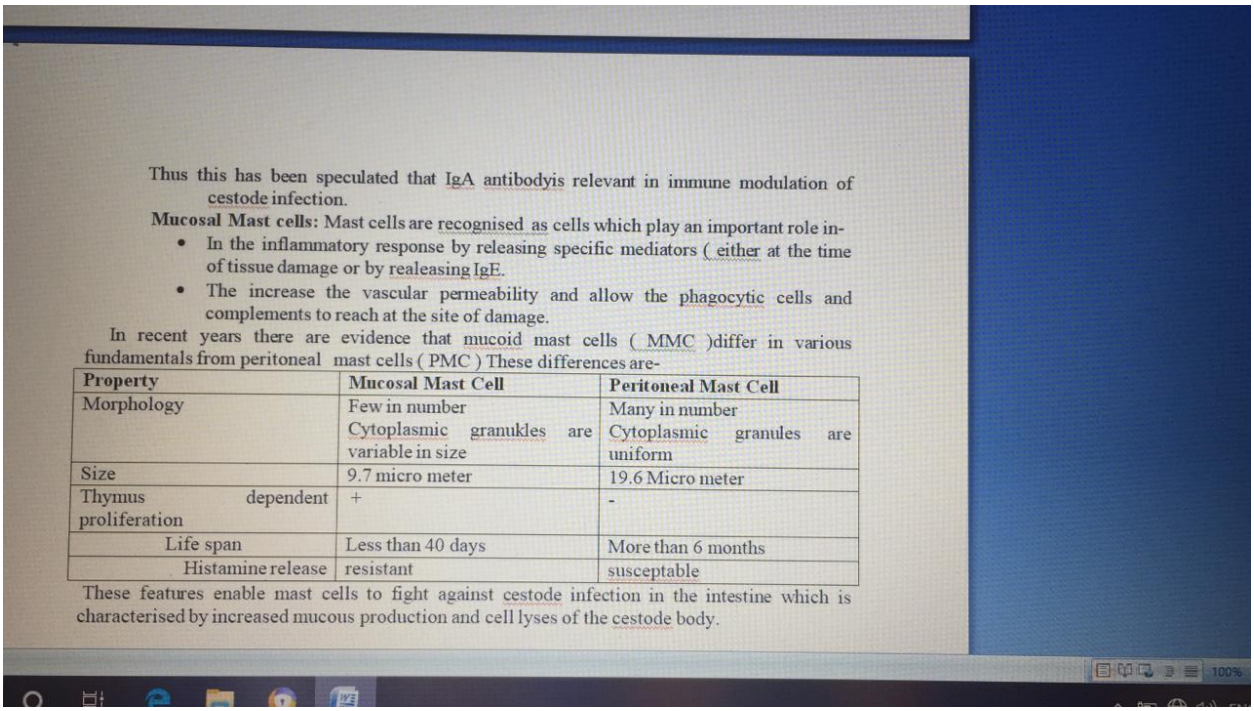


Fig. 11.4. Synthesis and transportation of immunoglobulin A in animals and (probably?)
man. Dimeric IgA (IgA_2) is synthesised by lymphoid cells in the intestinal lamina propria. It
transported into the lumen as secretory IgA (sIgA) after specific complexing with the secretor
component, a proteolytic fragment of a receptor (poly(Ig)receptor) synthesised by these cel
(see text). Some IgA ($(IgA)_2$) diffuses into the lymphatics and the circulation, from which mo
of it is cleared as sIgA by hepatocytes and passed in the bile, but some is cleared and secreted b
intestinal, lacrymal and salivary glands. Other cells with specific receptors for IgA, includin
monocytes, neutrophils and lymphocytes may also play a role in antigen clearance. (Redraw
with permission from Some thoughts on the biologic role of immunoglobulin A, by
Bienenstock and A. D. Befus, *Gastroenterology*, 84, 178–85. Copyright 1983 by The America
Gastroenterological Association.)

Thus this has been speculated that IgA antibodyis relevant in immune modulation of cestode infection.

Mucosal Mast cells



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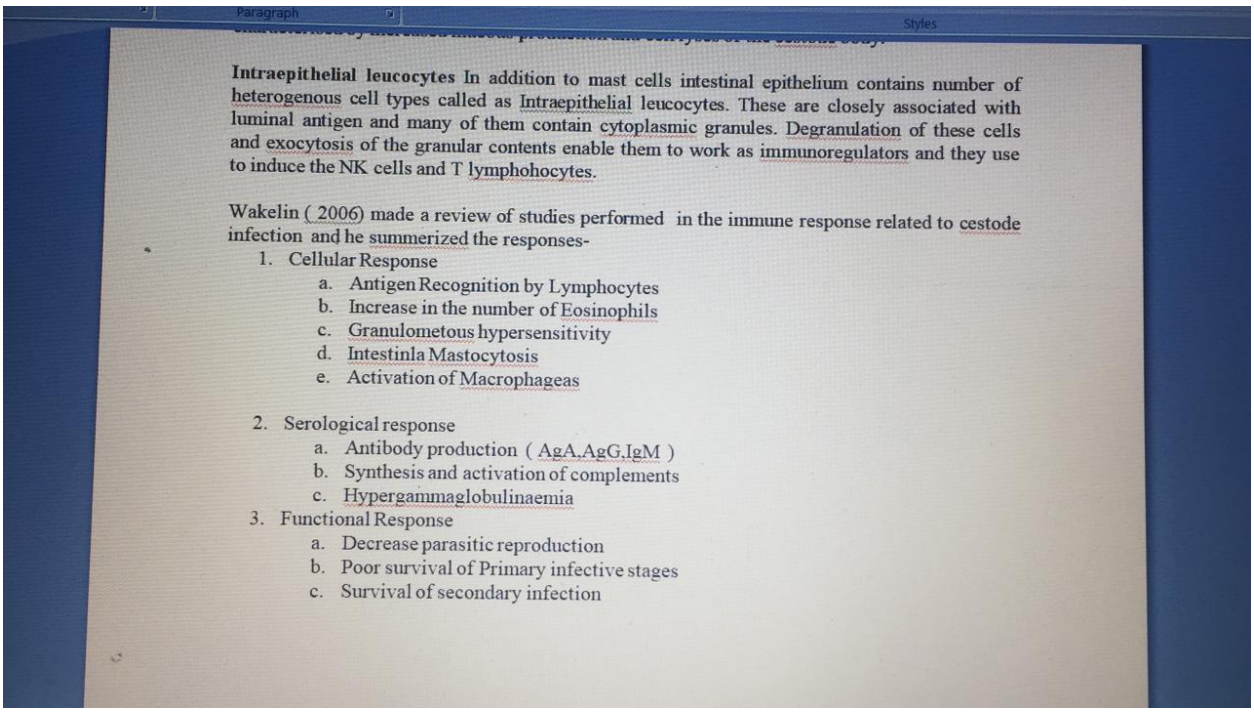
Mucosal Mast cells: Mast cells are recognised as cells which play an important role in-

- In the inflammatory response by releasing specific mediators (either at the time of tissue damage or by realeasing IgE.
- The increase the vascular permeability and allow the phagocytic cells and complements to reach at the site of damage.

In recent years there are evidence that mucoid mast cells (MMC)differ in various fundamentals from peritoneal mast cells (PMC) These differences are-

Property	Mucosal Mast Cell	Peritoneal Mast Cell
Morphology	Few in number Cytoplasmic granukles are variable in size	Many in number Cytoplasmic granules are uniform
Size	9.7 micro meter	19.6 Micro meter
Thymus dependent proliferation	+	-
Life span	Less than 40 days	More than 6 months
Histamine release	resistant	susceptable

These features enable mast cells to fight against cestode infection in the intestine which is characterised by increased mucous production and cell lyses of the cestode body.



Intraepithelial leucocytes In addition to mast cells intestinal epithelium contains number of heterogenous cell types called as Intraepithelial leucocytes. These are closely associated with luminal antigen and many of them contain cytoplasmic granules. Degranulation of these cells and exocytosis of the granular contents enable them to work as immunoregulators and they use to induce the NK cells and T lymphohocytes.

Wakelin (2006) made a review of studies performed in the immune response related to cestode infection and he summerized the responses-

1. Cellular Response
   a. Antigen Recognition by Lymphocytes
   b. Increase in the number of Eosinophils
   c. Granulometous hypersensitivity
   d. Intestinla Mastocytosis
   e. Activation of Macrophageas
2. Serological response
   a. Antibody production (AgA,AgG,IgM)
   b. Synthesis and activation of complements
   c. Hypergammaglobulinaemia
3. Functional Response
   a. Decrease parasitic reproduction
   b. Poor survival of Primary infective stages
   c. Survival of secondary infection

IMMUNITY OF LARVAL CESTODES

Larval cestodes use to make close contact with their hosts at two sites-

A. During the early phase of infection when immediately hatched oncosphere use to pernetrate the host intestine
B. At the time of final encystement in muscles, visceral organs, nervous system etc.

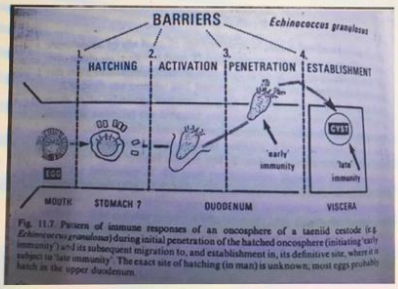


Fig. 11.7. Pattern of immune responses of an oncosphere of a taeniid cestode (e.g. *Echinococcus granulosus*) during initial penetration of the hatched oncosphere (initiating 'early immunity') and its subsequent migration to, and establishment in, its definitive site, where it is subject to 'late immunity'. The exact site of hatching (in man) is unknown; most eggs probably hatch in the upper duodenum.

Allen et al (2004) reported that both T and B cell responses are common in experimental system resulting the initiation of noth cellualar and humoral responses. These workers divided the larval immune response in two parts-

1. **Early or Pre-encystment Immunity**

Secretory IgA in the alimentary canal and in colostrums plays important role in attacking the oncosphere. Besides this, at later stages increase in population of mast cells, increased production of IgE and IgG antibodies has also been observed.

2. **Late or Post encystment Immunity**

Predominant cellular responses , increased population of eosiniphils, increase in the number of lymphocytes containg granumes in their cytoplasm. These granules are arginine rich proteins (= major basic proteins or MBP). There are evidence that MBP may function in killing of the cestodes both in vivo and in vitro.

IMMUNODIAGNOSIS

Diagnosis of parasitic infection largly depends on parasitological findings, cestodes are not exception to this.