Immuno-Parasitology


protozoa


helminths


arthropods

Professor Peter O'Donoghue

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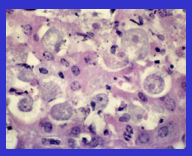
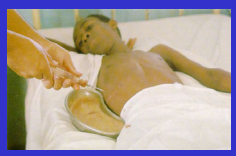
PARASITOLOGY





PARASITE + HOST

morphology	underpins	diagnosis
pathogenicity	causes	pathology
biochemistry	determines	treatment
transmission	influences	control

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Host + Parasite ≠ Disease

Outcome of infection dependent on various host-parasite interactions, especially:

- **parasite pathogenicity**
  - **high pathogenicity causes morbidity/mortality**
  - **low pathogenicity tolerated (commensalism?)**
- **host responses**
  - **over-reaction causes pathology (immunopathology)**
  - **under-reaction fails to clear infection**

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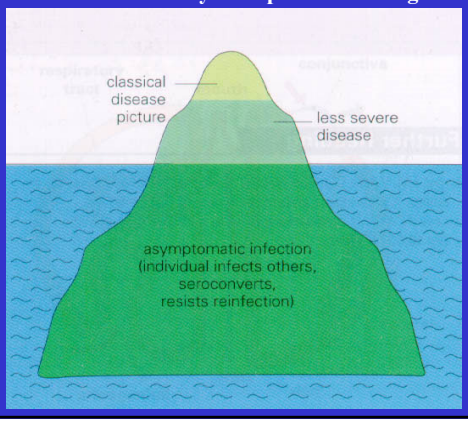
Disease is merely the tip of the iceberg



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WHO top 10 parasites

	Disease	Infections/yr	Deaths/yr
1.	Ascariasis	900 million	20,000
2.	Hookworm disease	800 million	55,000
3.	Malaria	800 million	1,500,000
4.	Trichuriasis	500 million	-
5.	Amoebiasis	480 million	75,000
6.	Filariasis	280 million	-
7.	Schistosomiasis	200 million	750,000
8.	Giardiasis	200 million	-
9.	Trypanosomiasis	25 million	65,000
10.	Leishmaniasis	1 million	1,000

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How do hosts survive it all?

- **Become resistant or tolerant**
  (survival of fittest - Red Queen hypothesis)
- **Ameliorate disease**
  (minimize acute-chronic damage)
- **Develop protective immunity**
  (memory, premunition)

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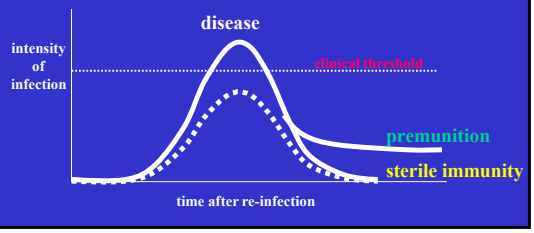
Three types of immunity

Previous exposure confers:

- **sterile immunity** (parasites eradicated)
- **clinical immunity** (disease prevented)
- **concomitant immunity** (some parasites persist)



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THREE LINES OF DEFENSE

first line BARRIER	second line INNATE	third line ADAPTIVE (ACQUIRED)
external coverings & secretions	phagocytes & inflammation	cell-mediated & humoral responses
nonspecific	nonspecific	specific

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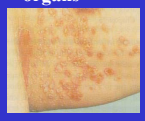
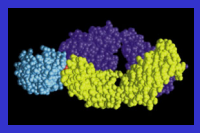
FIRST LINE

NONSPECIFIC EXTERNAL BARRIERS

Physical coverings
skin
mucous membranes
cilia in respiratory tract
flow through tubular organs



Chemical secretions
mucus, lysozyme
gastric juices, saliva
milk, sweat
urine



objective is to prevent entry of pathogens

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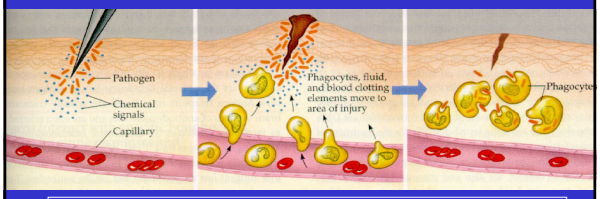
SECOND LINE

NONSPECIFIC INNATE IMMUNITY

phagocytes	- ingest pathogens
antimicrobial proteins	
complement (C')	- lyse organisms
interferon (IFN)	- inhibit spread
inflammation	- "setting on fire"



objective is to mop up pathogens that have entered

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THIRD LINE

ADAPTIVE (ACQUIRED) IMMUNITY

reliant on lymphocytes which provide:

- specificity
- diversity
- memory
- self tolerance

T cells mature in thymus	B cells mature in marrow
cell-mediated immunity	humoral immunity

objective is to target and destroy "nonself"

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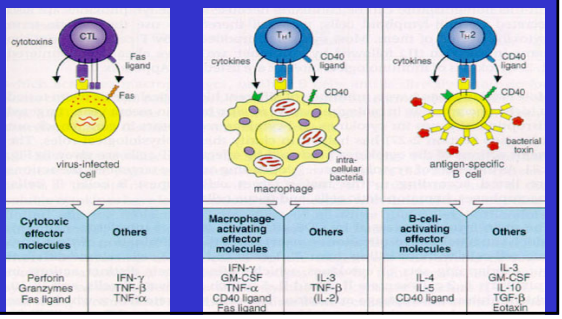
T-CELLS

Cytotoxic T cells CD8 + MHC I (Killer cells)	Helper T cells CD4 + MHC II (T_H1)	Helper T cells CD4 + MHC II (T_H2)



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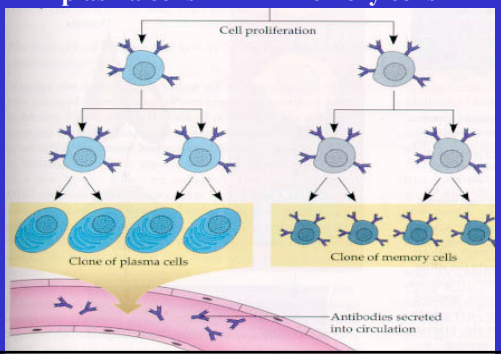
B-CELLS

antibody production
plasma cells memory cells



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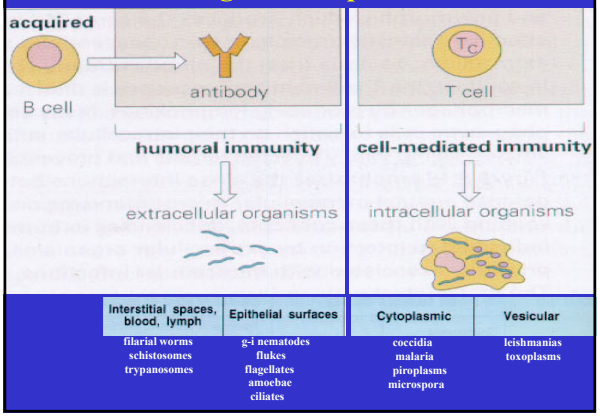
Integrated responses



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Immunity to Parasites

PROTOZOA	HELMINTHS
• acute disease	• chronic disease
• parasite multiplication	• no multiplication
• intracellular location	• extracellular location
• cell-mediated immunity	• humoral immunity
• cytotoxic T cells	• Ab opsonization
• helper T cells (Th1/Th2)	• then mϕ, NK, eo
• strong protection	• weak protection

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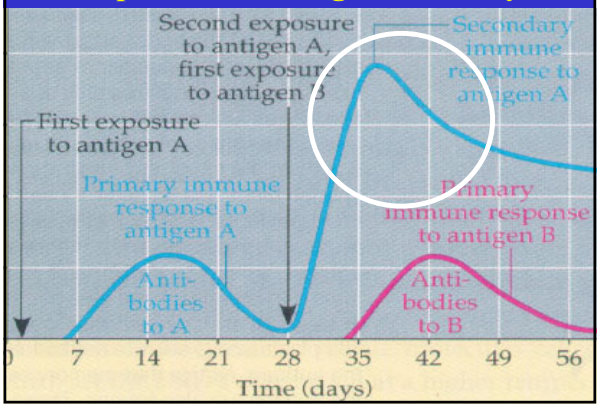
Exploit immunological memory



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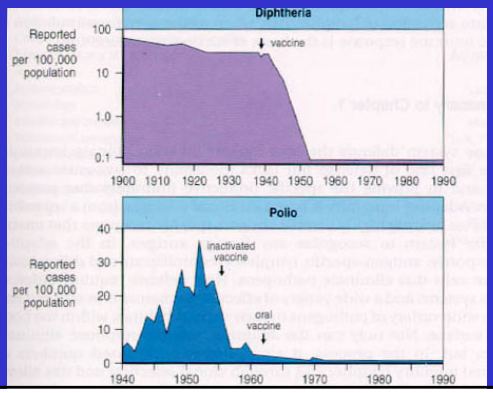
Vaccination programs



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Vaccination

Vaccine type:	Problems:
• live attenuated organisms	• reversion
• killed organisms	• allergy
• subcellular vaccines	• contamination

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Objectives

Resultant immunity acts to:

- prevent infection (block transmission)
- prevent disease (limit pathogenicity)
- eradicate infection (affect cure)

Various success stories

- most against bacterial or viral diseases
- few against parasites (yet!)

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The great debate

Chemotherapy	versus	Vaccination
• broad spectrum (targets whole groups)		• narrow activity (species specific)
• short-acting		• long-lasting
• re-infection possible		• re-infection prevented
• drug resistance		• reversion of virulence
• drug residues		• hypersensitivity
• environmental toxins		• contamination

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