Naked Mole-Rat

Naked mole rat – a “forecast“ species

- 1975 the evolutionary specialist Richard Alexander (East Lansing University, MI, USA) developed the idea of an eusocial mammal.

- 1976 during one of his lectures at the Flagstaff University (AR, USA) the zoologist Terry Vaugham pointed out that Alexander‘s concept would fit perfectly for the naked mole-rat which was already discovered in the middle of the 19th century

Social organisation in mammals

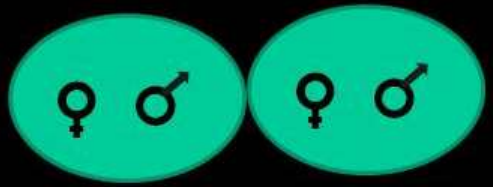
Monogamy

temporary

permanent

e.g. rhino

e.g. gibbon

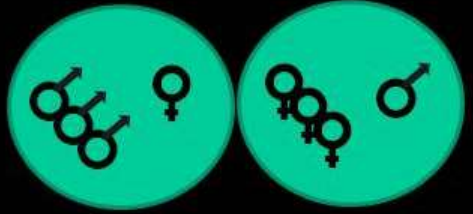


Polygamy

Polyandry

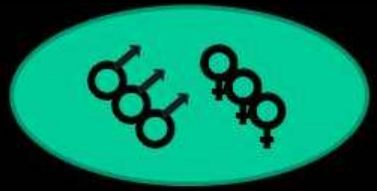
Polygyny

e.g. gorilla

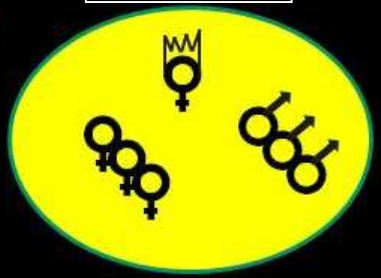


Promiscuity

e.g. bonobo

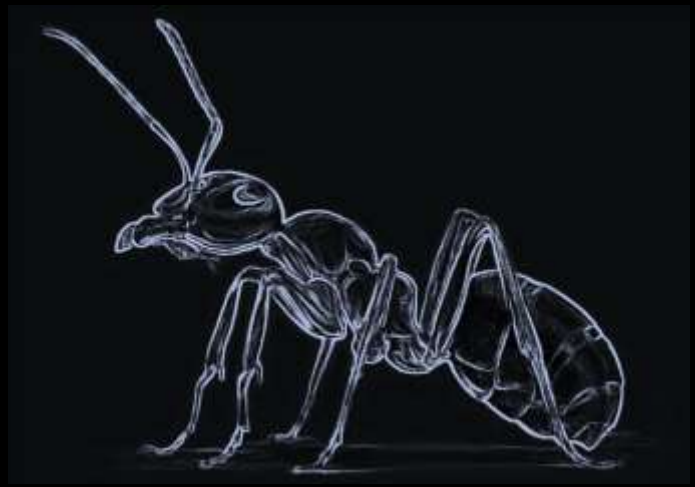


Eusocial



Eusocial mammals

Non-breeding Male | Non-breeding Female | Breeder Male | Breeder Female



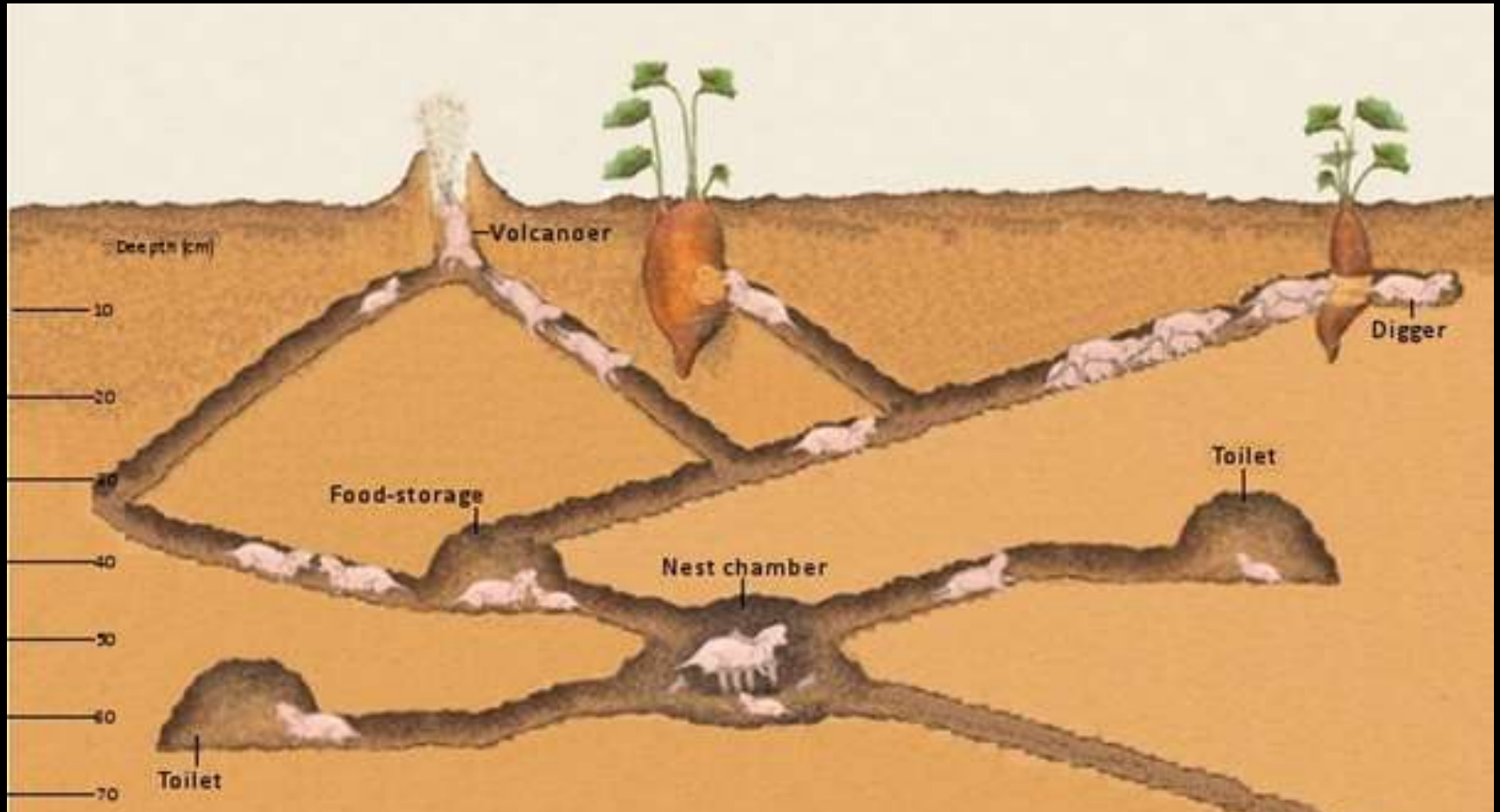
Henry *et al.* (2006) *J. Exp. Biol.*

Biological parameter
(*Heterocephalus glaber*)

Length:	70 – 120 mm
Body mass:	43 – 65g
Pregnancy length:	70d
Litter size:	8 - 31
Birth weight:	0.8 – 2.5 g
Weaning:	5 weeks
Sexual maturity:	6 - 24 months

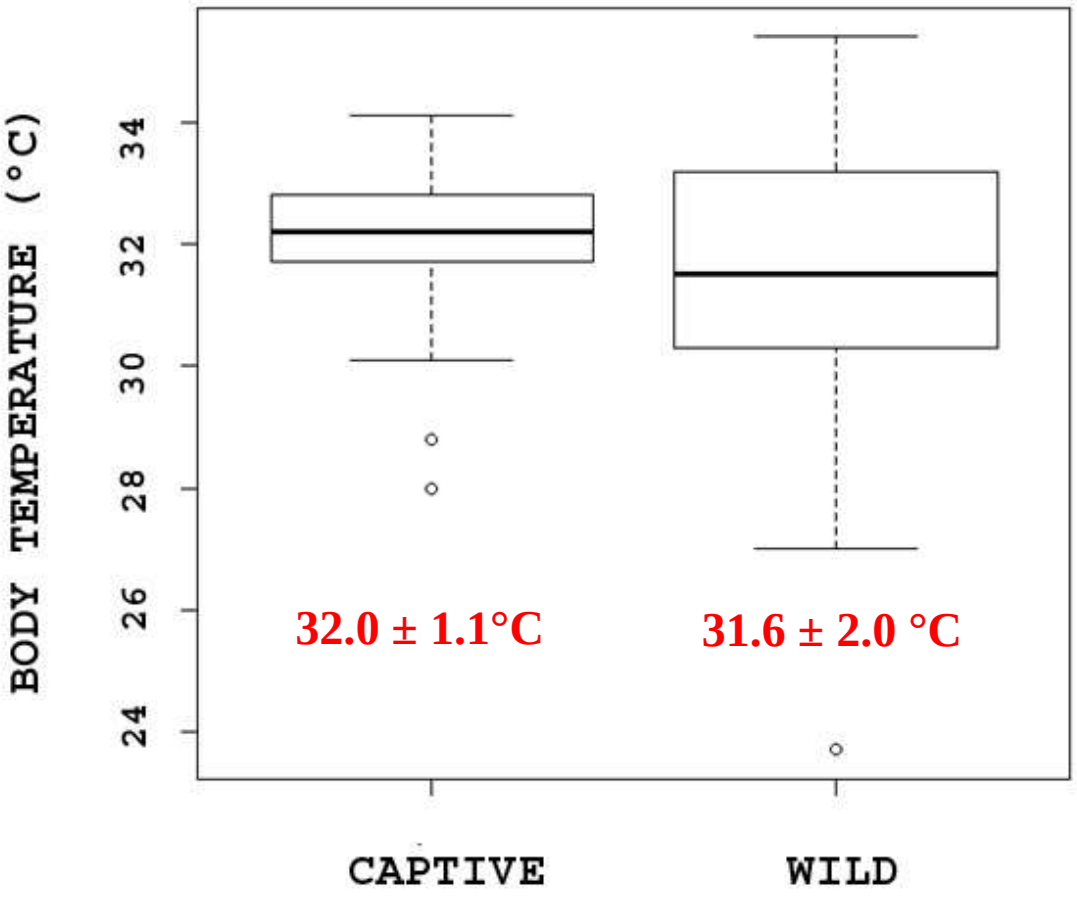
Complex subterranean tunnel system
up to 3 meters deed and >100 meters long

Burrow system



Natural habitat in East Ethiopia

Body temperature

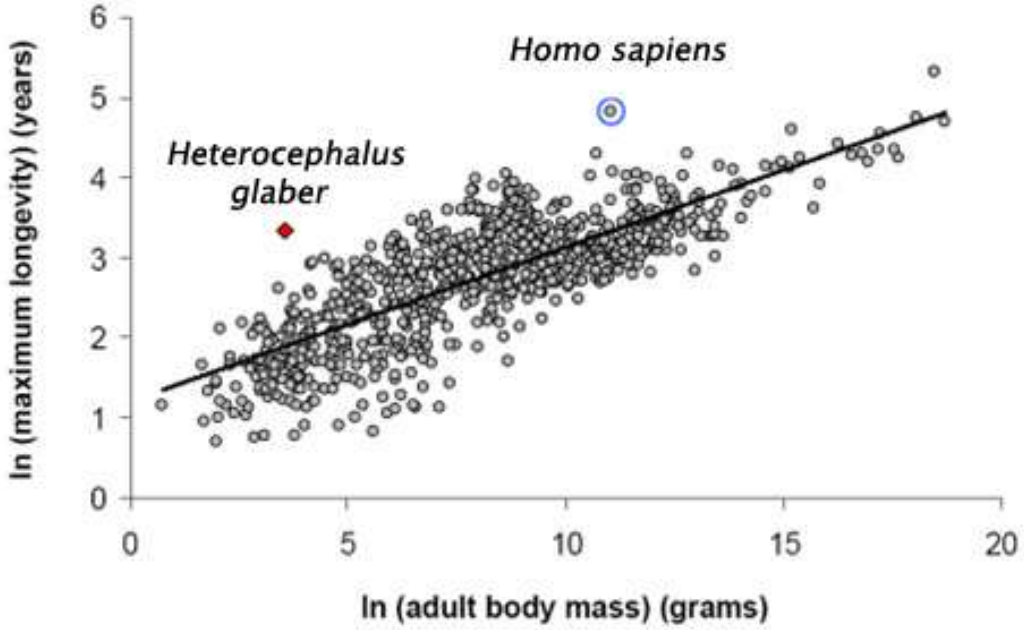


n.s.

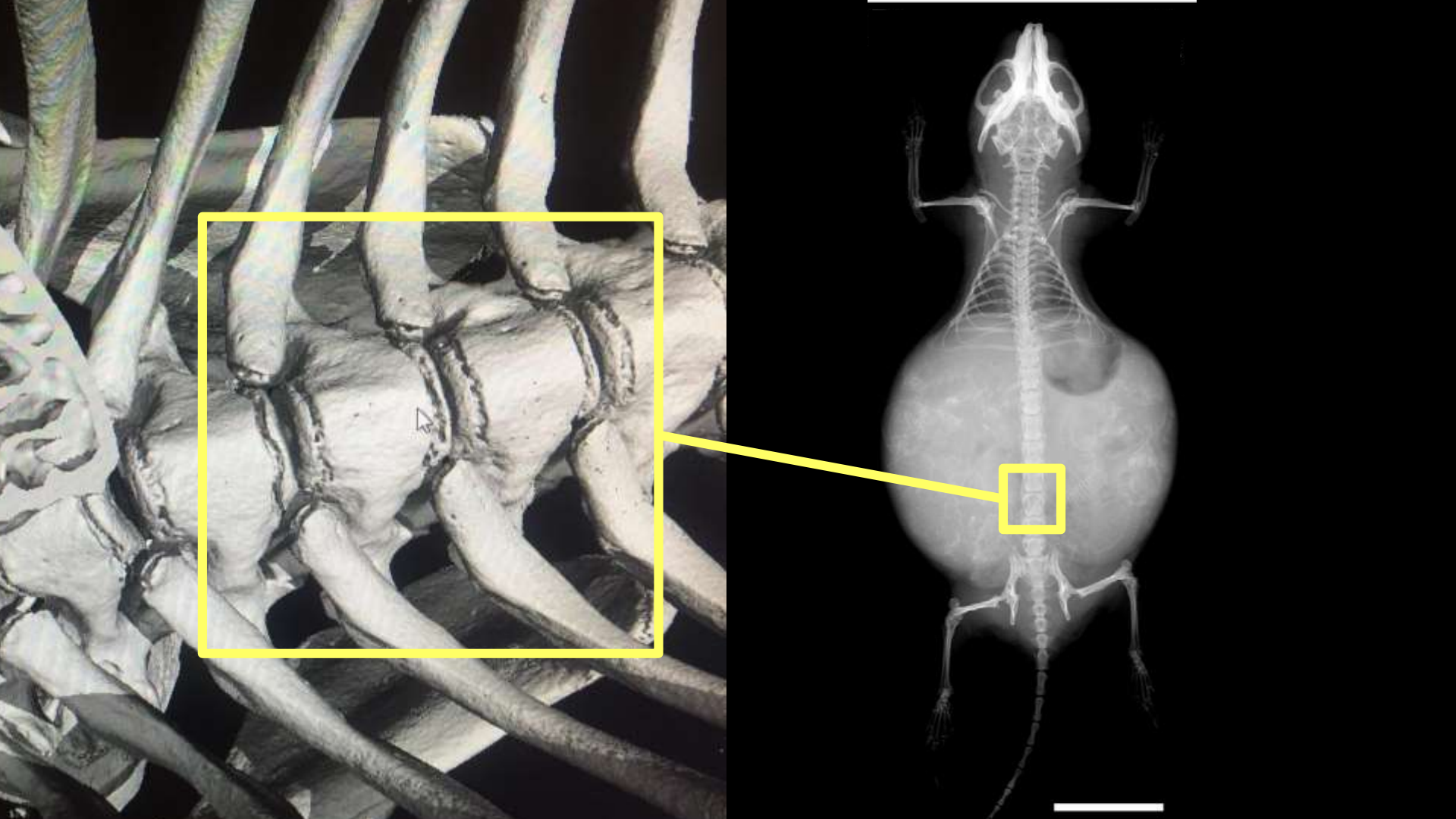
Fitness training in the tunnel sytem

Unique Traits of Naked Mole-Rat

- Eusocial Lifestyle
- extreme Longevity (>38 yrs.)
- Hypoxia resistant (18 min. without O_2)
- Cancer resistant
- Disease resistant
- Queen starts to grow after coronation
- Pain resistant

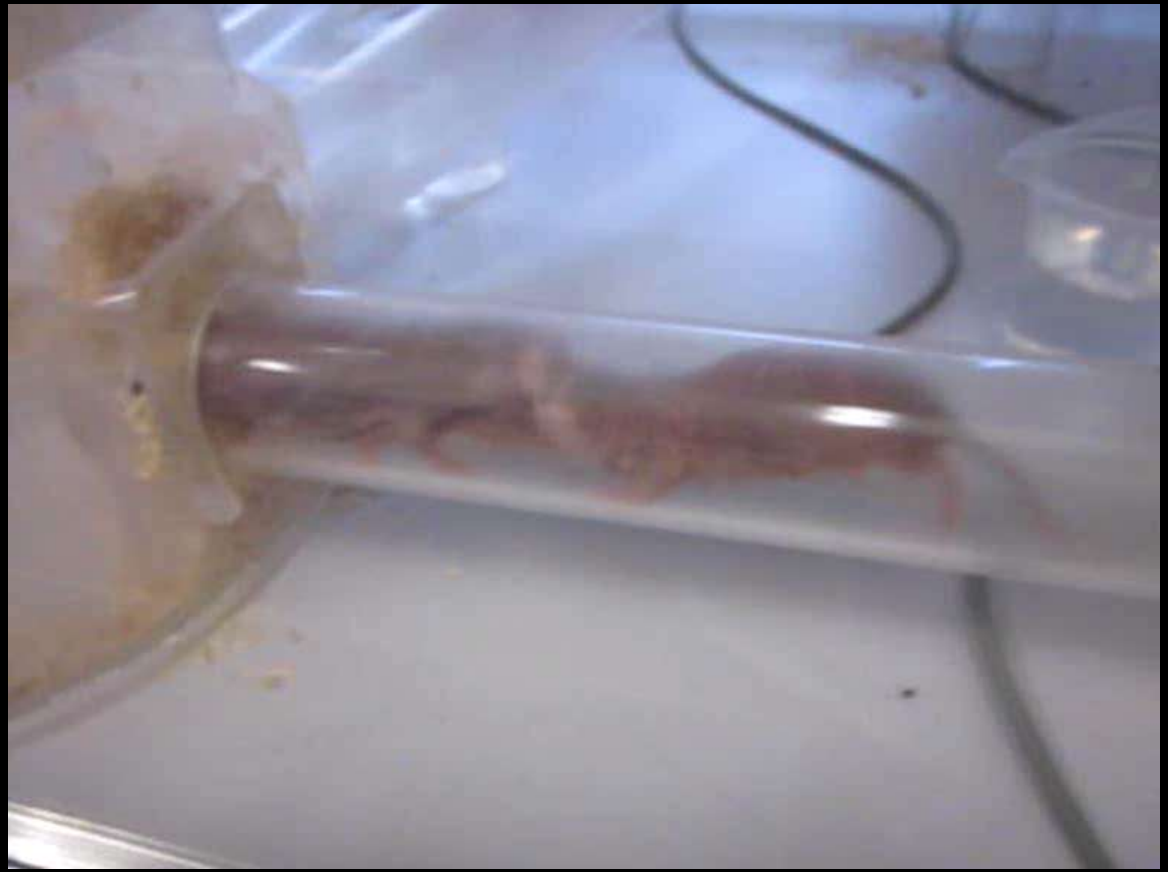


Malgahaes et al., (2007), *J Gerontol A Biol Sci Med Sci*

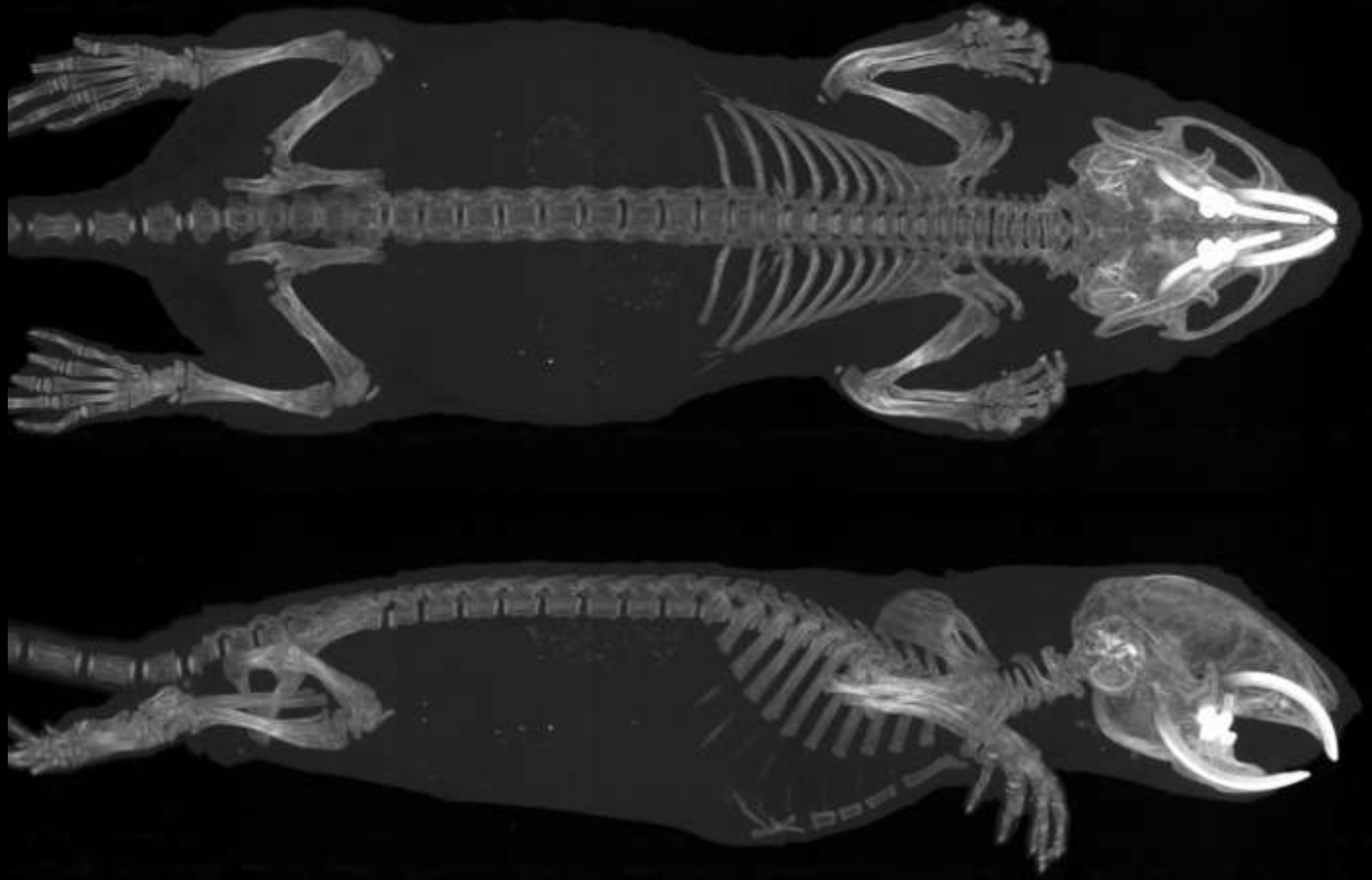


Mating of queen and pasha

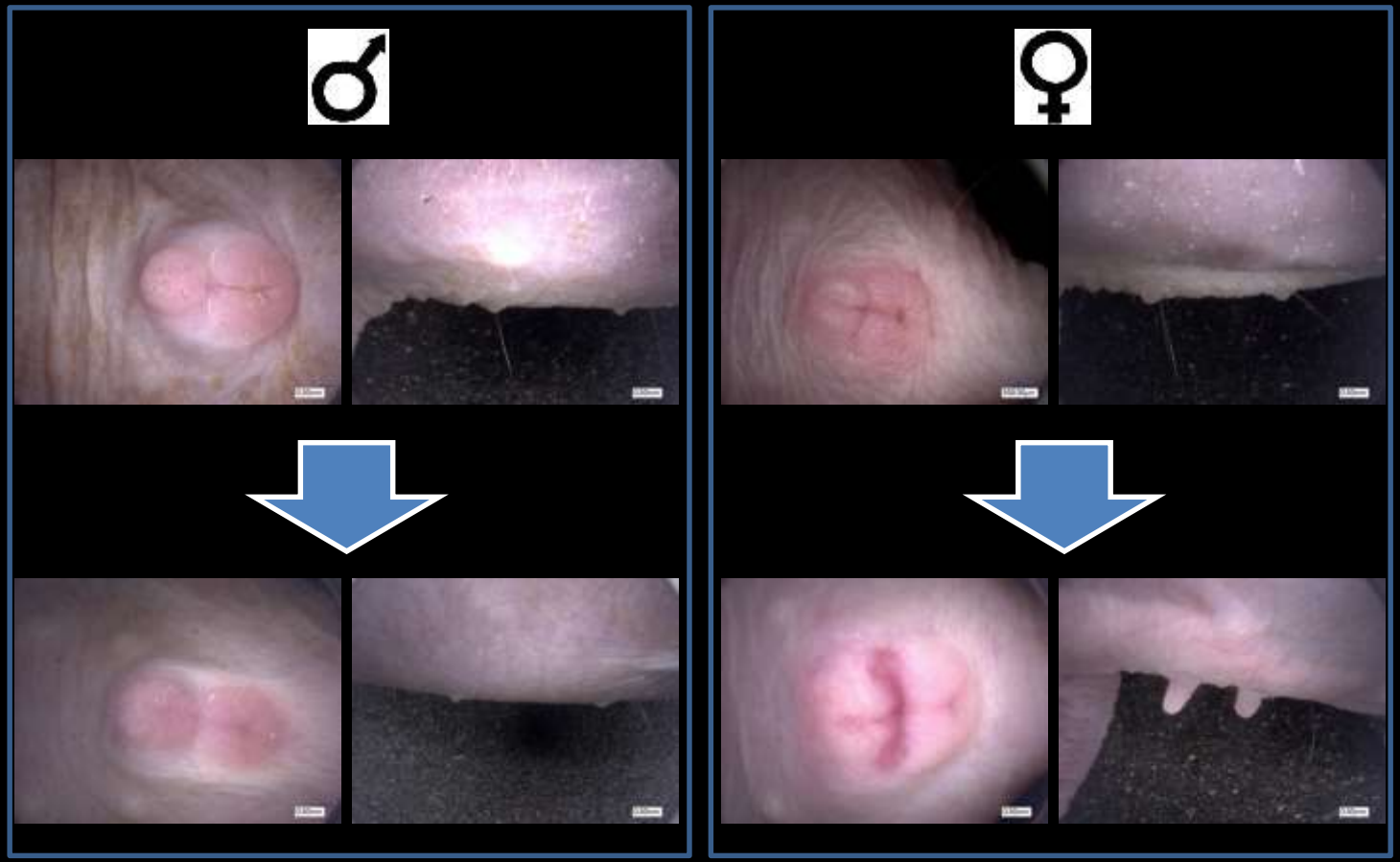
Queen is quite aggressive



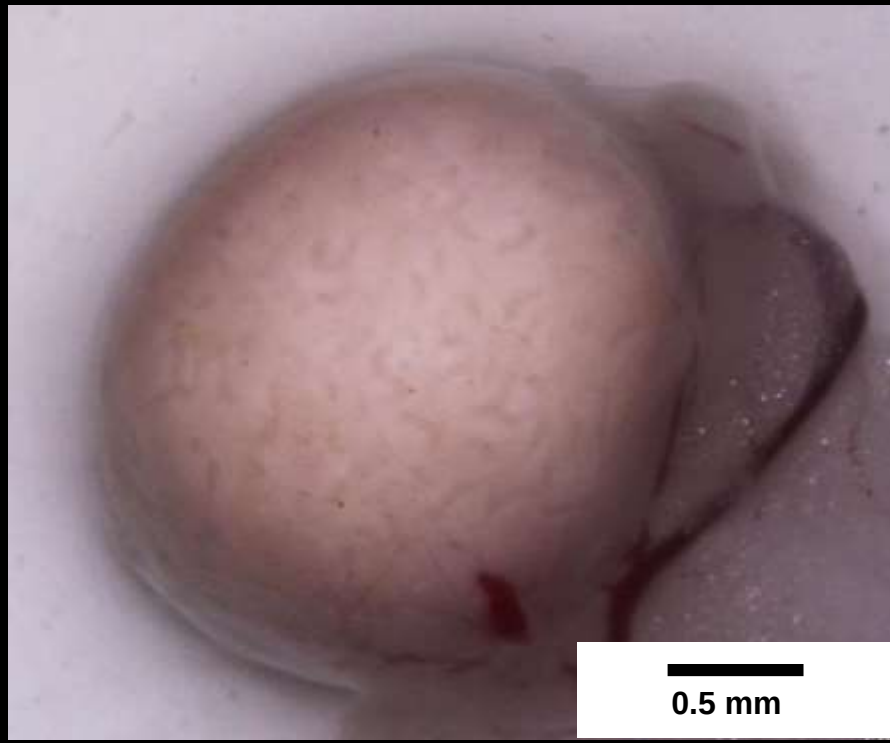
Exterior characteristics



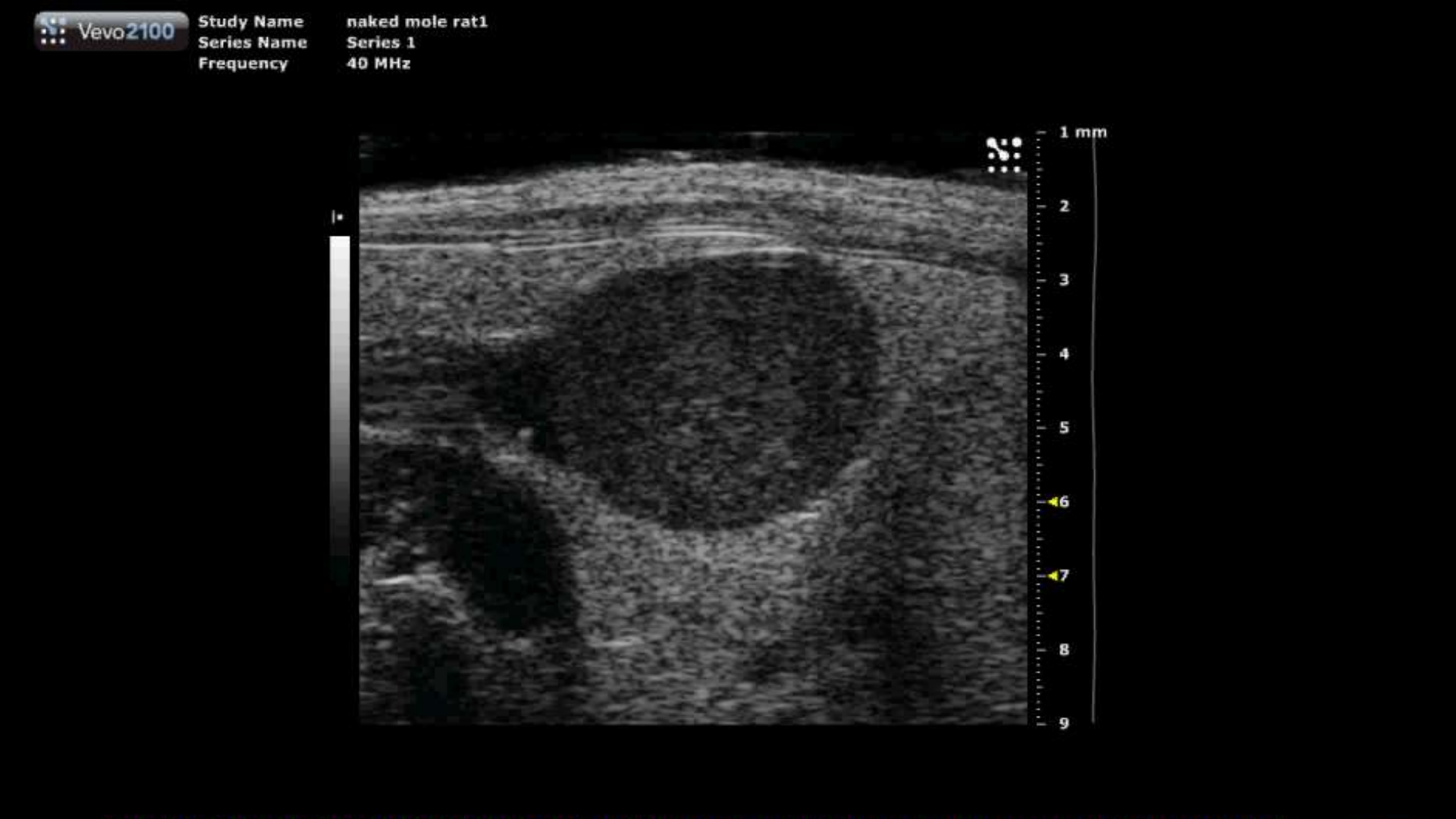
External genitals



male worker



pasha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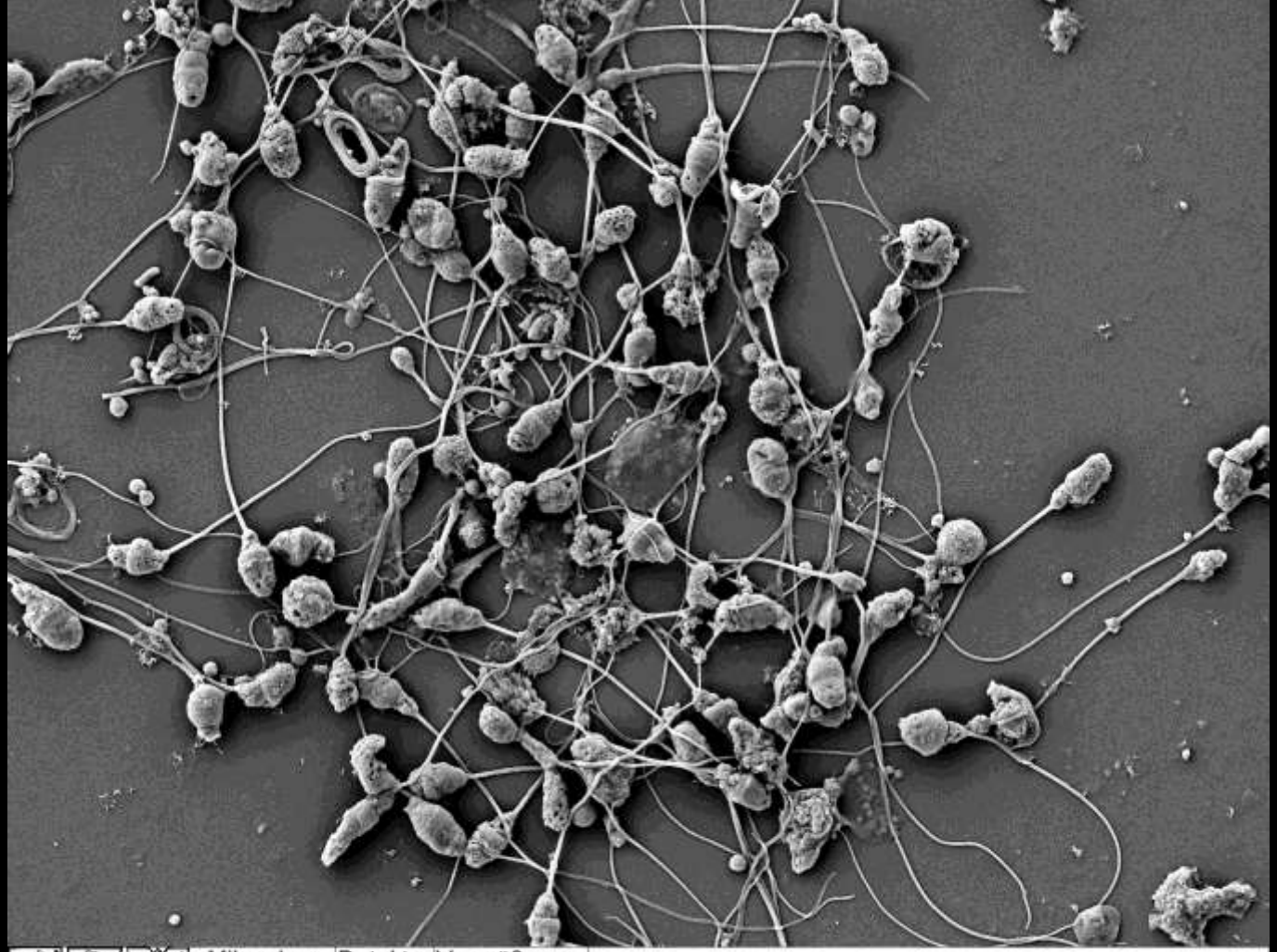
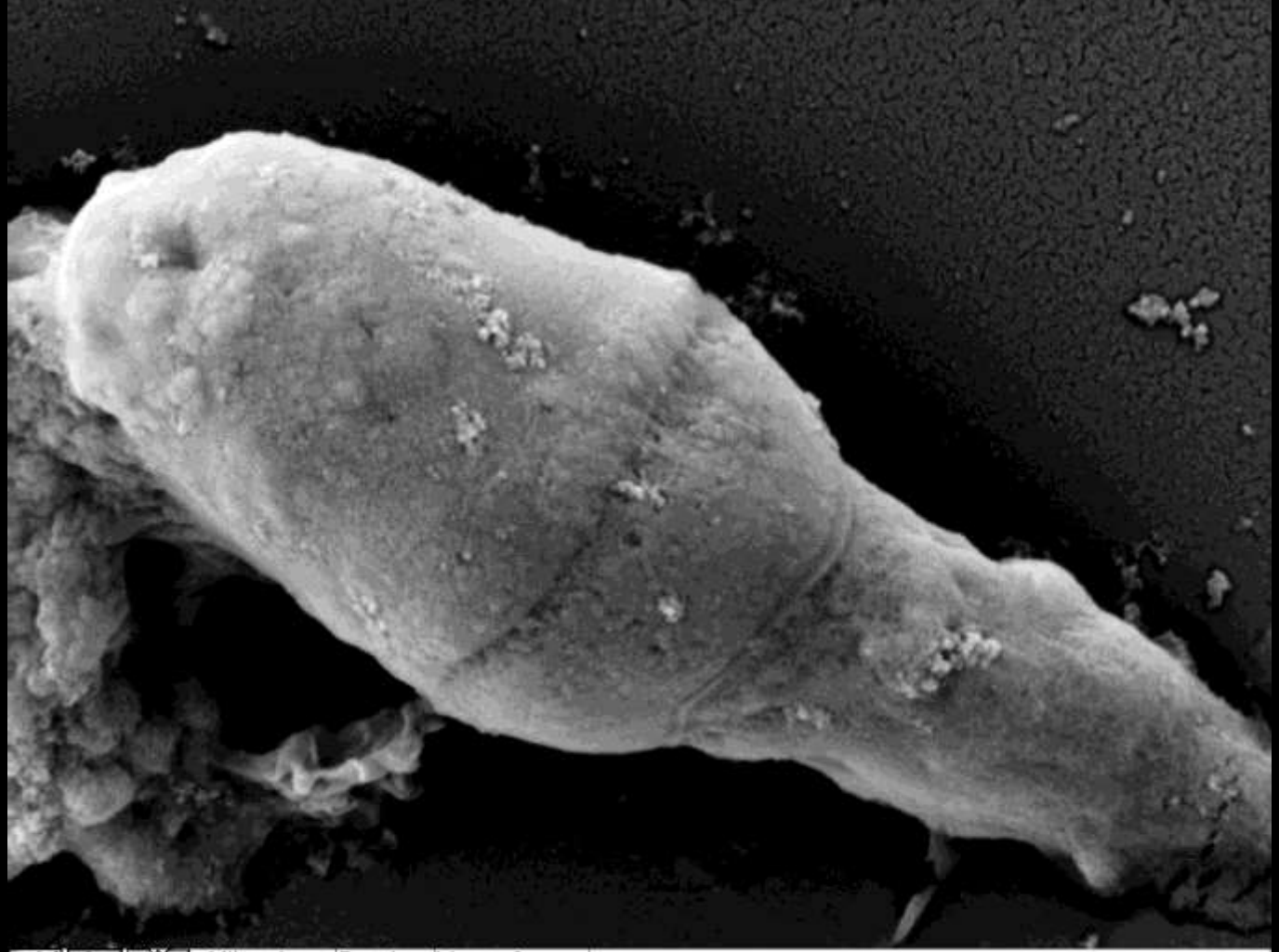
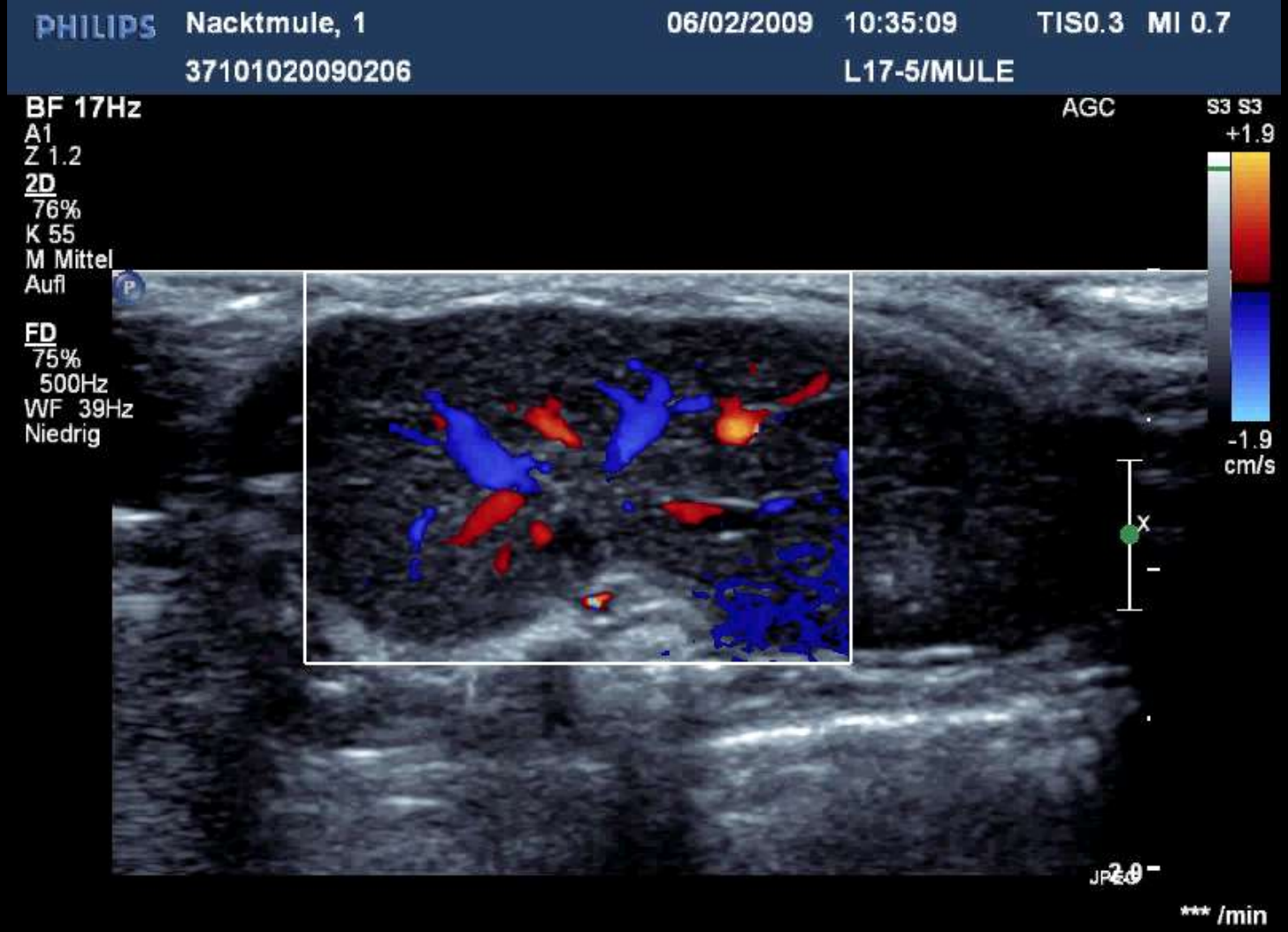


Mikroskop	Detektor	Vergrößerung	
Supra 40 VP	SE2	3991 x	10 µm



Mikroskop	Detektor	Vergrößerung	
Supra 40 VP	SE2	53969 x	1 µm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Z 1.2
2D
76%
K 55
M Mittel
Aufl
FD
75%
500Hz
WF 39Hz
Niedrig
AGC
S3 S3
+1.9
-1.9
cm/s
*** /min


PHILIPS
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06/02/2009
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P1
2D
84%
K 45
M Mittel
Aufl
FD
80%
7000Hz
WF 490Hz
Niedrig
S3 S3
+38.5
-38.5
cm/s
1.1
JPEG
*** /min


worker
breeder
2.0 mm
2.0 mm

nature communications

Article

https://doi.org/10.1038/s41467-023-36284-8

Postnatal oogenesis leads to an exceptionally large ovarian reserve in naked mole-rats

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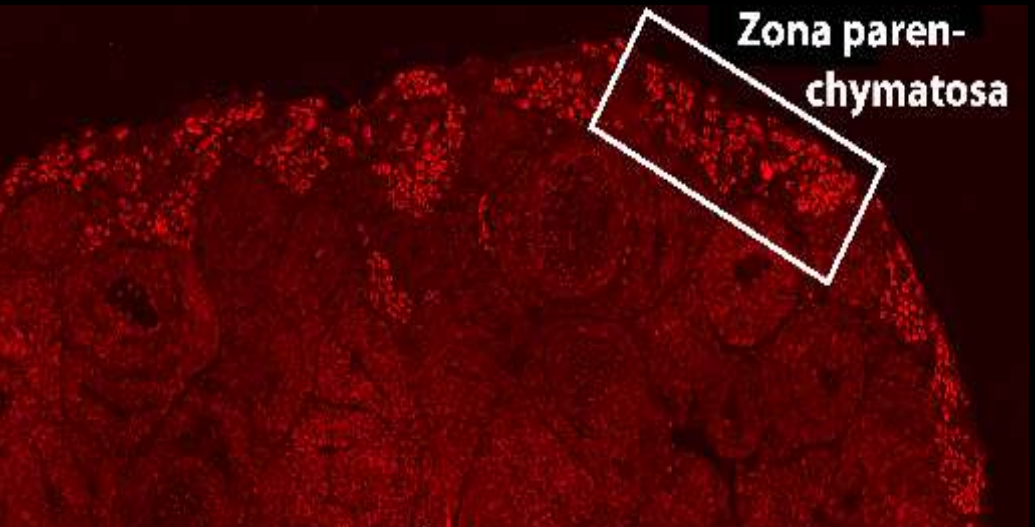
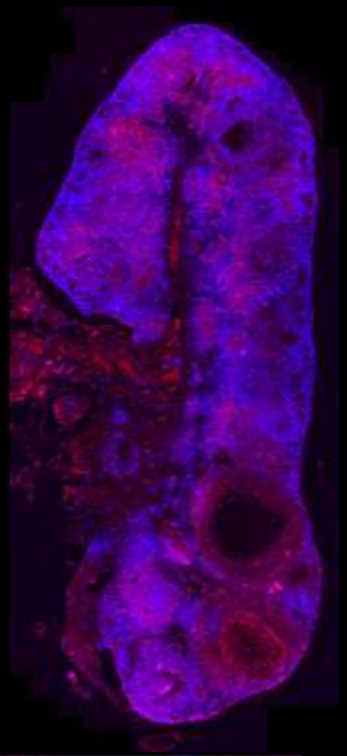
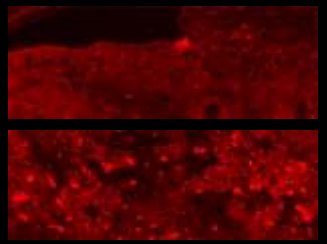
Check for updates

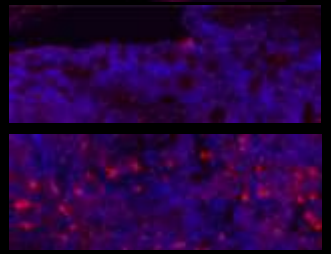
Miguel Angel Brieño-Enriquez[1,2], Mariela Faykoo-Martinez[2,4,5], Meagan Goben[1], Jennifer K. Grenier[6], Ashley McGrath[7], Alexandra M. Prado[7], Jacob Sinopoli[7], Kate Wagner[7], Patrick T. Walsh[1], Samia H. Lopa[1], Diana J. Laird[6], Paula E. Cohen[8], Michael D. Wilson[9,10], Melissa M. Holmes[2,4] & Ned J. Place[7]

In the long-lived naked mole-rat (NMR), the entire process of oogenesis occurs postnatally. Germ cell numbers increase significantly in NMRs between postnatal days 5 (P5) and P8, and germs cells positive for proliferation markers (Ki-67, pHH3) are present at least until P90. Using pluripotency markers (SOX2 and OCT4) and the primordial germ cell (PGC) marker BLIMP1, we show that PGCs



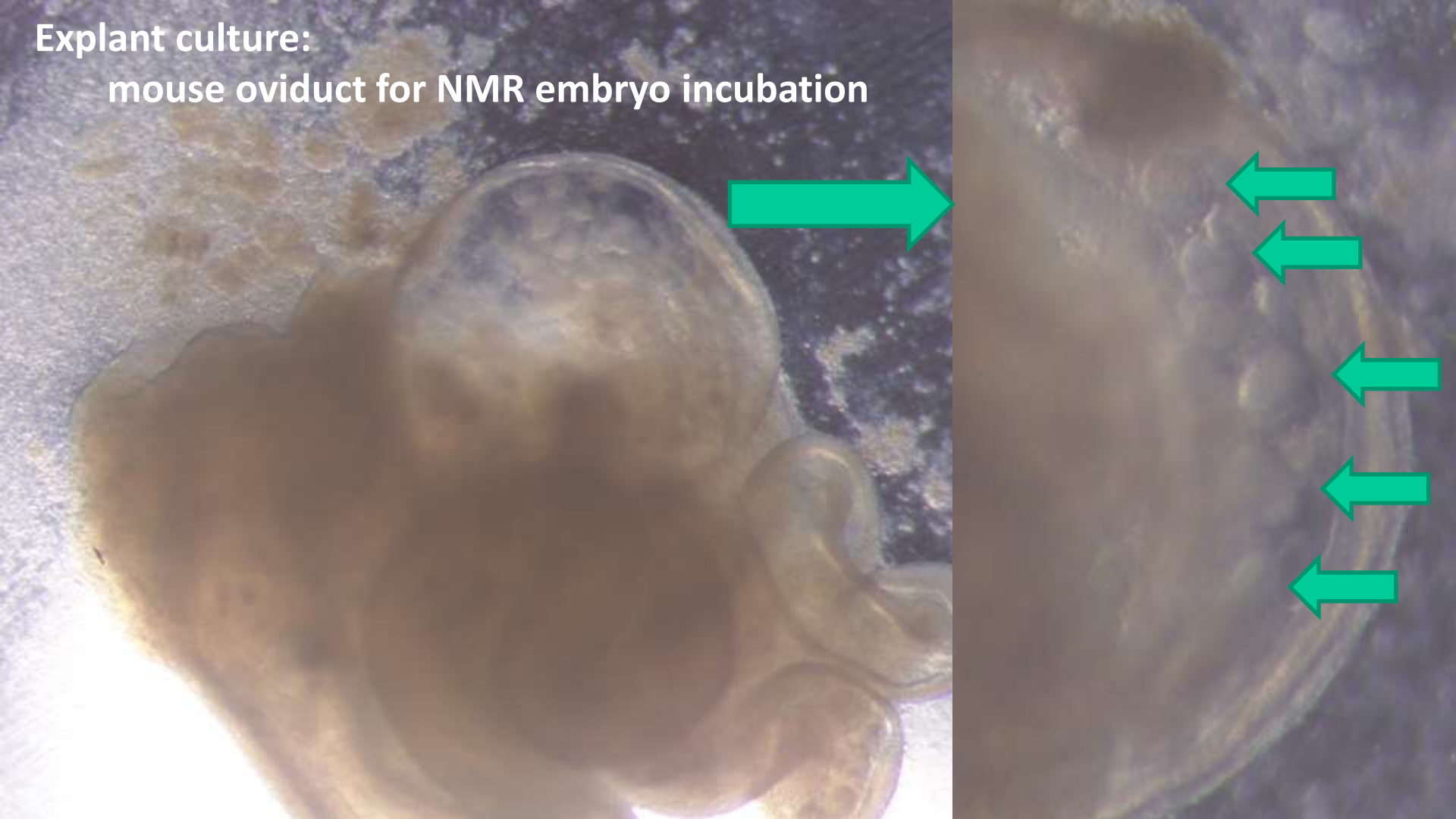






Explant culture:

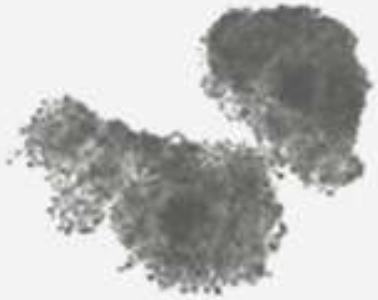
mouse oviduct for NMR embryo incubation

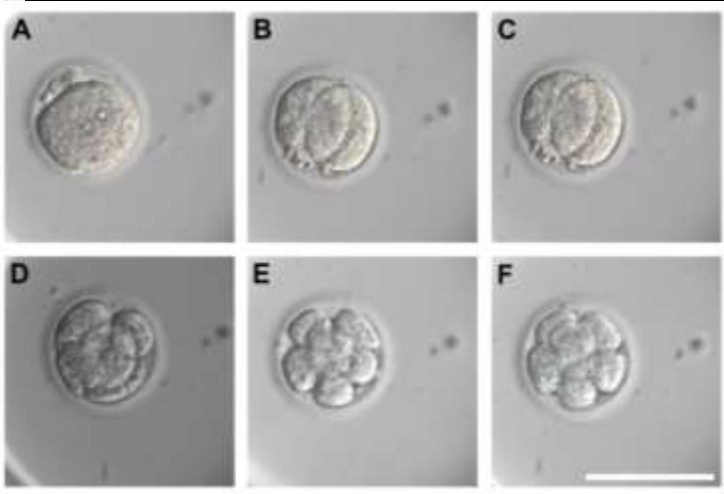


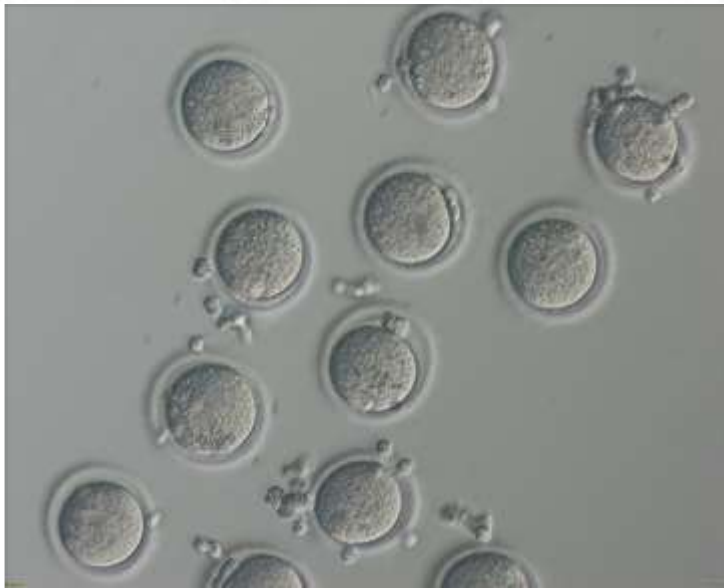
naked mole rat


scientific reports

OPEN In vitro production of naked mole-rats' blastocysts from non-breeding females using in vitro maturation and intracytoplasmic sperm injection



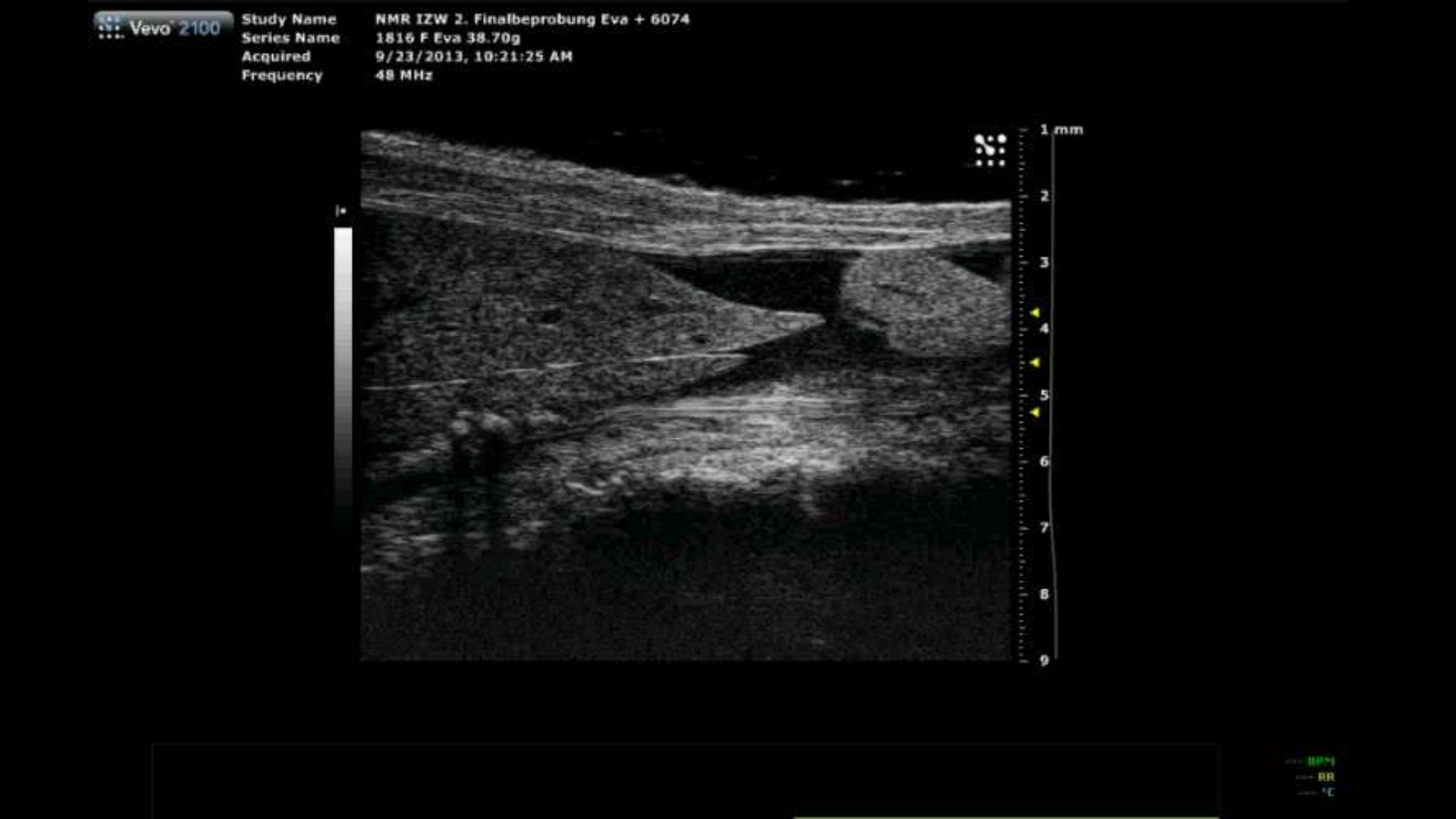




Prenatal Diagnostic in Naked Mole Rat

Ultrasound Microscopy

System Configuration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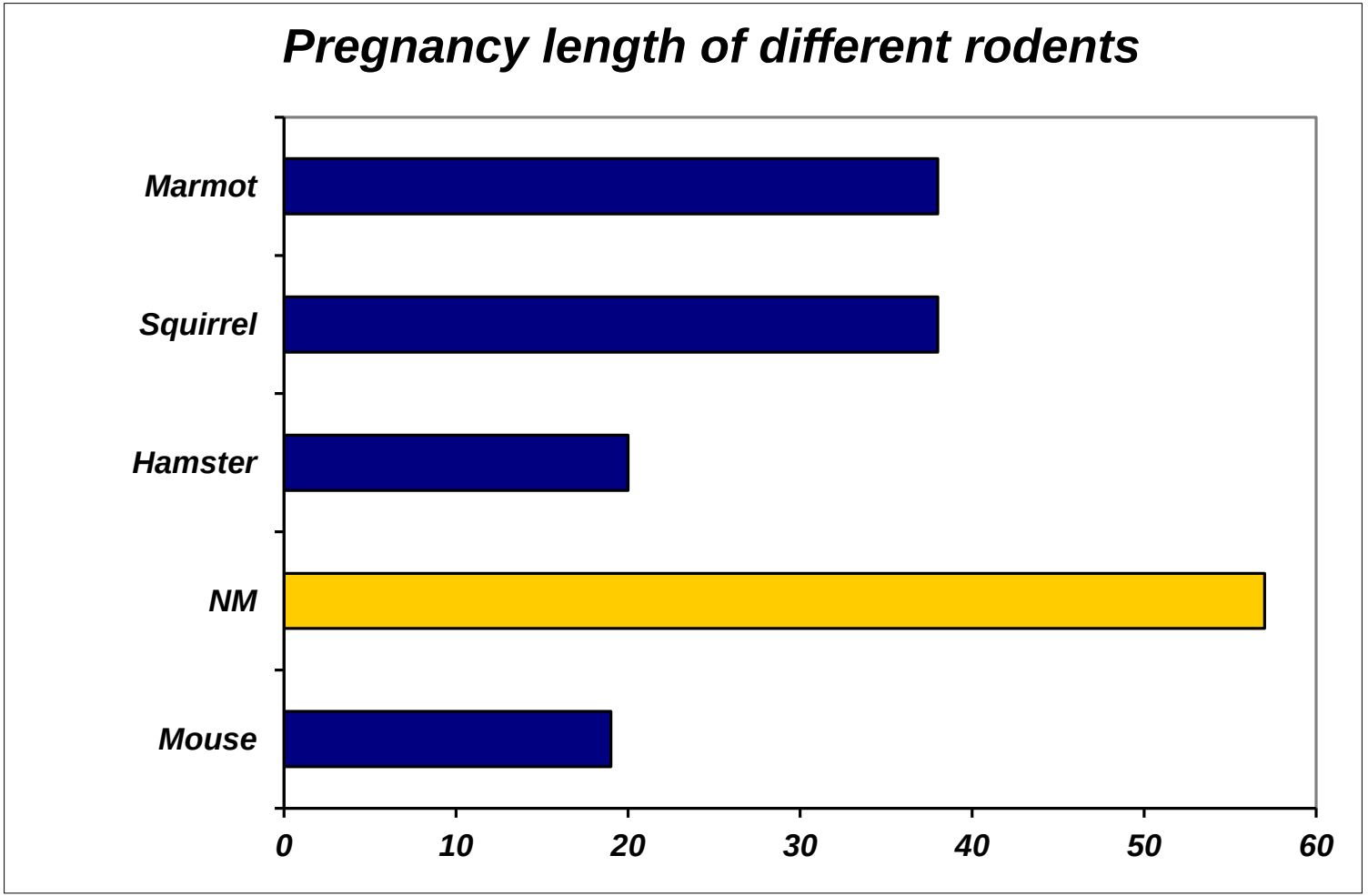

Pregnancy length of different rodents
Marmot
Squirrel
Hamster
NM
Mouse
0
10
20
30
40
50
60

MS-700

Application	General Imaging
Preset	Slow Flow

Transmit

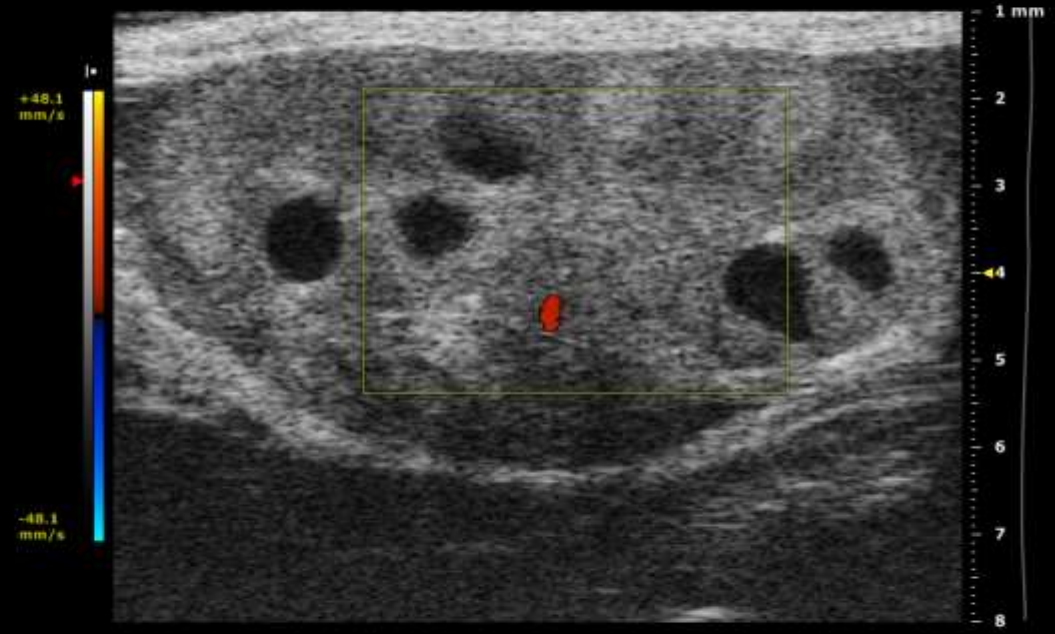
Frequency	40 MHz
Power	100 %
PRF	5 kHz
Gate	2

Acquisition

Doppler Gain	8 dB
2D Gain	40 dB
Frame Rate	22
Width	9.73 mm
Beam Angle	0 deg
Sensitivity	5
Line Density	Full
Persistence	Low
ECG/Resp Gate	Off/Off

Display

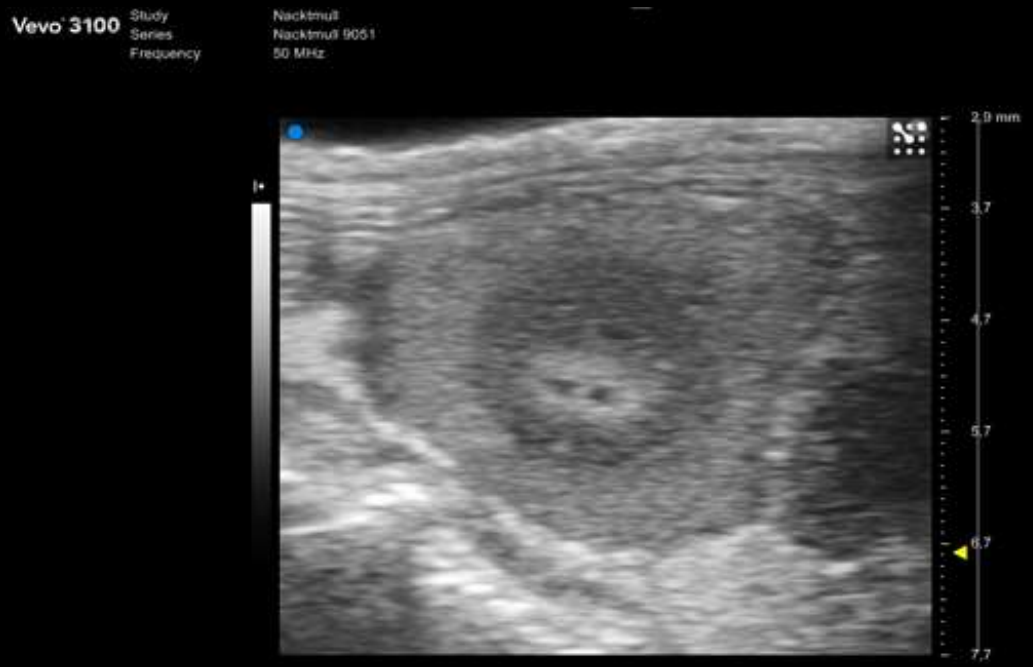
Display Map	G1
Wall Filter	Med
Priority	80
Brightness	50
Contrast	50



Ima

Prenatal Diagnostic in Naked Mole Rat

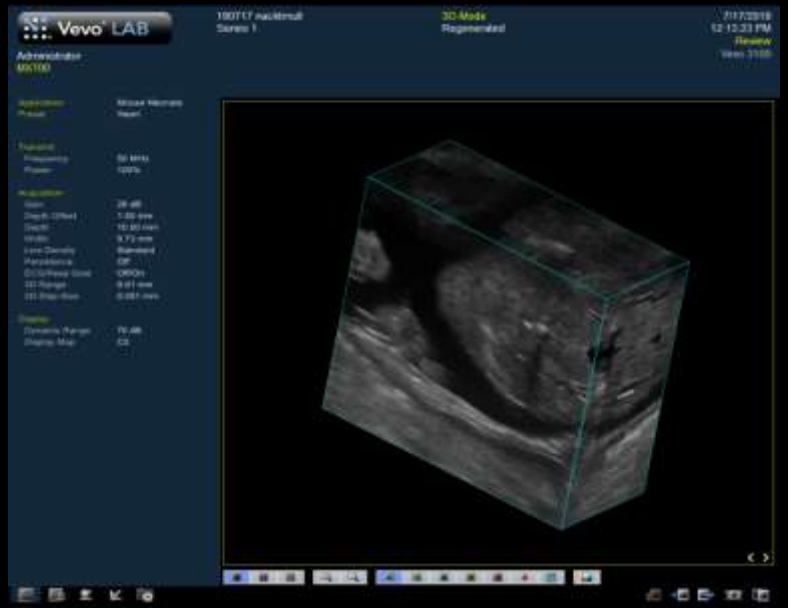
Ultrasound Microscopy

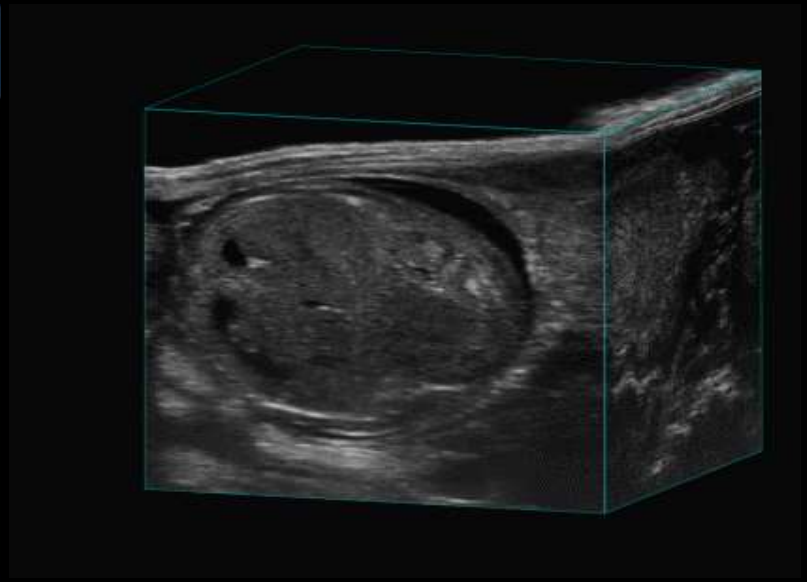


Early Implantation – Decidua Reaction

Prenatal Diagnostic in Naked Mole Rat

Ultrasound Microscopy

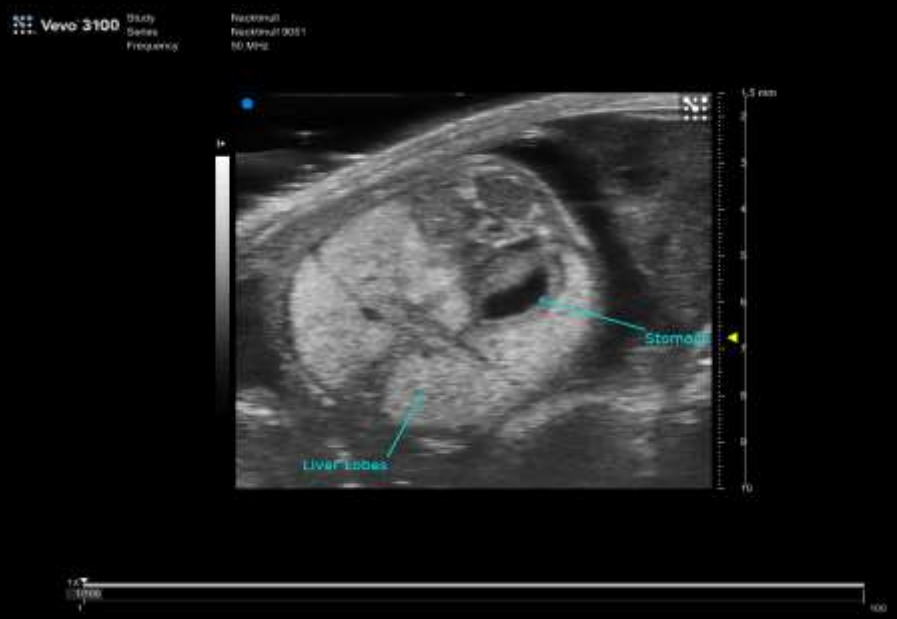




Mid-term Fetus

Prenatal Diagnostic in Naked Mole Rat

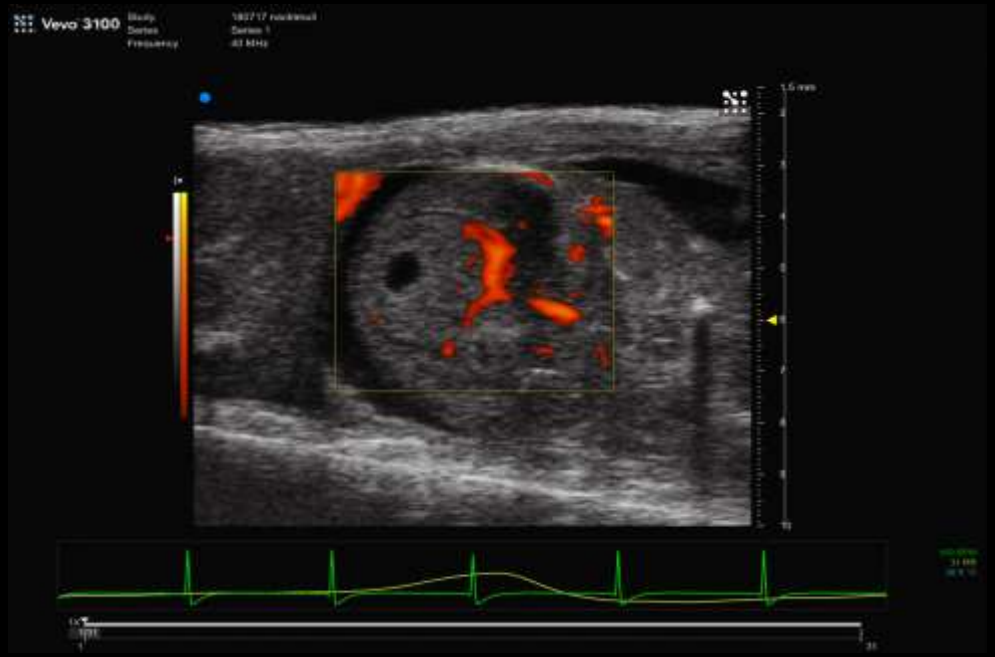
Ultrasound Microscopy



Mid-term Pregnancy – Fetal Abdomen

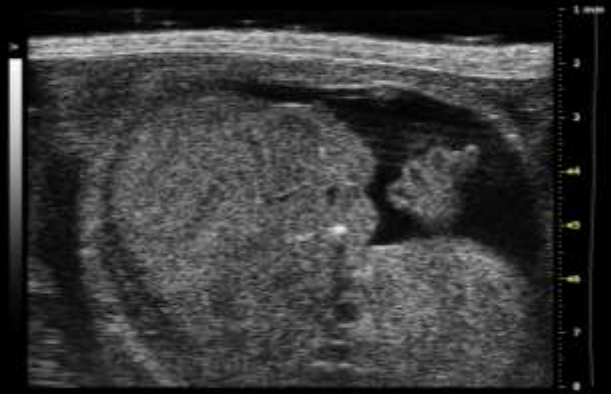
Prenatal Diagnostic in Naked Mole Rat

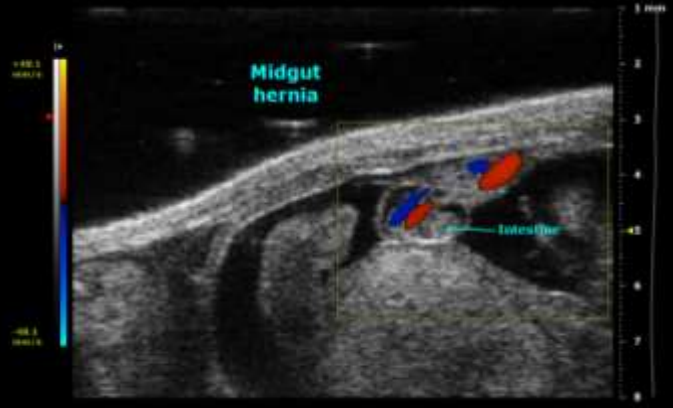
Ultrasound Microscopy

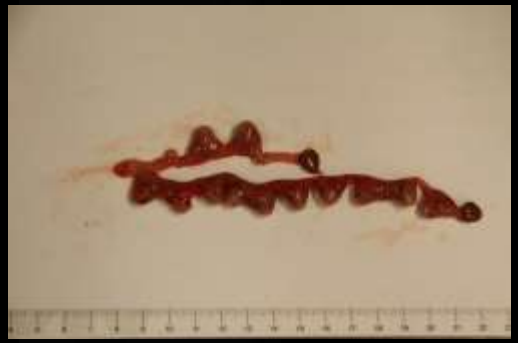


Brain Vascularization

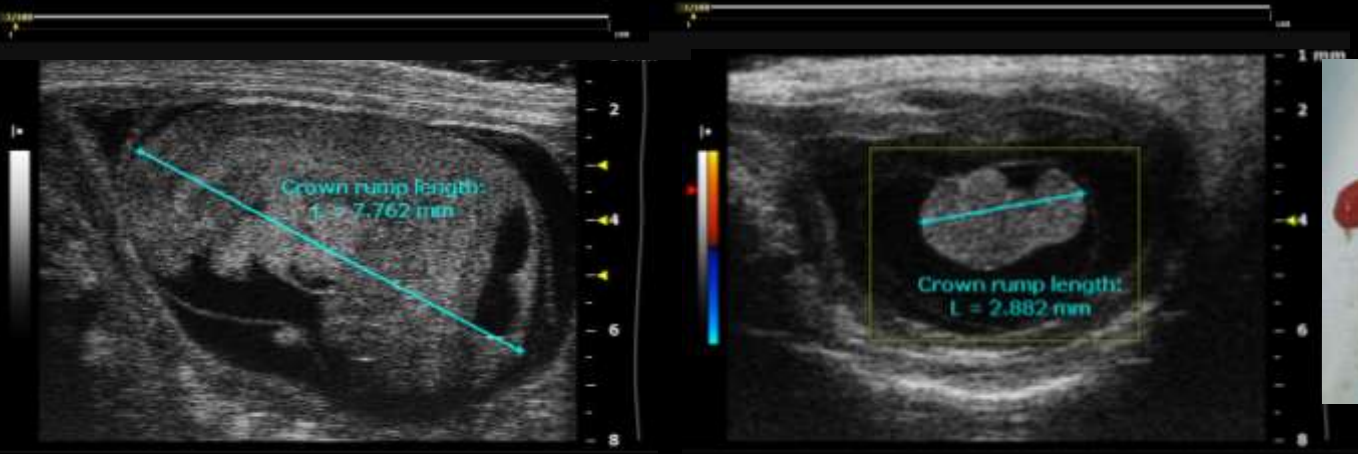
Police Gesture




Midgut
hernia



Normal embryonic development next to resorption sites




IZW 4US
RSM5-14/SM P
IZW Reproduction Management
Naked Mole Rat Queen pregnan
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04.12.2009
13:02:20
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Th10/Qual mid1
B58°/V30°
Mix94/6
S.txt/min
M21/110
SRI II e
3D Static
--- 2D ---
Thyroid
Har-high
Pwr 95 %
Gn 5
C4 / M7
P3 / E3

Babies

- 2 – 30 / litter
- Gestation > 2 months
- Weaning ~ 2-3 months
- Sexual maturity ~ 6 months


Controller

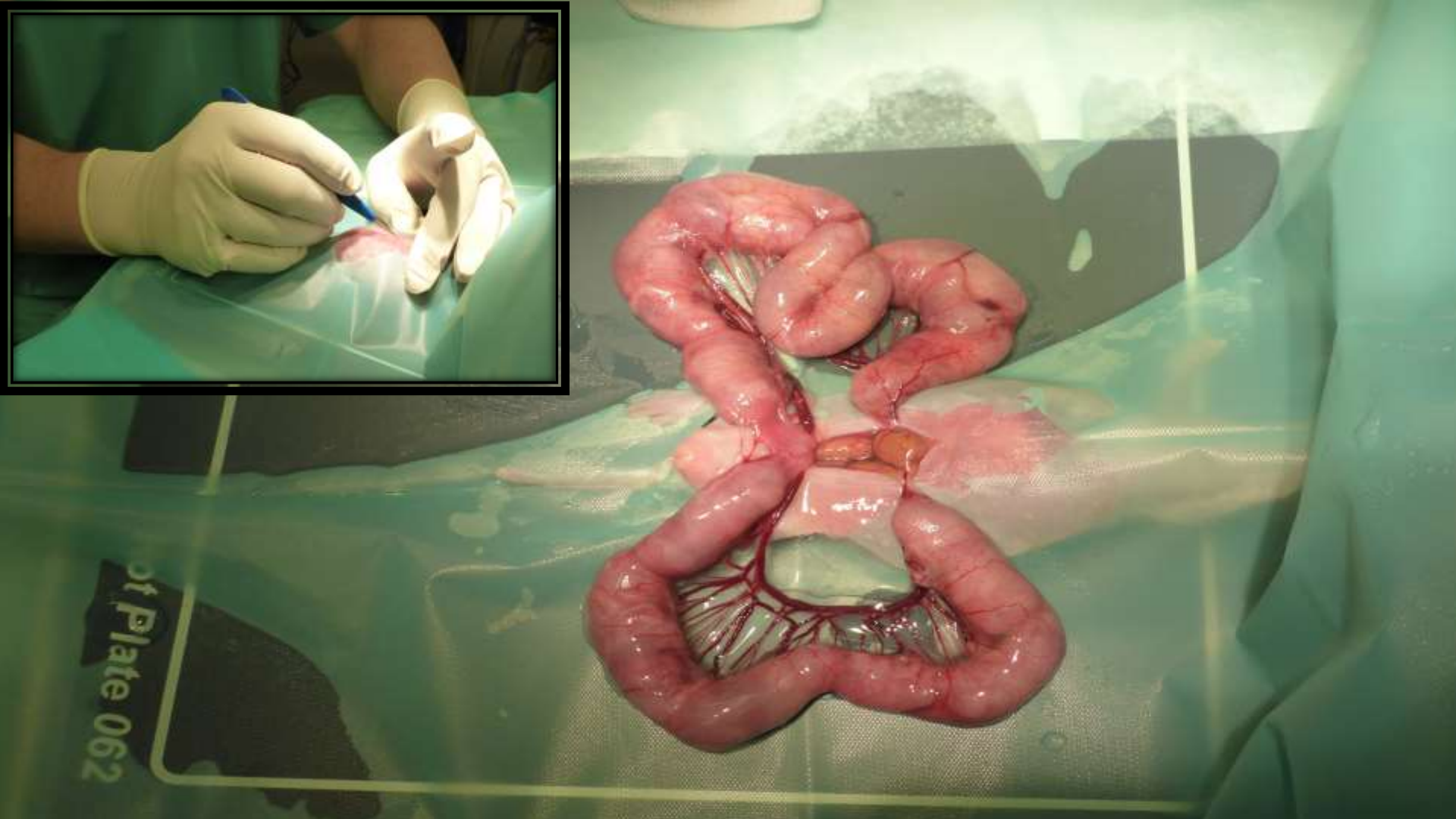
Plate 062


17 babies recovered
1 dead
1 injured by surgery


Follow-up check
16 days after surgery
- 10 babies alive
- normal development

Champion of the Animal Kingdon