Sludge under the microscope:

The *Ascaris* Story

Parasites (including the round worm, ***Ascaris***) have been around for centuries.

There are ± **1 billion people**,

25% of the world's population,

infected with ***Ascaris***

The word, "parasite" comes from medieval French '*parasite*' / Latin '*parisitas*'/ Greek '*parasitos*', meaning '**one who eats at the table of another**'.

In ancient Greece,

a **parasite** or **sycophant**

earned a meal at the table of a rich man by flattering and humouring his host:

A Professional Dinner Guest !

Parasites in the medical context, are however, not as pleasant to tolerate

as they eat away at our "table" of nutrients,

causing discomfort,

malnutrition

and disease…

Ascaris lumbricoides - the common round worm -

"marker" for safe re-use of human excrement as soil conditioner,
or simply for the safe disposal of human biological waste.

Reason: eggs of this parasite = extremely hardy
outlive most other pathogens (e.g. bacteria & viruses)

In 2007: a few of us from the PRG Biological Sciences Group, collaborated with Zitholele Consulting/East Rand Water/Nat. Auton. Uni of Mexico
Standard Method for the recovery & enumeration of helminth ova from wastewater, sludge, compost and urine-diversion waste.

END-RESULT of this collaborative study :

- A MANUAL of STANDARD METHODS for laboratories (TT 322/08)
- which, if adopted **(together with intensive training)…**
- will result in enabling us to collect

COUNTRY-WIDE DATA ON HELMINTHS present in

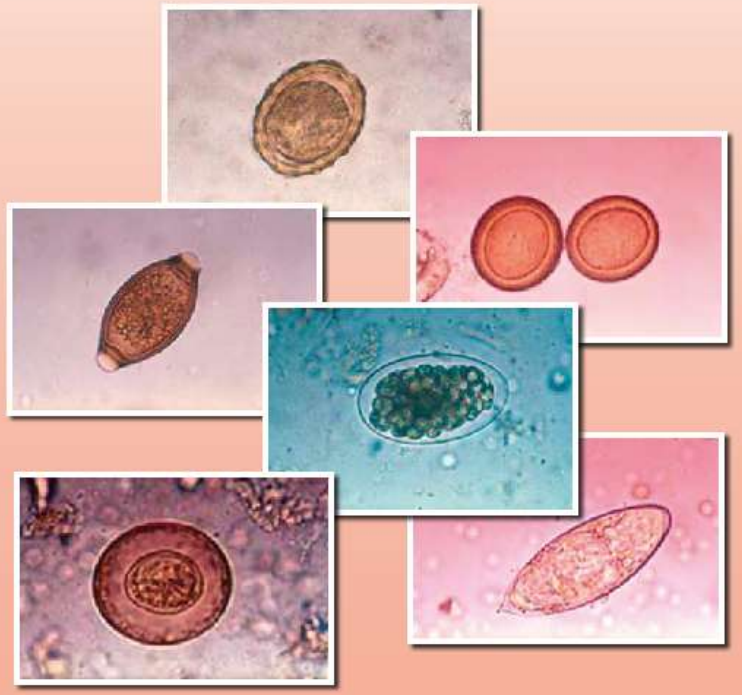
VARIOUS TYPES OF SANITATION WASTE throughout S.A.

Standard Methods for the Recovery and Enumeration of

Helminth Ova

in Wastewater, Sludge, Compost and Urine-Diversion Waste in South Africa

Priya Moodley, Colleen Archer & David Hawksworth
in association with Lizette Leibach



TT 322/08
Water Research Commission

METHOD:

- WASHING with a solution that dislodges the parasite eggs from soil particles & debris
- SEIVING to separate the large particles from the parasite eggs & smaller particles
- FLOATING & SEDIMENTING to recover the parasite eggs

These 3 steps can be adjusted &/or repeated during the processing of the waste to accommodate the various types of waste that may be brought into a lab for analysis.

The manual was published in 2008 and the methods are being used in about 5 labs in the country.

Since becoming involved in the analysis of VIP sludge & buried VIP/Soil mixtures, I have slightly adapted the first washing step of the method and the final washing of the floated parasite eggs to enhance the recovery from this rather difficult “medium” and in the process have found it to be an excellent method for the recovery of parasite eggs from general soil samples.

The following photographs show the method we are using:

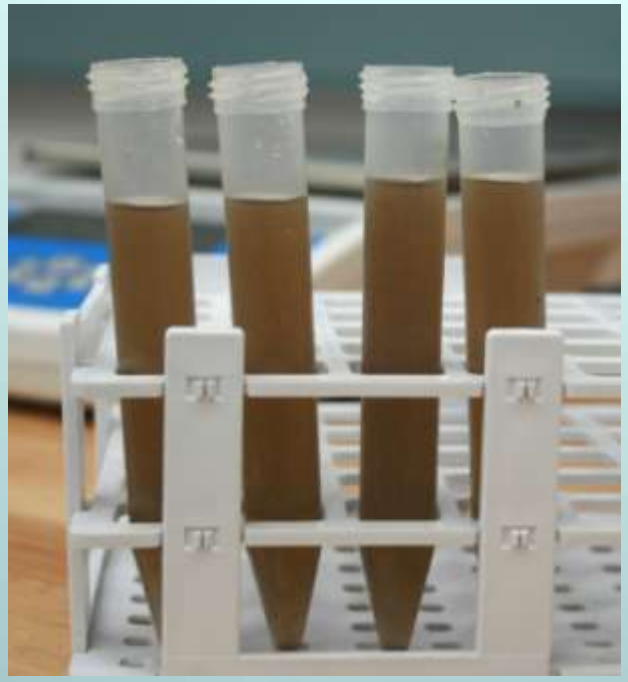

Ammonium
bicarbonate


Zinc
Sulphate
S.G. 1.3

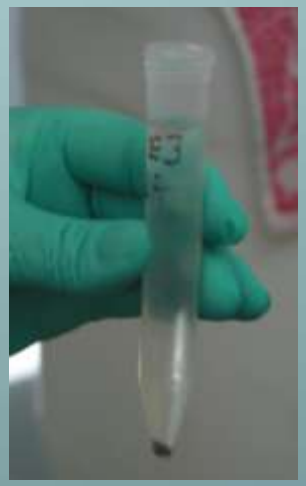

643


MAG STIRRER
HOT PLATE


Zinc
Sulphate
S.G. 1.3
VORTEX-GENIE 2




hygiene
handwash



Now, for the *Ascaris* Story....

Final processed sample –

examine
identify parasites present
count
classify *Ascaris* eggs

These categories are:

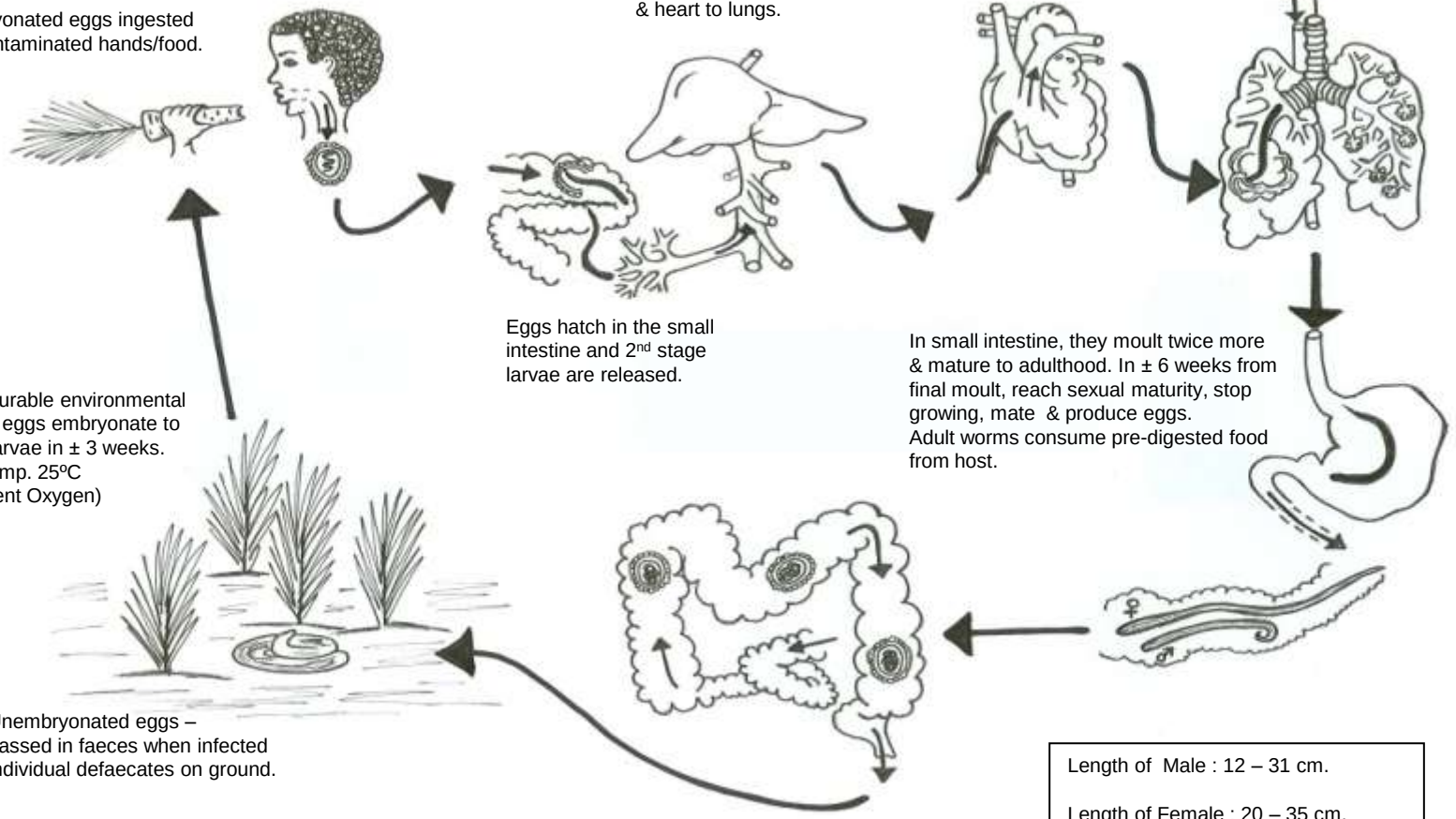
Asc ova: Unde-veloped	Asc ova: Motile larva	Asc ova: Immotile larva	Asc ova: Necrotic larva	Asc ova: Dead	Asc ova: infertile	Tt ova	Taenia ova	Other

To better understand what this all means,

let us look at the life-cycle of *Ascaris lumbricoides*,

some photographs of the adult worms & different eggs...

Life Cycle of *Ascaris lumbricoides*



Embryonated eggs ingested on contaminated hands/food.

Larvae penetrate intestinal wall, enter blood stream, travel via liver & heart to lungs.

In lungs, larvae moult to 3rd Stage, break out into alveolar spaces. Actively migrate up bronchi & trachea, cross epiglottis, swallowed.

In small intestine, they moult twice more & mature to adulthood. In ± 6 weeks from final moult, reach sexual maturity, stop growing, mate & produce eggs. Adult worms consume pre-digested food from host.

Eggs hatch in the small intestine and 2nd stage larvae are released.

Under favourable environmental conditions, eggs embryonate to 2nd stage larvae in ± 3 weeks. (Optimal temp. 25ºC with sufficient Oxygen)

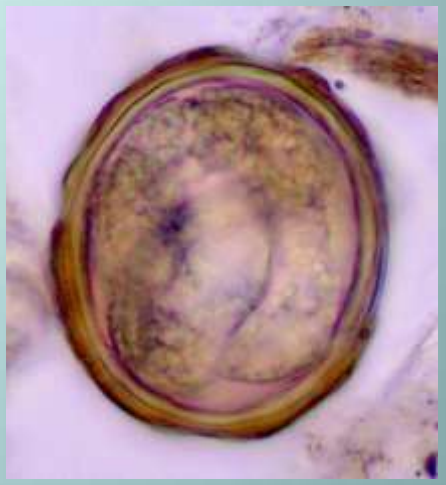
Unembryonated eggs – passed in faeces when infected individual defaecates on ground.

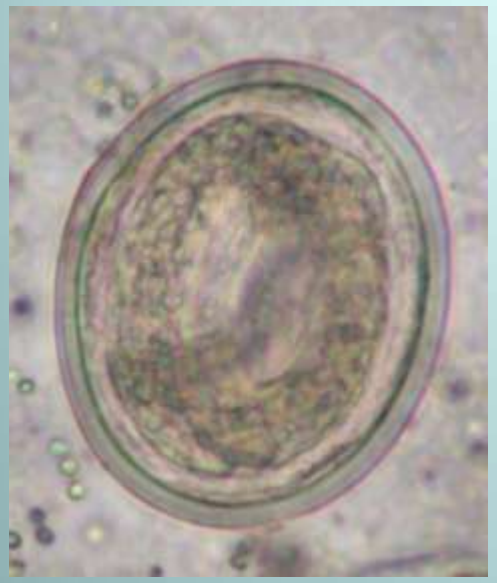
Length of Male : 12 – 31 cm.

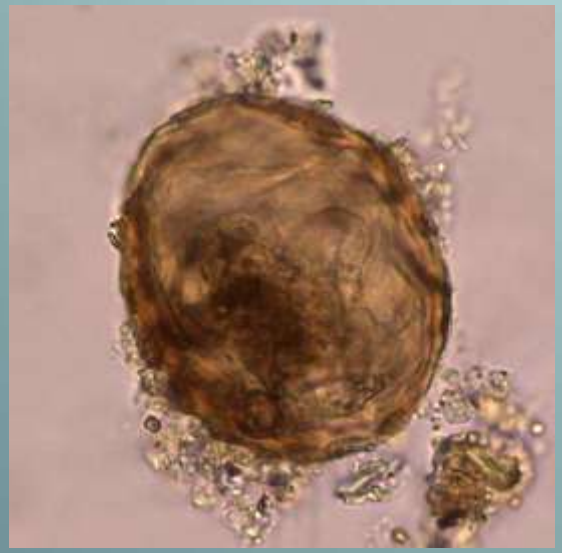
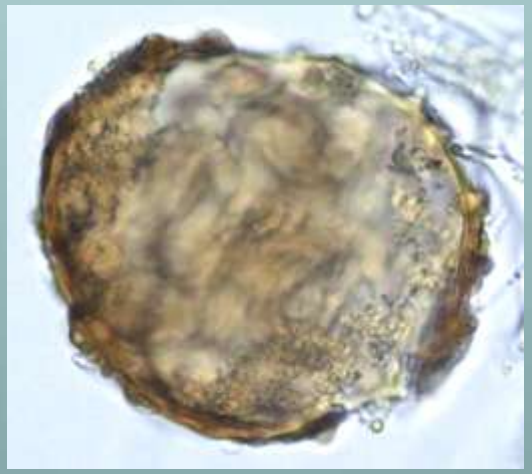
Length of Female : 20 – 35 cm.

Female lays ± 200 000 eggs per day.






FINALLY, I WOULD TO LEAVE YOU WITH THIS : *this whole "shi#t#in-biz#nis"* **is …..**

Multi-faceted Problem:

- Engineers & Biologists providing Water and Sanitation and constantly looking for new ways to treat human waste, will never solve the problem of parasite transmission ALONE…..

We Need others on board:

- Health Dept providing bi-annual de-worming in schools & communities
- Social Scientists & Educators providing Hygiene Education to communities, getting them on-board, encouraging them to take ownership of their sanitation facilities and constantly reinforcing the importance of using the facilities correctly so that the "starting point" of the waste is a much more environmentally friendly and safer product for those in **Sanitation Management** to have to deal with!