

Roslyn Watts– Southern Biological

**DISSECTING RATS
PRESERVED WITH CAROLINA
BIOLOGICAL'S PERFECT
SOLUTION**

Why Dissect Rats?

- Common research animal. Easy to breed. Large litters. Easy care.
- Placental Mammal like us.
- Similar internal organs & systems.
- Hands on practical study.
- Can't use Primates.



What is Perfect Solution?

- A trade secret!
- Perfect Solution® specimens are the new, safe alternative to frozen or fresh specimens.



Perfect Solution is

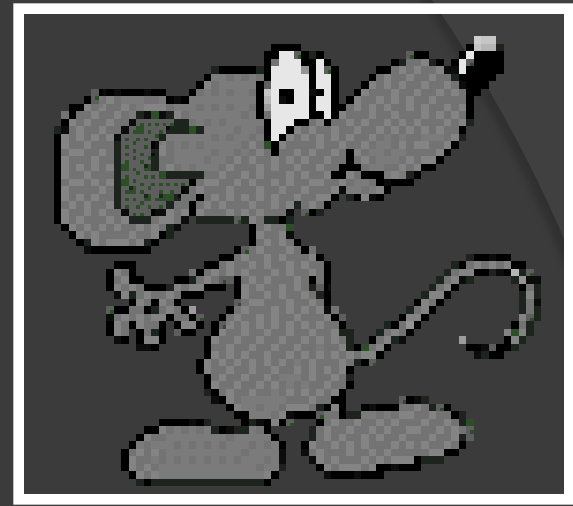
- ⦿ Not smelly like formaldehyde. It has an odour but less offensive to most people.
- ⦿ Not toxic, with easy disposal.
- ⦿ Safe to handle. See MSDS
- ⦿ Inexpensive. Costs the same as a frozen rat.

Classroom: Bottom Line

- If formalin smell has put you off before, then these rats may better suit your requirements.
- More readily available than frozen/fresh rats.
- Tissue is a better 'colour', more 'flexible' and 'softer' to dissect.
- Dissection can go over a number of days.

Dissection Time!

- Our focus: major organs of the abdominal and thoracic cavities
- Other possible approaches:
 - Musculoskeletal system
 - Reproduction (using pregnant rats)
 - Focus on any organ system



External examination

- Hair
- Teeth
- Feet
- Eyes
- Tail
- Whiskers
- Genitals



External examination

- ◎ Hair.
- Compare a rat's features with the more-familiar features of a human
 - Body Hair
 - Rats have normal hair distribution.
 - Why are humans so bald?



External Examination

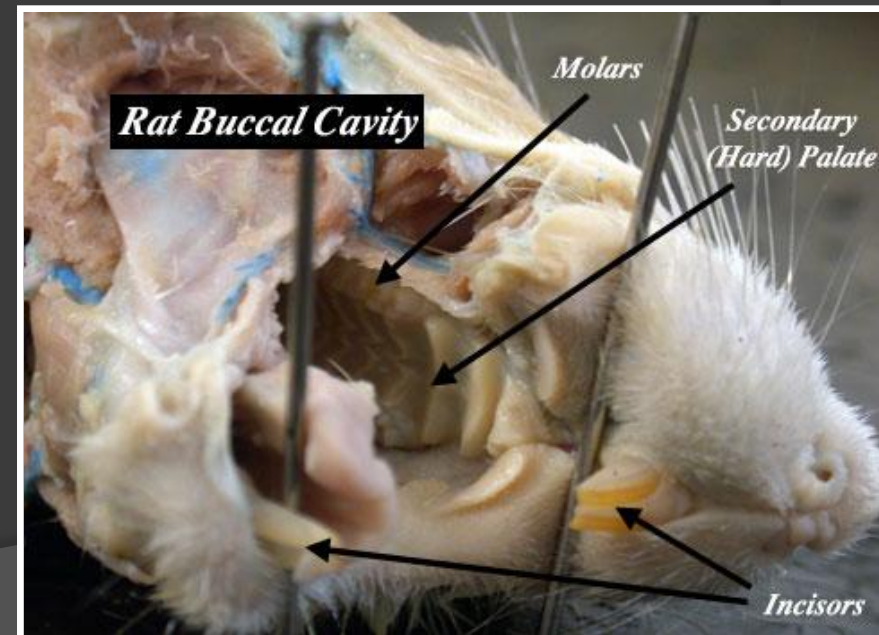
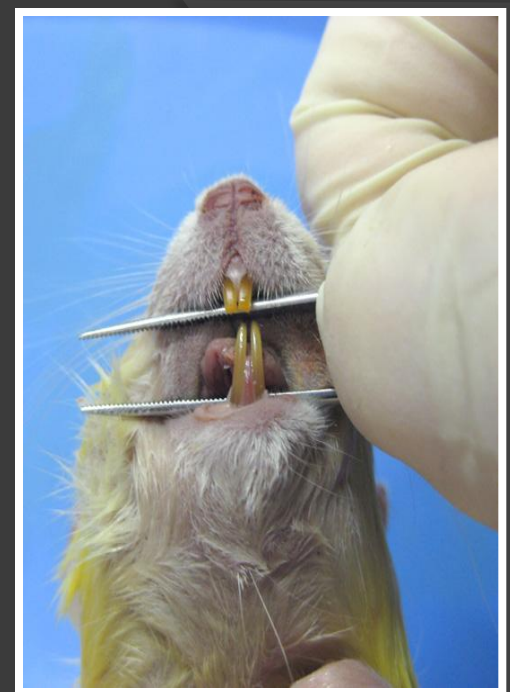
- Whiskers:
 - Rats: Major sensory organ – allows for feeling close things in the dark & finding way home.
 - Thicker and stiffer than any other hairs.
 - Specialized hair follicles detect deflections
 - Humans: no whiskers
 - Not as active in the dark as rats
 - Use our hands to feel



External Examination

Teeth

- Rats:
- 16 teeth in all. Open-rooted.
 - made for gnawing (front) and chewing (back)
 - incisors grow – approx. 10-12 cm each year.
 - No canines or premolars. Lower jaw is not joined in the centre like the human jaw.
- Humans:
- 32 teeth in total.
 - use our hands and tools to get through tough things – no need for gnawing teeth



External Examination

⦿ Feet

- Rats:
 - Claws allow for good grip/traction – climbing.
 - Paws – Scent trails.
 - Front paws also good for manipulating objects (quite human-like)
- Humans:
 - ‘front feet’ entirely transformed into manipulative tools – no longer for locomotion.
 - ‘back feet’ entirely adapted for walking on the ground – no longer good at climbing or manipulating



External Examination

- Eyes
 - Rats:
 - Eyes point outward.
 - Wide range of vision.
 - Relatively poor vision.
 - Poor colour vision. Light, Shadow & Movement.
 - Humans:
 - Eyes point forward .
 - Good depth-perception and colour vision.



External Examination

- Genitals (if students are mature enough):
 - Rats: very large testicles (relative to body size)
 - Humans: comparatively small testicles
 - Sperm competition – rats more promiscuous than humans?
- Nipples
 - Humans: 2
 - Rats: lots!

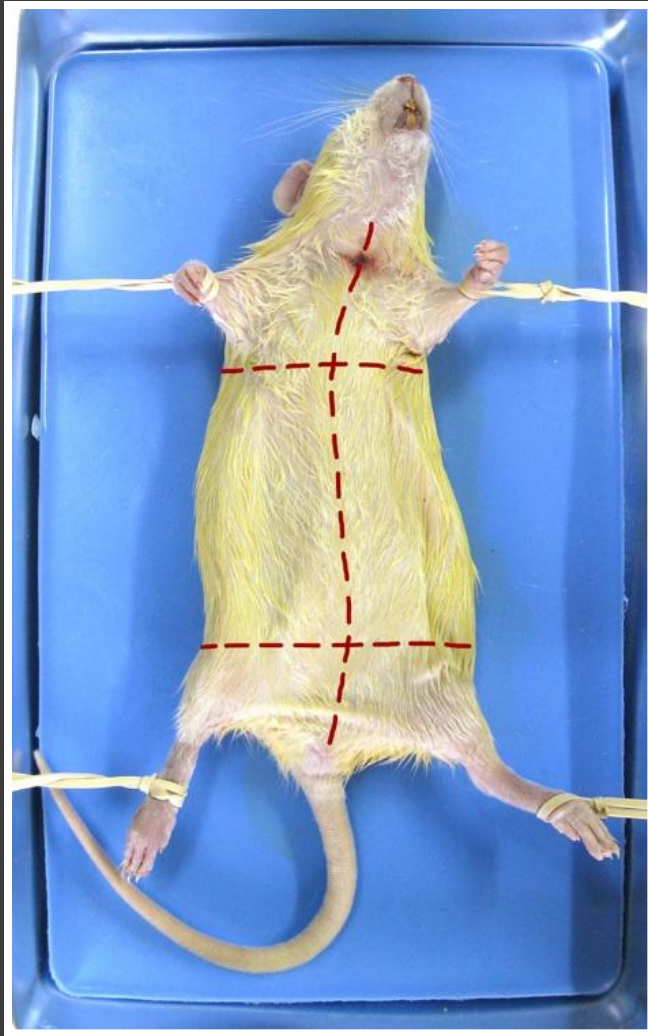
External Examination

Tail

- Rats
 - balance aid
 - temperature regulator (why no hair?)
- Humans: None
 - millions of years gone!



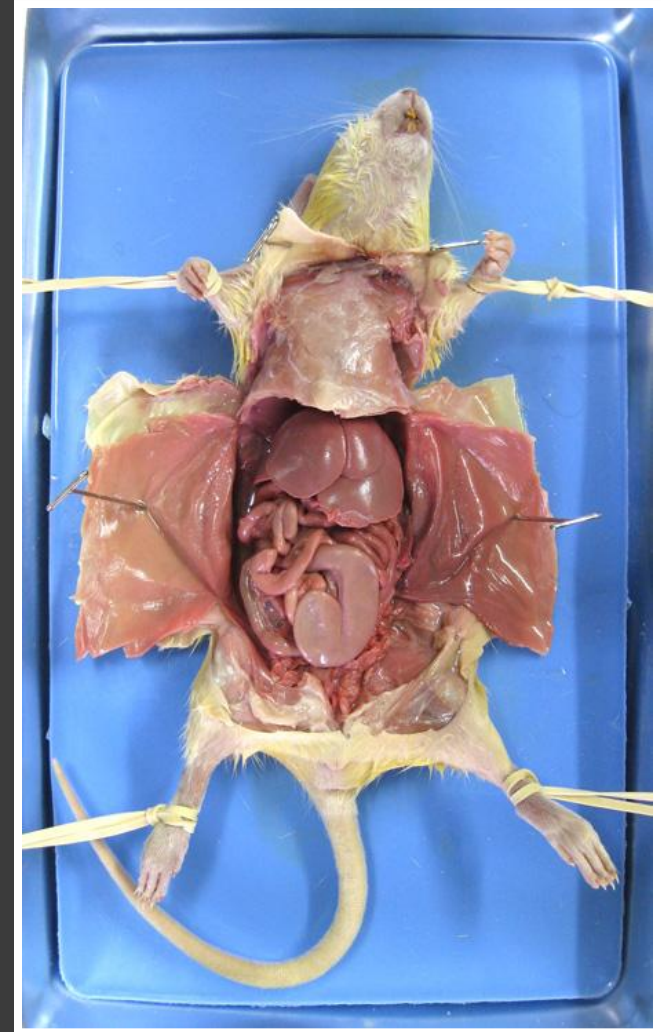
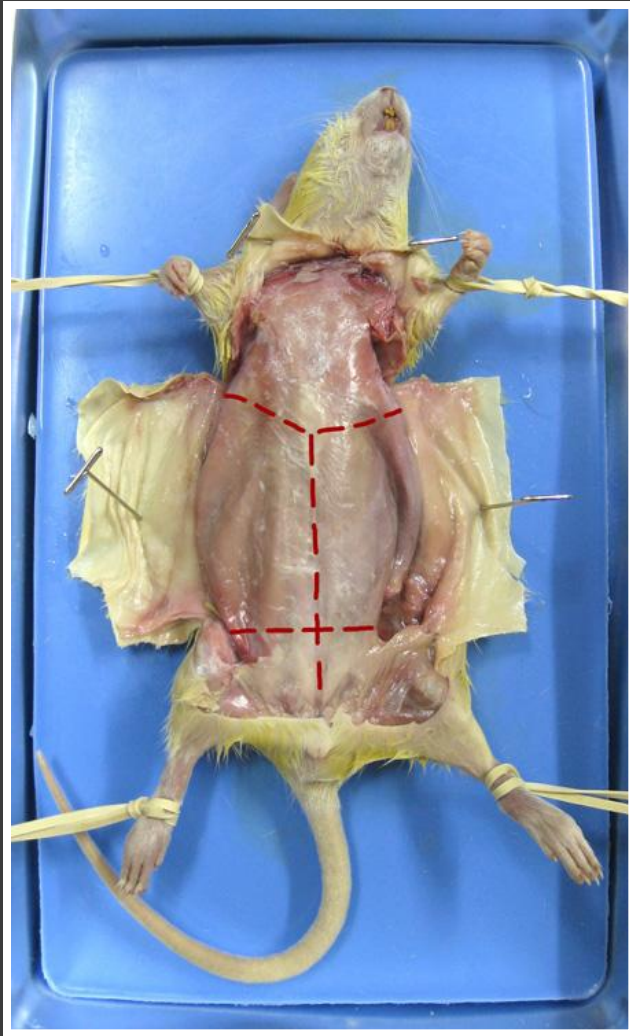
Cut through skin



Incisions

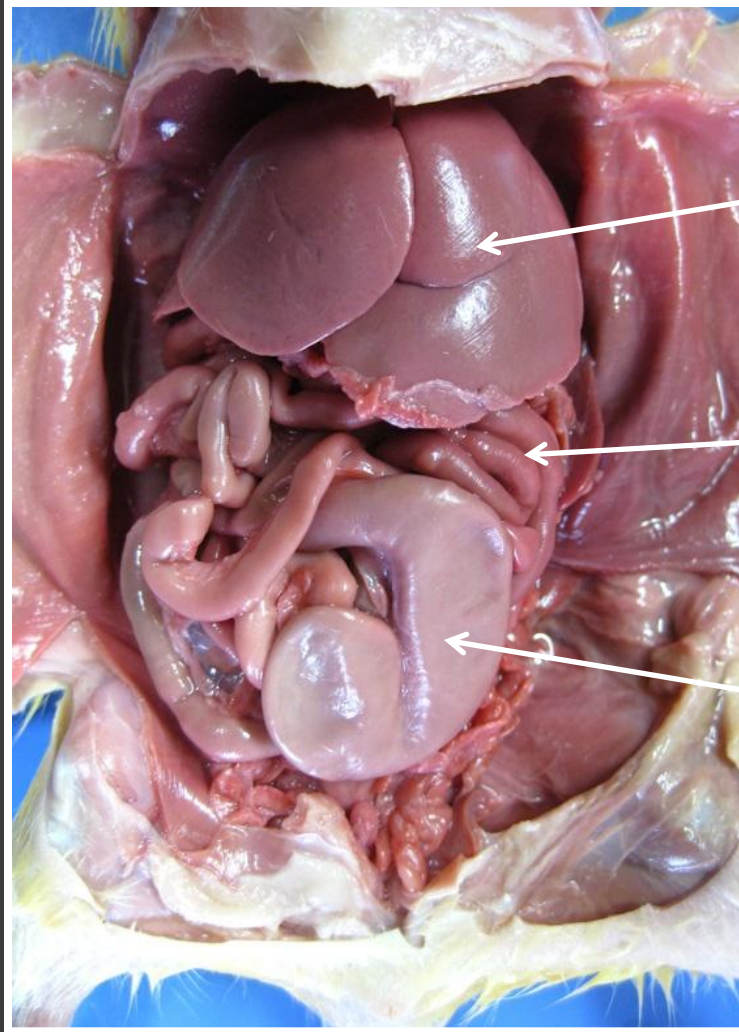
- Secure with rubber bands
- Scissors are the best tool
 - prevents accidentally cutting things underneath
- Start by pulling up skin and then snipping
 - just skin! Careful not to get muscle as well
- Extend cuts with scissors
- Peel skin back.
- Examine muscles
 - Pectoralis major easily visible
 - Appeals to boys that have recently discovered the bench press
 - Abdominal muscles form a soft wall
 - Very thin and almost translucent

Cut through muscle



- Similar procedure to skin
- Only cutting up to the rib cage

Examine abdominal cavity



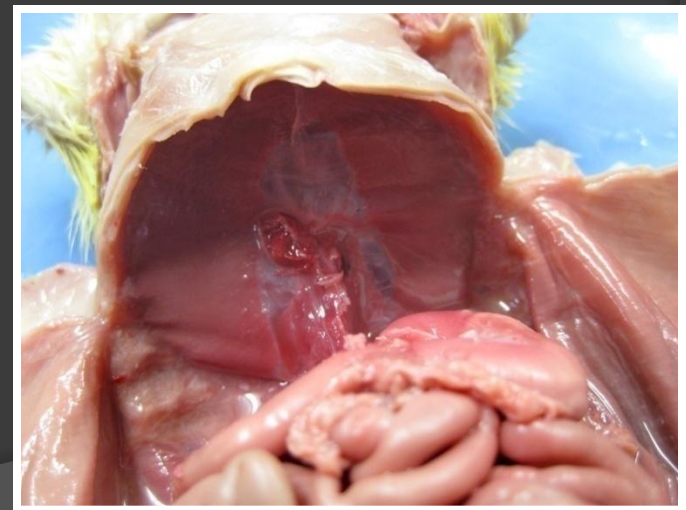
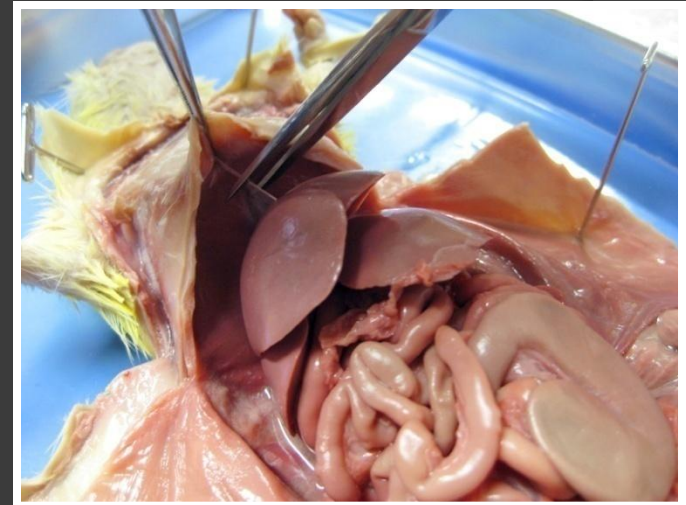
Liver

Small
intestine

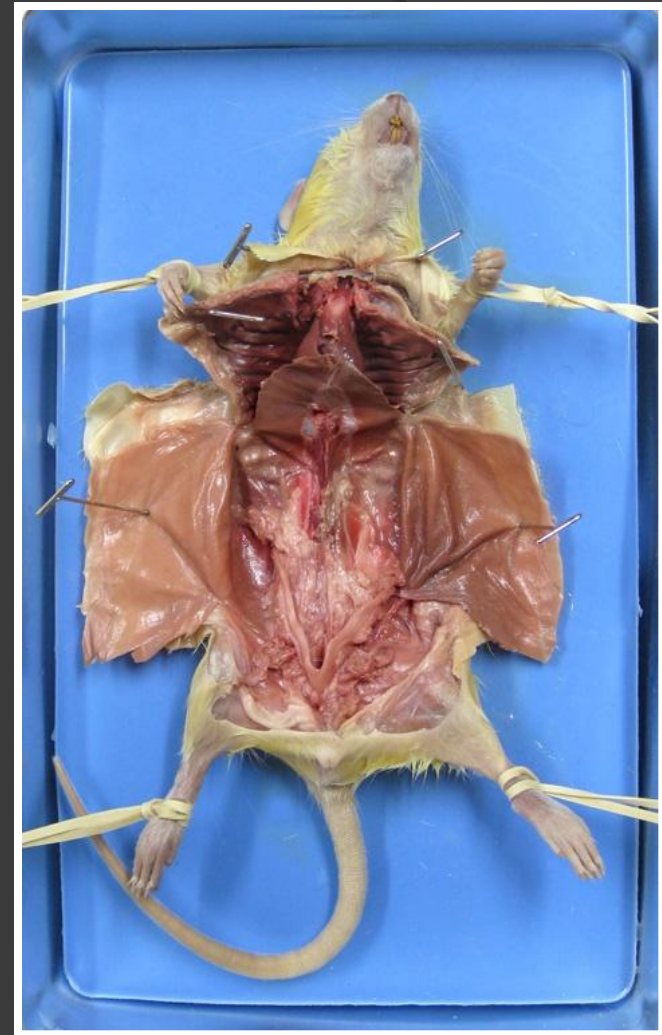
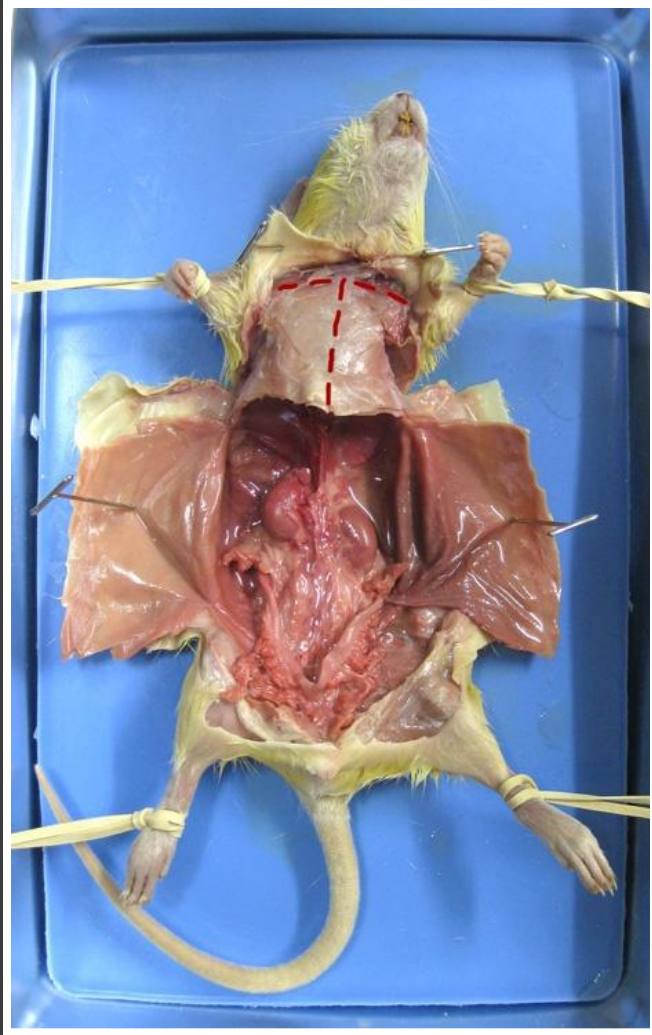
Caecum

Remove Abdominal Organs

- Carefully snip connective tissue
- Try to not damage diaphragm
- Try to keep digestive tract intact

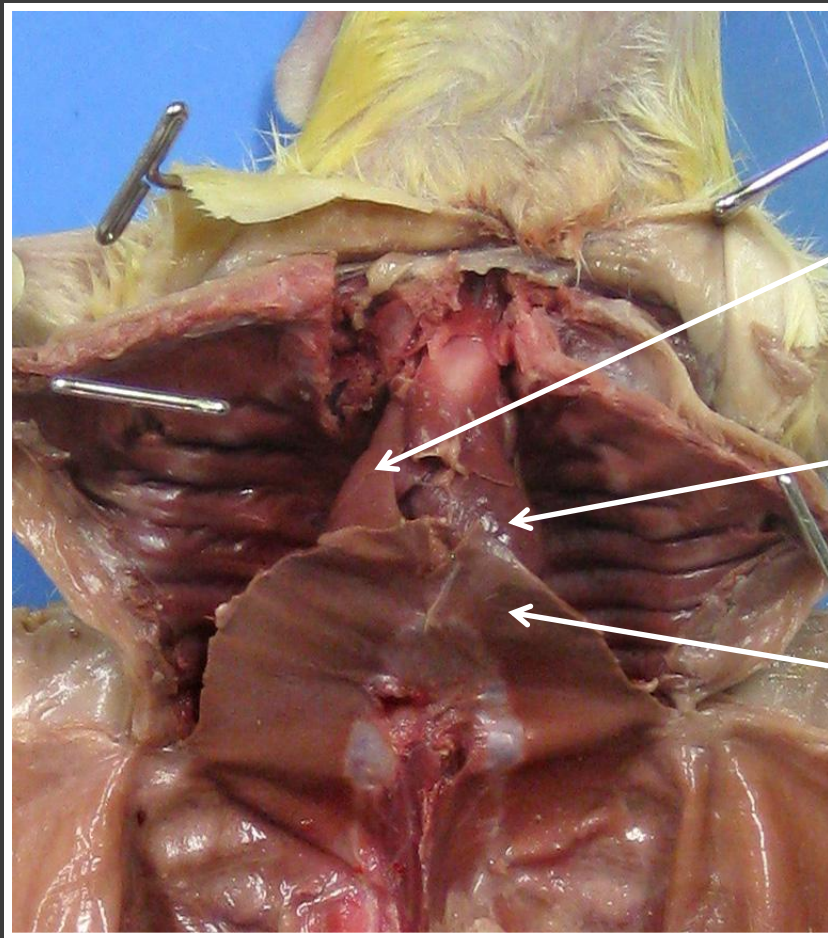


Open Thoracic Cavity



- Snip through rib cage and pull sides back
- Might take a bit of force – don't worry if you hear a few cracks in the process.

Examine thoracic cavity



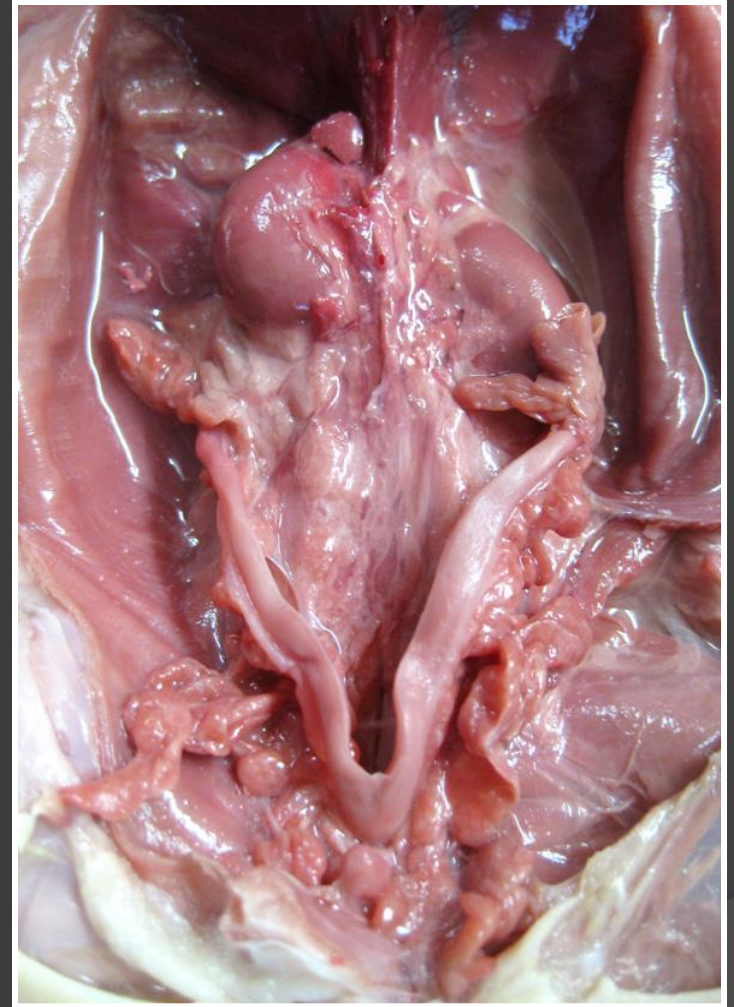
Lungs

Heart

Diaphragm

Other things to do

- Dissect individual organs
- Expose trachea
- Investigate other systems:
 - Reproductive
 - Muscular
 - Nervous – including brain!
 - Endocrine



Hero Rats



Hero Rats

- ◉ African Giant Pouched Rat.
- ◉ Cheap. Easy to train. Use in any terrain.
- ◉ Relatively long life span for a rat of 6 – 8 years.



Hero Rats

- Detect Mines – trained on TNT in Africa & Cambodia.
- Detect Tuberculosis – trained on positive sample.
- Lab Tech – 40 samples per day using microscopy evaluation
- Hero Rat – 40 samples in seven minutes!



Hero Rats

- ◎ This second-line screening increased new TB case detection rates in some of the African hospitals by **43%!**

