

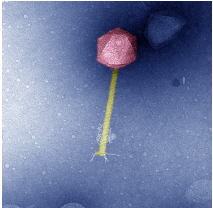


Nancy Holroyd

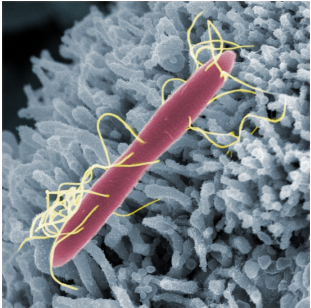
Introduction to Infectious Diseases Seminar Series

March 15th 2011

Infectious diseases – all shapes & sizes



Phage
Image David Goulding

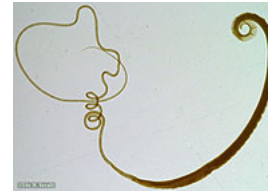


Clostridium difficile – 'bad guy'
Image David Goulding

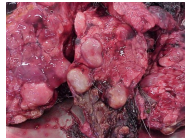


Worms - helminths

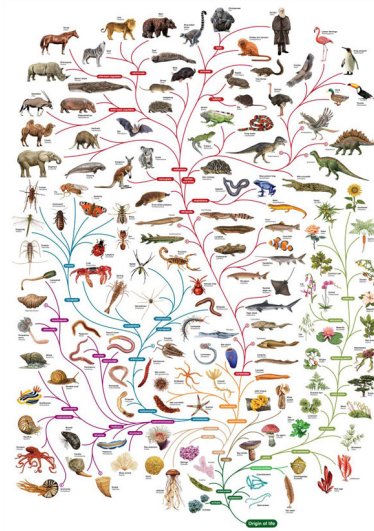
Helminths are parasitic worms...



...that parasitise many host species



Tree of life



Roundworms (nematodes)



Ascaris lumbricoides (roundworm)



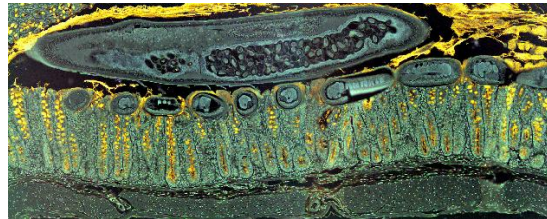
Necator ancylostoma (hookworm)



Strongyloides ratti (threadworm)



Trichuris (whipworm)

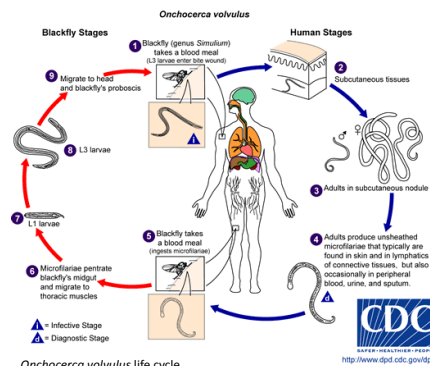


Trichuris (whipworm)

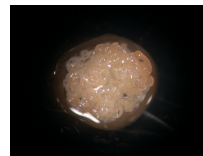
Onchocerca volvulus – river blindness



Simulium black fly



Onchocerciasis nodule



Worm mass inside a nodule

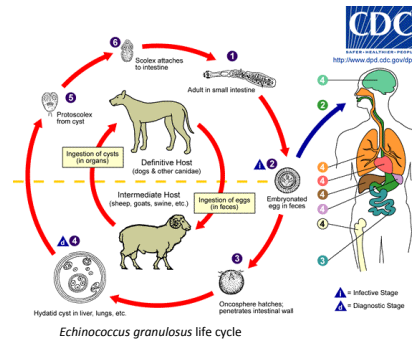
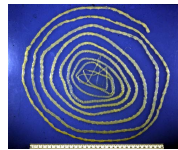


nodulectomy

Tapeworms (cestodes)



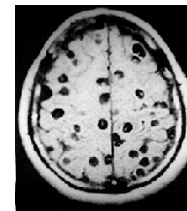
Hymenolepis microstoma (rodent tapeworm)



Echinococcus granulosus

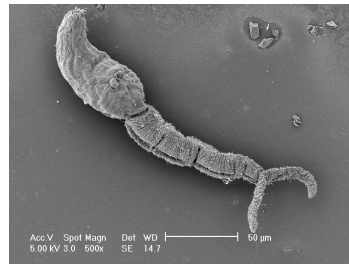


Pork tapeworm *Taenia solium* attachment organ

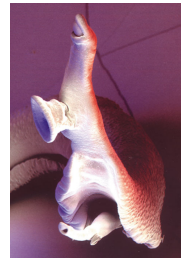


Cysticercosis

Flukes (Trematodes)



Schistosoma mansoni cercariae



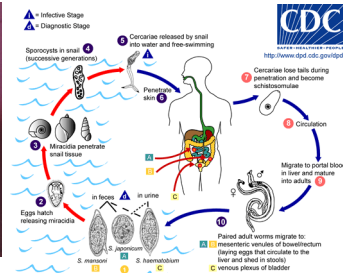
Schistosoma mansoni adult male and females



Schistosoma mansoni adult male and females



Clinical manifestation of schistosomiasis



Schistosoma life cycle



Fresh water snail



History of helminths



By FRANK A. KIERMAN, JR.
Drawings by Carolyn Galbre



THE BLOOD FLUKE that saved Formosa

A tiny, worm-shaped parasite proved out to be a pest of Formosa and Nationalist China, crippling a Communist invasion that would have changed the history of the Pacific.

IT IS IN December 1949, the two countries are at war. The Nationalist government has fled to the island of Formosa, and the Communists are marching on the mainland. The Nationalist Chinese army is in a desperate struggle, and the Communists are closing in on the island.

In that province, the blood fluke was a pest of the war effort. It was a pest of the war effort because it was a pest of the war effort. The blood fluke was a pest of the war effort because it was a pest of the war effort.

JURK THAT SAVED FORMOSA

The blood fluke was a pest of the war effort. It was a pest of the war effort because it was a pest of the war effort. The blood fluke was a pest of the war effort because it was a pest of the war effort.

SWIM OR LURE

The blood fluke was a pest of the war effort. It was a pest of the war effort because it was a pest of the war effort. The blood fluke was a pest of the war effort because it was a pest of the war effort.

The blood fluke was a pest of the war effort. It was a pest of the war effort because it was a pest of the war effort. The blood fluke was a pest of the war effort because it was a pest of the war effort.

Harpers, 1959

Why are helminths important today?



1st WHO report on
Neglected Tropical Diseases, 2010

Buruli Ulcer

Chagas disease (American trypanosomiasis)

Cysticercosis

Dengue haemorrhagic fever

Dranunculiasis (guinea worm disease)

Echinococcosis

Fascioliasis

Human African trypanosomiasis

Leishmaniasis

Leprosy

Lymphatic filariasis

Onchocerciasis

Rabies

Schistosomiasis

Soil transmitted helminthiasis

Snakebite

Trachoma

Yaws

Neglected Tropical Diseases (NTD)



...primarily infectious diseases.

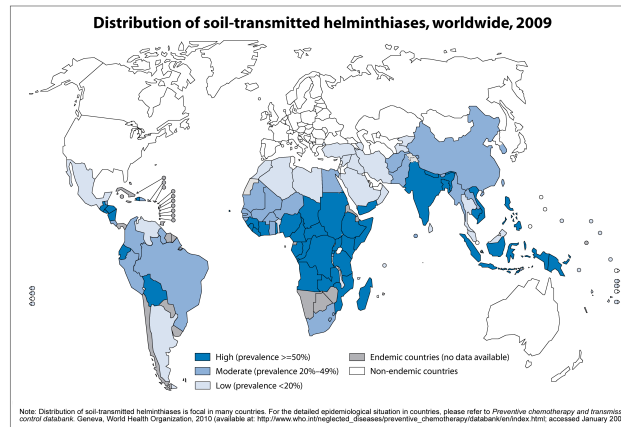
...thrive in impoverished settings, especially tropical climates.

...[mostly] parasitic diseases, spread by insects... and snails ... [or] spread by contaminated water and soil infested with the eggs of worms.

...transmission cycles... perpetuated by poor standards of living and hygiene.

...concentrated in settings of extreme poverty.

Where does helminthiases occur?

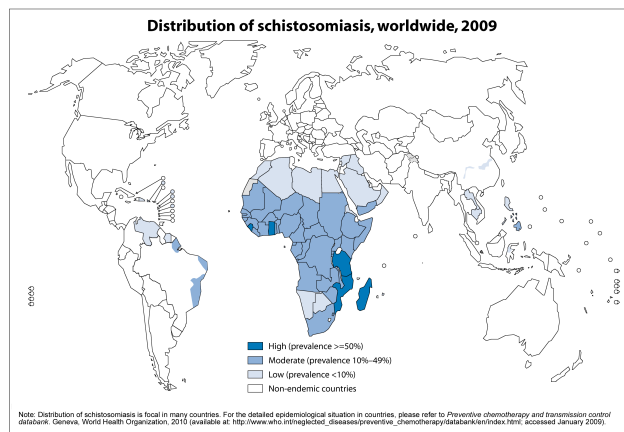


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2010. All rights reserved.

Data Source: World Health Organization
Map Production: Control of Neglected
Tropical Diseases (CNTD)
World Health Organization



Where does schistosomiasis occur?

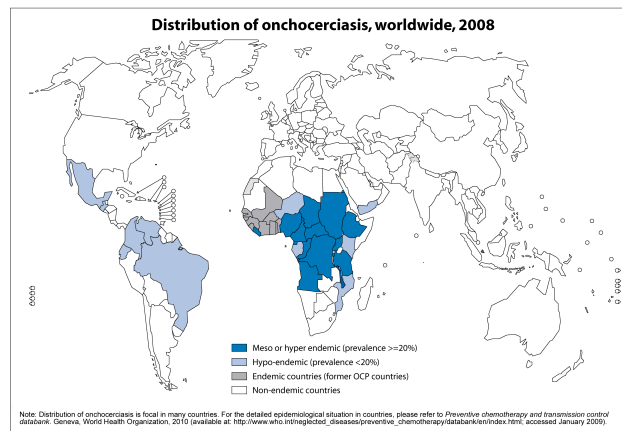


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2010. All rights reserved.

Data Source: World Health Organization
Map Production: Control of Neglected
Tropical Diseases (CNTD)
World Health Organization



Where does onchocerciasis occur?



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2010. All rights reserved.

Data Source: World Health Organization
Map Production: Control of Neglected
Tropical Diseases (CNTD)
World Health Organization



Disease characteristics



Dracunculosis



Lymphatic filariasis

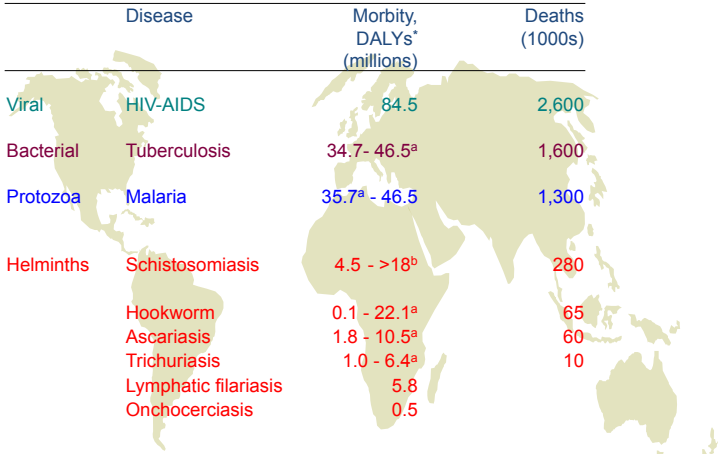


Fascioliasis



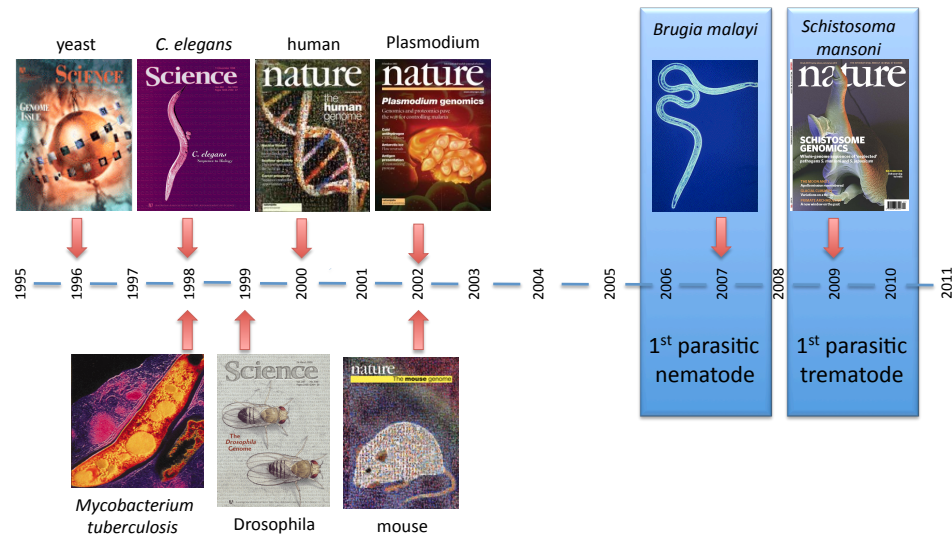
River blindness

Global burden of infectious disease



* Disability adjusted life years.
 Source: World Health Report (2004) WHO. Except for: ^a Chan (1997) Parasitol. Today; ^b King et al (2005) Lancet

Helminths & genomics



WTSI helminth genomes

wellcome trust
sanger
institute

Home Research Scientific resources Work & study About us

Mouse Zebrafish Data Software Database Tools

Helminth genomes - data download

This page provides access to genomes sequenced at the Wellcome Trust Sanger Institute. We will make all of our Illumina/Solexa and 454 sequence reads available in the European Nucleotide Archive. Assembled genome data are made available in the European Nucleotide Archive. The list below may include complete, ongoing and forthcoming sequences.

- > [Ascaris suum](#)
- > [Caenorhabditis elegans](#)
- > [Echinococcus granulosus](#)
- > [Echinococcus multilocularis](#)
- > [Globodera pallida](#)
- > [Haemonchus contortus](#)
- > [Hymenolepis microstoma](#)
- > [Nippostrongylus brasiliensis](#)
- > [Onchocerca volvulus](#)
- > [Schistosoma mansoni](#)
- > [Strongyloides ratti](#)
- > [Teladorsagia circumcincta](#)
- > [Trichuris muris](#)

Search www.sanger.ac.uk for Enter search here...

Genome Research Linked

Links

- genomics
- genetics
- pathogenetics
- the use of data in publications
- info policy

<http://www.sanger.ac.uk/resources/downloads/helminths/>

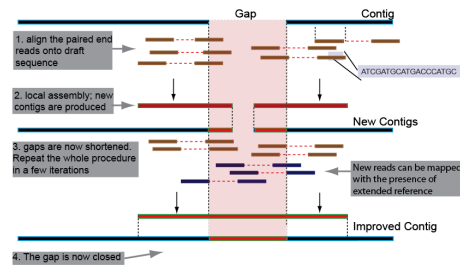
Challenges we're tackling

- De novo sequencing
- Source DNA
 - Scarce
 - Variable
- Long range information (DNA hungry)

WTSI's niche in helminth genomics

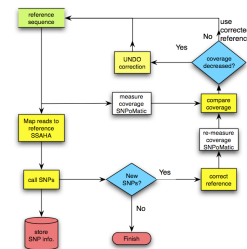
- High quality reference genomes
- Automated & manual improvement

IMAGE – Iterative Mapping & Assembly For Gap Elimination



Tsai *et al.* (2010) Genome Biology

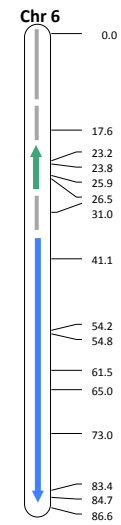
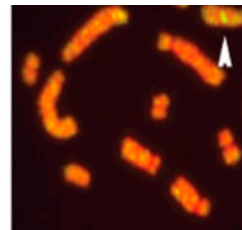
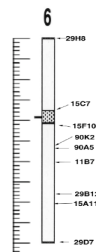
ICORN – Iterative Correction of Reference Nucleotides



Otto *et al.* (2010) Bioinformatics

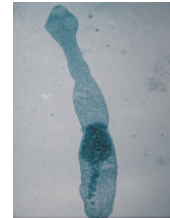
Schistosoma mansoni

- Initial draft published in 2009
 - survey of gene content
 - was 51,000 contigs ... **New draft now 9,000** (N50 16 -> 78 kb)
 - was 19,000 scaffolds ... **New draft now 570** (N50 0.8 -> 32 Mb)
- **Latest:** 174 scaffolds (81% of genome) mapped to chromosomes*

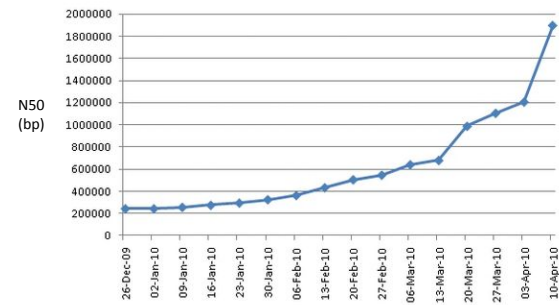


*using linkage map from Criscione et al (2009) Genome Biol. 10:R71.

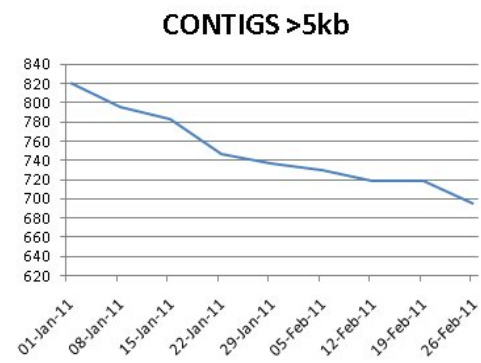
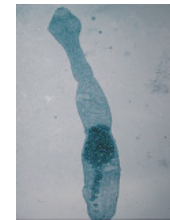
Echinococcus multilocularis



N50 throughout 'sprint 1' of manual improvement



Echinococcus multilocularis



Worm therapy

BBC Home Search [Explore the BBC](#)

BBC NEWS [LIVE](#) **BBC NEWS CHANNEL**  [News services](#)
Your news when you want it 

Low graphics | Accessibility help

Last Updated: Wednesday, 3 December, 2003, 13:02 GMT
[E-mail this to a friend](#) [Printable version](#)

Eat worms - feel better

Who would deliberately drink a dose of gut worms? The answer is Anna Glanz, an ordinary mother-of-two from Iowa.



Anna drinks worm eggs as a treatment.

She's testing the remarkable theory that not all parasites are necessarily bad for us. Some of them may actually help us fight diseases.

A BBC documentary looks at how some parasites are so well-adapted to using humans as hosts, that when you take them away, there are unexpected results.

Ulcerative colitis is a disease of the intestine caused by the immune system over-reacting - in this disease the white blood cells attack the gut as though it's a foreign invader, making it bleed.

Mother-of-two, Anna Glanz, from Iowa, suffers from it and gets terrible cramps and sudden, intense attacks of diarrhoea.

The disease is incurable, but she is now taking part in an experimental trial run by Dr Joel Weinstock, a specialist in bowel diseases.

SEE ALSO:

- Invasion of the Bodysnatchers 25 Nov 03 | Health
- Tapeworm evolution revealed 14 Jun 02 | Sci/Tech

TOP HEALTH STORIES

- Hospitals 'eyeing private market'
- Stem cell method put to the test
- Stem cell 'hope' for arthritis

[News feeds](#)

RELATED BBC SITES

- SPORT
- WEATHER
- CBBC NEWSROUND

Navigation: News Front Page, World, UK, England, Northern Ireland, Scotland, Wales, Business, Politics, Health, Medical notes, Education, Science & Environment, Technology, Entertainment, Also in the news, Video and Audio, Have Your Say Magazine, In Pictures, Country Profiles, Special Reports.

Auto-immune protection


AutoimmuneTherapies

Home
Safety
About
FAQ

Disease Information -
Science & Experience
Allergies
Anaphylaxis & Peanut Allergy
Asthma
Autism
Crohn's Disease
Multiple Sclerosis
Sjogren's Syndrome
Ulcerative Colitis

News & Links
Contact Us
How to Purchase
Forums

GREEN HOSTING



Immunotherapy using Probiotic Helminthic Therapy

Probiotic Immunotherapy safely and naturally restores nature's balance to your immune system, quiets inflammation, and stops tissue damage. Helminthic therapy, nature's most powerful probiotic, harnesses nature to heal, restoring the helper organisms we co-evolved with and that our immune systems depend on to function correctly, and is based on sound science.

Stop treating the symptoms, fix the problem.
[Learn more.](#)

[Home](#) | [Privacy Policy](#) | [Terms & Conditions](#) | [Contact Us](#)
Copyright © 2008, 2009 Autoimmune Therapies. All rights reserved.
Autoimmune Therapies was founded and is operated by Jasper Lawrence

SECURED BY
GeoTrust
click to verify
01-Feb-11 17:24 GMT

DIY worm therapy

Latrine walking in Cameroon



DIY worm therapy



Whipworm treatment of autism

autism **TSO** A potential new treatment for Autism's most difficult symptoms
about | research | blog | forums

the science

There is evidence that certain symptoms of autism may be the result of an aberrant immune response. There is also evidence showing that the elimination of helminths from the human gut may be the environmental trigger for development of autoimmune disorders. Studies using TSO (*Trichuris Suis Ova*) to treat certain autoimmune disorders have yielded remarkable results with no side effects. I brought these two together and treated my autistic son with TSO with dramatic results. All of this is supported by the literature and is presented here with references.
[read more >>](#)

the story

After 14 years of observing my autistic son and researching the topic, I formed the hypothesis that the most difficult symptoms of autism (including self abusive behavior, compulsivity, anxiety, behavioral inflexibility, etc.) are the result of an aberrant immune response. I researched ways to down-regulate the immune system and came to TSO, a living organism being used successfully to treat other autoimmune disorders. After preparing a research paper showing this hypothesis was supported by the medical literature, I presented it to my son's doctor and we began treating my son with TSO. After 10 weeks he completely lost all symptoms of agitation, aggression, self abusive behavior (including head smashing and hand biting), perseveration, behavioral inflexibility, compulsivity, impulsivity, repeated questioning, "stimming" and hypersensitivity to external stimuli. He continues to take TSO every two weeks and the symptoms have been gone now.

Upcoming Events

Mount Sinai School of Medicine - December 2009
Clinical Trial of TSO for Autism Recruiting
clinicaltrials.gov
A 16 week, open-label trial of TSO to assess the effect on repetitive behaviors, aggression and irritability, and global functioning in adults with autistic disorder is currently recruiting patients.

Recent Blog Posts

02/11/2011
Article on TSO and my son in The Scientist
The story of my son and our experience with TSO is chronicled in an article ... [read more >](#)

12/03/2010
Textbook chapter on my experience with TSO

Parasitic helminths

- Hugely diverse group.
- Medical & economical impact for billions of people, particularly in developing countries.
- Key reference genomes from Sanger will accelerate research into these organisms.

Acknowledgements



Parasite Genomics group

Matt Berriman
James Cotton
Bernardo Foth
Thomas dan Otto
Taisei Kikuchi
Antonio Murio
Anna Protasio
Adam Reid
Alejandro Sanchez
Jason Tsai
Magdalena Zarowiecki

Helminth finishing teams

Richard Clark
Christine Lloyd
Anna Babbage
Helen Beasley
Karen Brooks
Karen Holt
Sarah Nichol
David Saunders
Kathy Seeger
Christopher Stephens
Alan Tracey

Sequencing Division

SAGE teams
454 sequencing
Library construction
Illumina sequencing
PSD
+ lots more people at WTSI
& our collaborators around
the world.

Helminth Morphology

Cestodes	Trematodes	Nematodes
flatworm, segmented	flatworm, non-segmented	round worms
e.g. tapeworms (pork tapeworm)	e.g. flukes (Schistosomes)	e.g. major intestinal worms, filarial worms (river blindness)
hermaphrodite	hermaphrodite or dioecious	male & female
no digestive tube	digestive tract to caecum	digestive tract to anus
oral sucker	oral sucker	lips and teeth