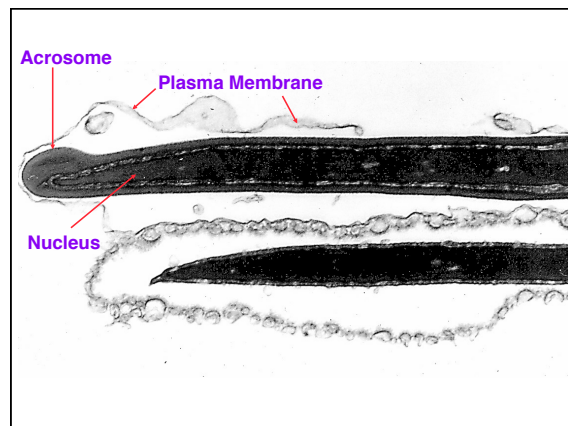
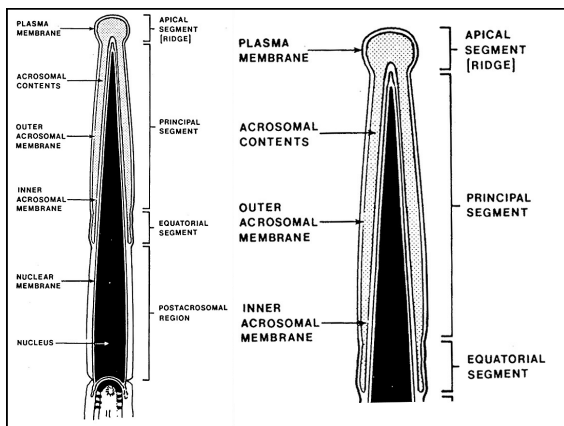
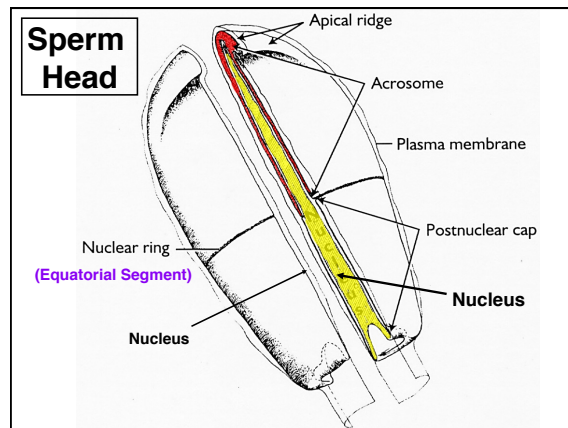
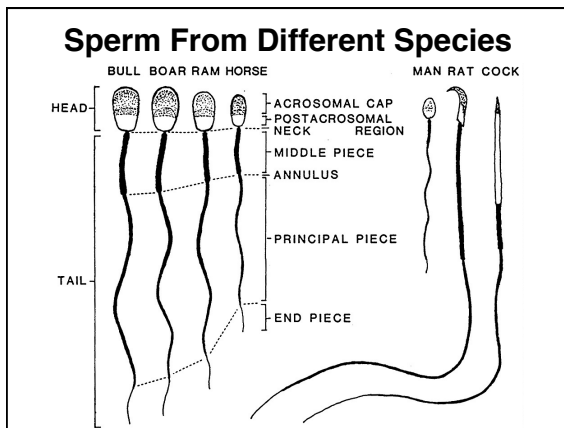
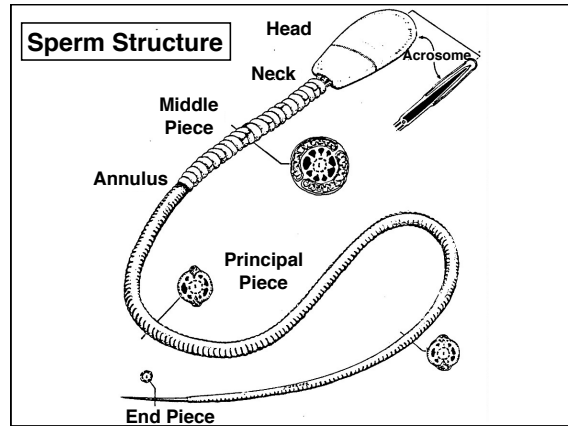
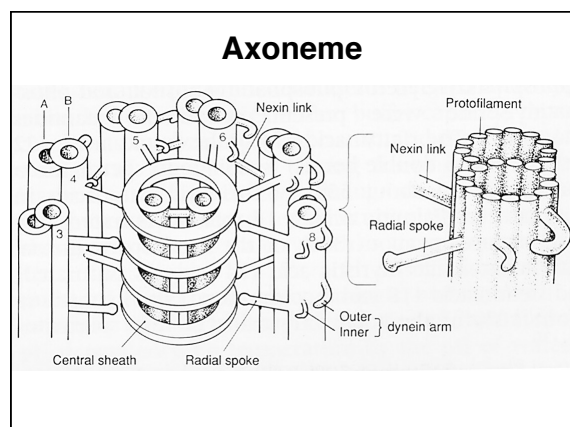
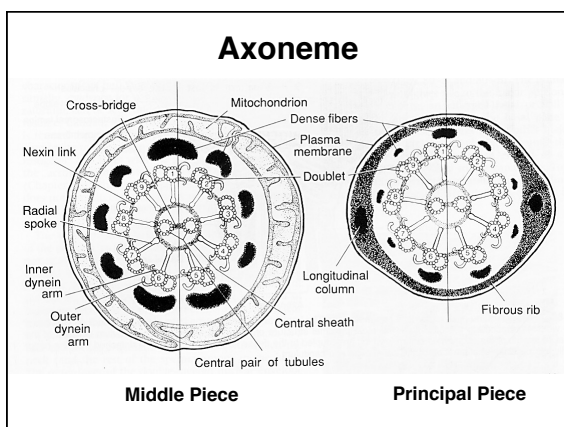
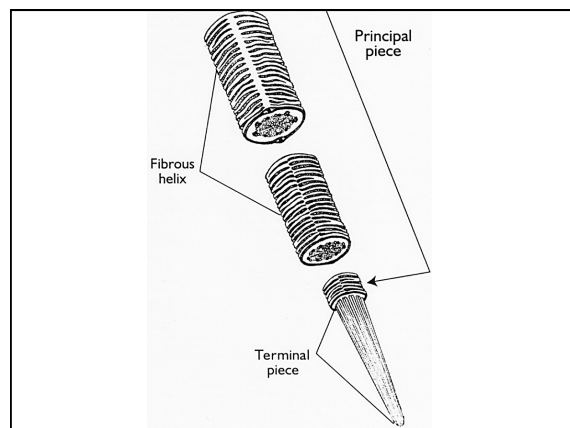
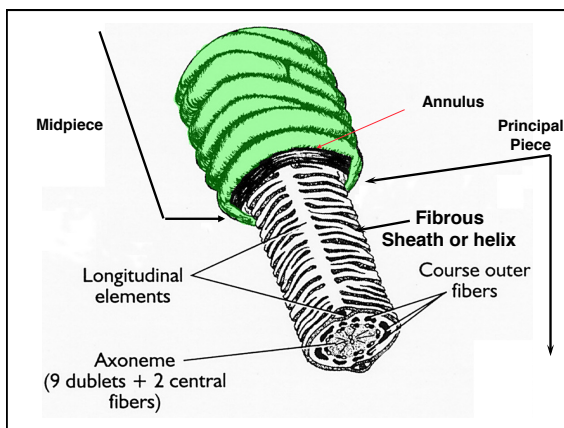
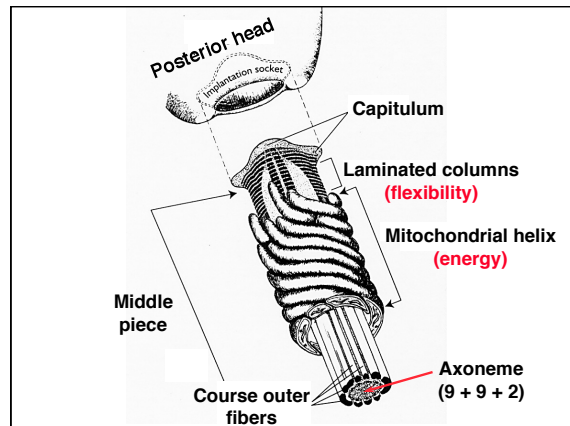
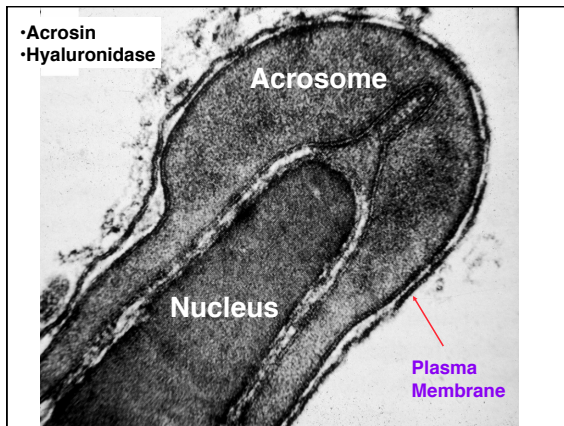
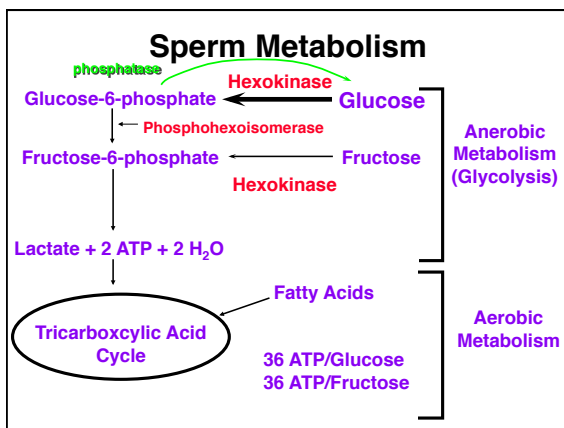
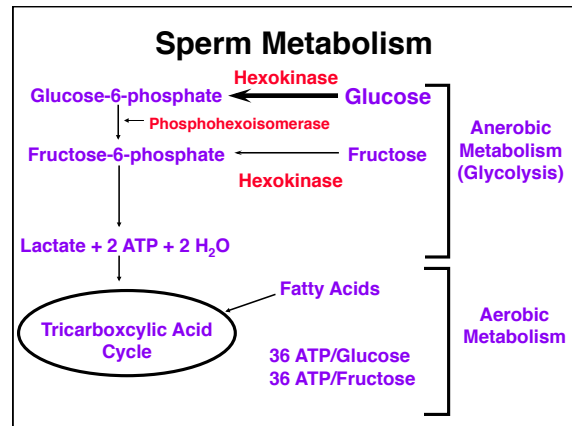
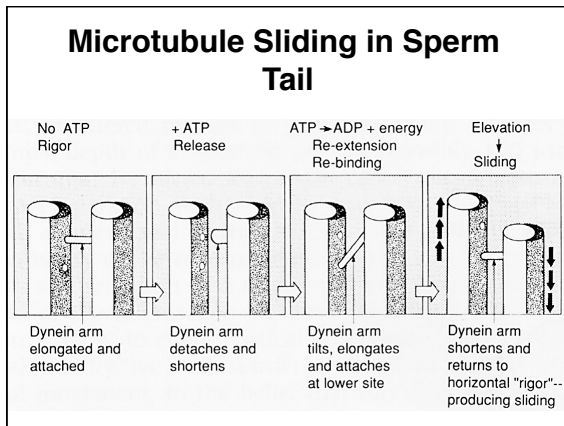


Animal Science 434

Epididymis, Ejaculation and Semen

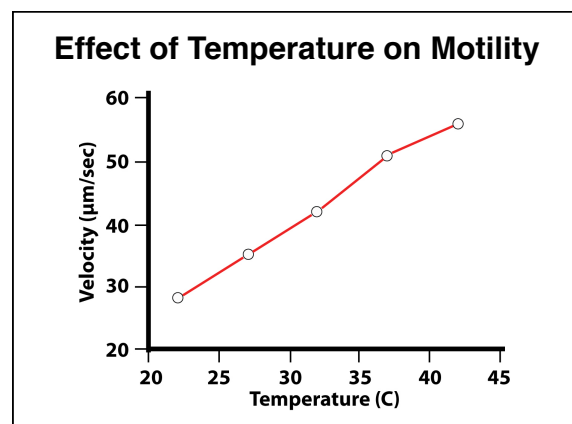


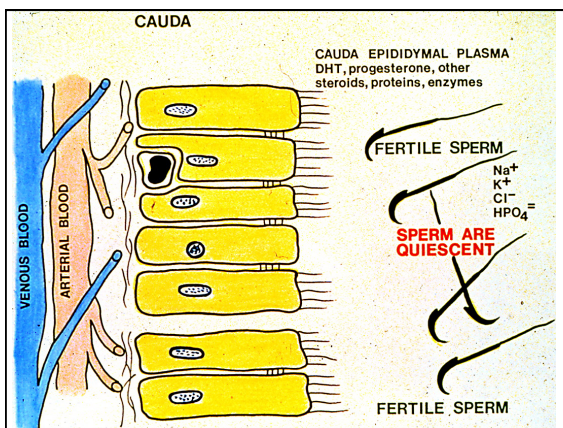
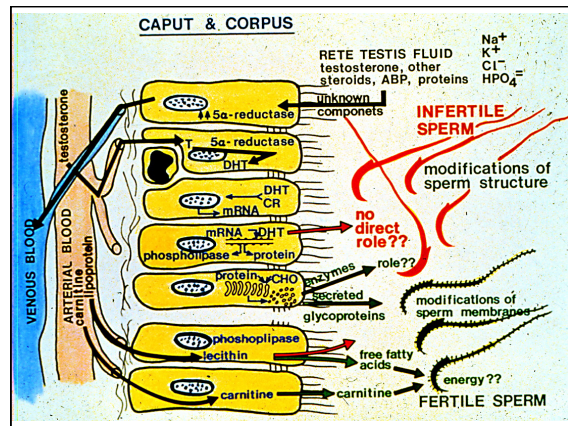
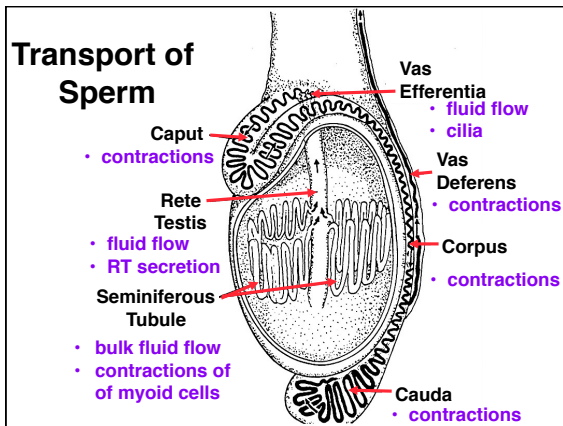




- ### ATP Utilization in Sperm
- **motility (60%)**
 - **substrate cycling (40%)**
 - wasted
 - **maintenance of ionic gradients**
 - very small amount
 - **transcription and translation**
 - none after condensation of nucleus and loss of residual body

- ### Sperm Metabolism
- **Temperature dependent**
 - ATP production increases as temperature increases
 - **ATP dependent processes are temperature dependent**
 - motility increases with increasing temperature





Epididymal Function

1. Maturation

- change in fertility
- develop motility
- nuclear condensation
- cytoplasmic droplet

2. Concentration

- remove water

Epididymal Function

3. Secretion

- **T** → **DHT**
- energy substrates (GPC, free fatty acids, carnitine)
- glycoproteins, lipids, enzymes

4. Transport

- smooth muscle contraction

5. Storage

- cauda

Hormonal Control of Epididymis

• Absolute need for Androgen

• Caput

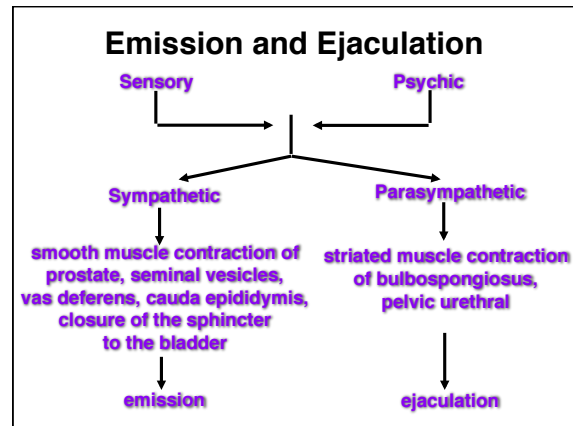
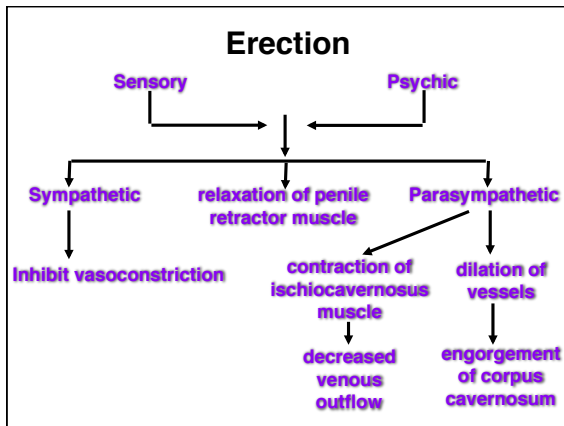
- tubal testosterone

• Corpus

- tubal dihydrotestosterone (DHT)
- vascular testosterone

• Cauda

- tubal DHT
- vascular testosterone



Ejaculate Characteristics		
Species	Time lapse for	Composition of
Bull	1 second	single fraction
Ram	1 second	single fraction
Boar	5 - 25 minutes	fractionated sperm-free sperm-rich coagulum
Stallion	30 - 60 seconds	fractionated sperm-free sperm-rich mucus
Human	10 - 30 seconds	single fraction but coagulated

Components of Semen
• water • sperm • substrates – fructose – sorbitol – inositol – glycerol phosphatidyl choline (GPC) – citric acid • inorganic salts – sodium, potassium, calcium, magnesium, chloride • proteins

Initial Semen Evaluation
• color • volume • concentration • motility • viability • morphology

Semen Color and Volume
• Color – White to cream color - good – Yellow – urine present – Clear or thin in appearance – few sperm • Volume – Weight, 1 ml = 1 gm • Concentration – Hemocytometer – gold standard – Spectrophotometer, photometer, fluorometer

Motility Evaluation

- Also a viability evaluation
- Visual estimation – Nearest 5% estimate
 - Total motility – all the moving sperm
 - Progressive motility – those sperm moving in a straight line
- CASA – Computer aided sperm analysis
 - Tracts individual sperm and computes a variety of statistics on the sample
- Sample preparation is key to usefulness of data obtained!!!

- # Morphology
- **Variety of sample preparations and methods for evaluation**
 - Stain vs. no stain
 - Wet mount vs. dried or fixed
 - Magnification of observation
 - Computer systems require training samples

A fluorescence micrograph showing a filament of a cyanobacterium. Most cells in the filament are glowing orange, while a few cells at the ends are glowing green. The cells are elongated and connected by thin, thread-like structures.

Morphology Classifications

- **Scheme A**
 - ✓ **Primary** – Head abnormalities
 - ✓ **Secondary** – Tail abnormalities
- **Scheme B**
 - ✓ **Primary** – Head abnormalities
 - ✓ **Secondary** – Tail abnormalities
 - ✓ **Tertiary** – Cytoplasmic droplets

PRIMARY

Normal	Micro	Long	Giant	Other	Pyriform
	Short				
	Detached				
					Knobbed Acrosomes

SECONDARY

Broken tail	Bent tail / Translocating droplet	Abaxial tail	Double midpiece	Midpiece abnormalities
	Long Head		Larger Head	
	Pyriform		Coiled tail	
				Bent tail

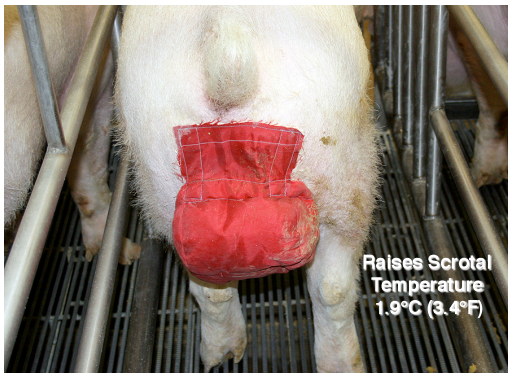
[illegible]

Ejaculate Characteristics

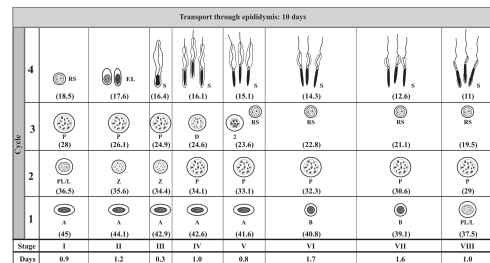
Species	Ejaculate Volume	Sperm Conc. (x10 ⁹ /ml)	Total Sperm (x10 ⁹) /Ejaculate	% Motile	% Normal
Bull	8.0	1.5	12	75	95
Ram	1.0	3.0	3	95	95
Boar	200	.25	50	70	90
Stallion	80	.15	12	70	40-90
Man	2-6	.15	.9	65	30-70

Impact of Heat on Spermatogenesis

L Enwall, J. Schindler, K Gibbs, K Yagoda and J. Parrish

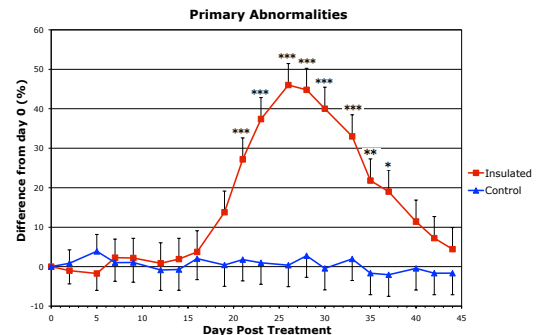


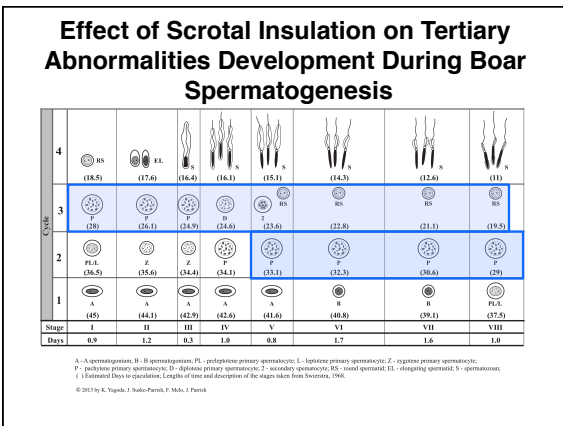
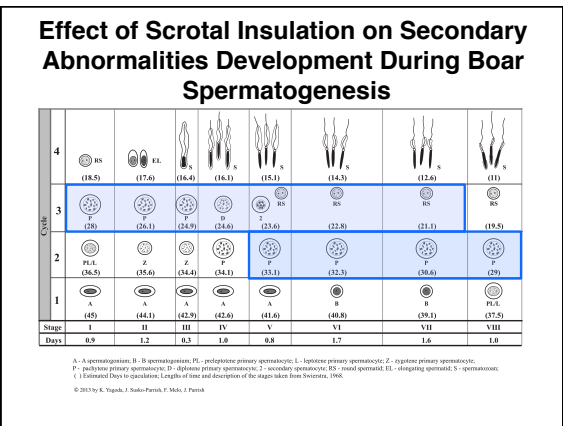
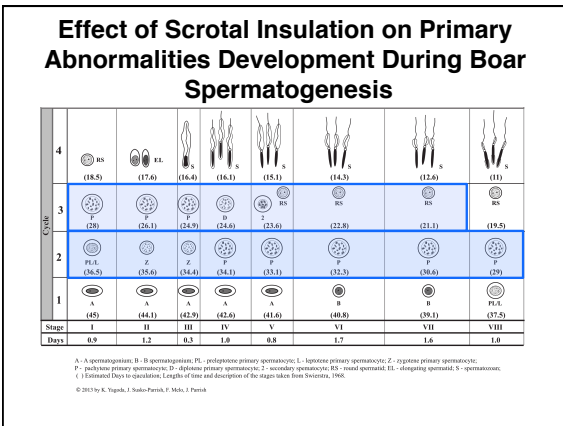
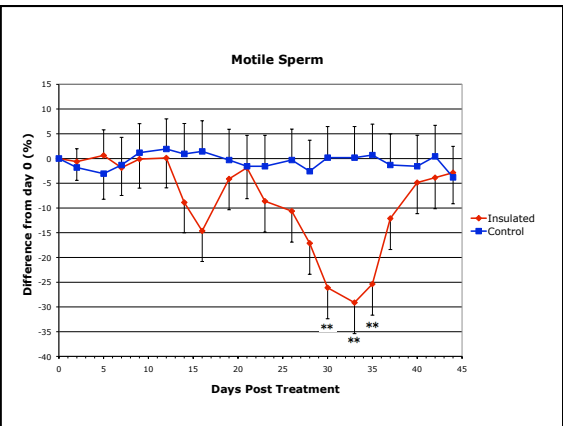
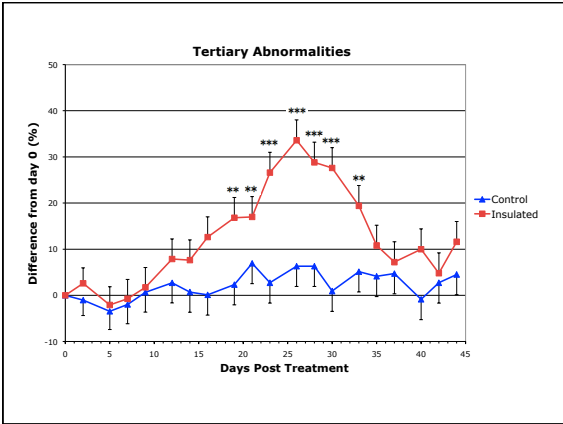
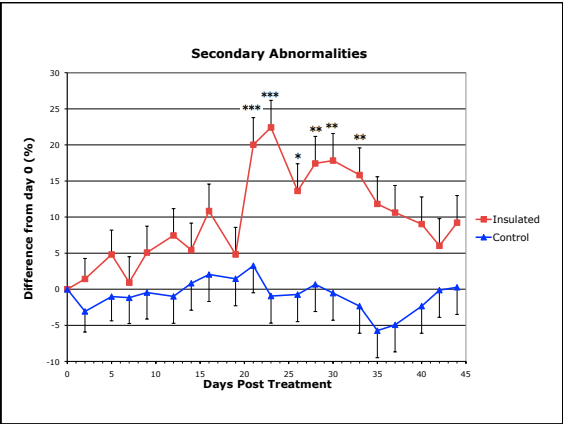
Boar Spermatogenesis



Normalization of Data

- (Sample value) – (Pre-insulation value)
- Normalized for each boar
- On day 0, all graphed data should be 0
- Data
 - Primary Abnormalities
 - Secondary Abnormalities
 - Tertiary Abnormalities
 - Motile Sperm





	Cystic						Noncystic	
4	 BS (18.5)	 EL (17.6)	 (16.4)	 (16.1)	 (15.1)	 (14.3)	 S (12.6)	 S (11)
3	 P (20)	 (16.1)	 P (24.5)	 P (24.6)	 P (22.6)	 BS (22.8)	 BS (21.1)	 BS (19.5)
2	 PLA (26.5)	 (25.6)	 Z (24.4)	 (24.1)	 P (33.1)	 (32.3)	 (26.9)	 P (29)
1	 (45)	 (44.1)	 (42.5)	 (42.6)	 (41.6)	 (40.8)	 P (39.1)	 P (37.2)
Stage	I	II	III	IV	V	VI	VII	VIII
Days	0.9	1.2	0.3	1.0	0.8	1.7	1.6	1.0

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- **Pachytene Primary Spermatocyte**
 - **Morphology**
 - **Motility**
 - **Total sperm output**

Epididymal Transport 9.5 d

Sb1	Sb2	Sc	Sc	Sd1	Sd1	Sd2	Sd2
							
20.9	17.8 d	15.6	13.7	12.9	12.4	11.5	10.2
P	P	P	D:SS	Sa	Sa	Sa	Sa
34.3	31.4	29.1	27.2	26.4	25.9	25.0	23.7
B:L	Z	Z	Z	P	P	P	P
							
47.9	44.8	42.6	40.7	39.9	39.4	38.5	37.2
A	A	A	IN	IN	IN	B	B
							
61.4	56.3	56.1	54.2	53.4	52.9	52.0	50.7
		A	A	A	A	A	A
							
		69.6	67.7	66.9	66.4	65.5	64.2
I	II	III	IV	V	VI	VII	VIII
4.09	2.17	2.30	1.40	0.22	0.85	1.01	1.46

