

'Calcium Tetany' and Early Lay Mortality in Broiler Breeders

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Calcium Tetany – Risk Factors

- Genetics (high production)
- Early production (20-22 weeks)
 - Day length
 - Diet
 - Calcium early (before 5% production)
- Lack of flock uniformity
- Seasonality (Spring & Summer)
- Heat stress
 - ↑ water & ↓ feed intake
 - Panting/respiratory alkalosis

Calcium Tetany – Introduction

- Calcium tetany
 - Acute calcium imbalance
 - Diet, genetics, management
 - Signs and history
 - Early producing flock prior to peak lay (25-30 wks)
 - Lethargy, tremors, paralysis, and death
 - Panting, lethargy, cyanotic combs, death
 - Increased mate persecution
- Mortality
 - Up to 1-2%/wk for 1-2 wks

Calcium Tetany – Prevention & Treatment

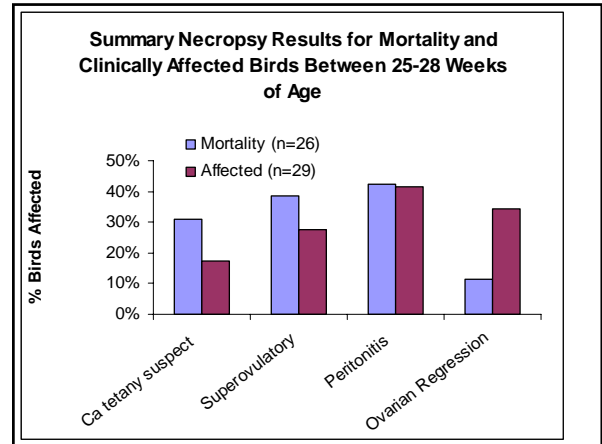
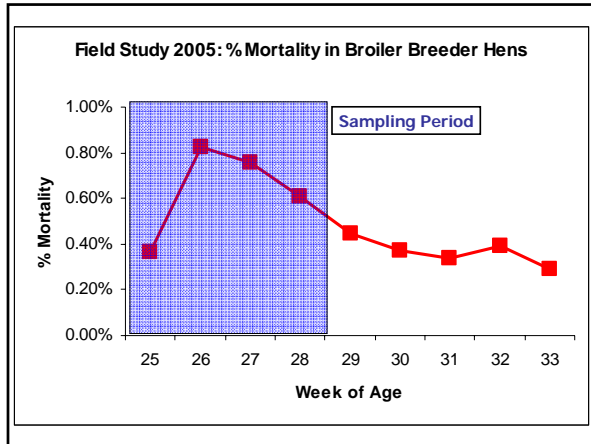
- Prevention
 - Usable calcium sources (after 5% production)
 - Feeding/supplementation schedule
 - Vitamin D
- Treatment
 - Calcium and vitamin D
 - 3 days on & 3 days off
 - Up to 2-3 weeks

Calcium Tetany – Introduction

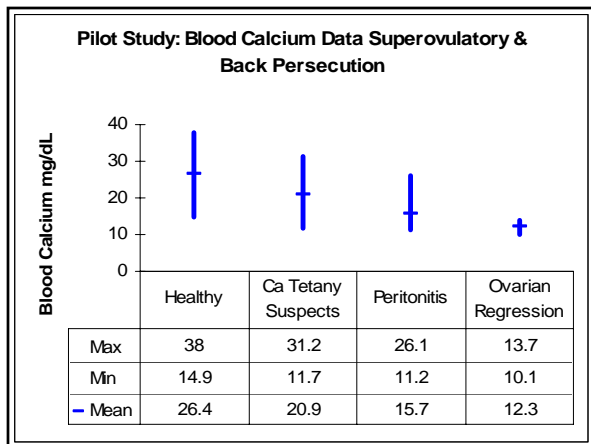
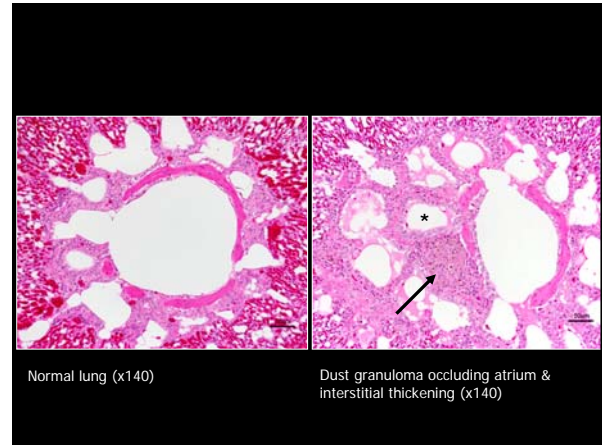
- Necropsy findings
 - Shelled egg in shell gland
 - Congested lungs, cyanosis, skeletal/heart muscles
 - Active ovary (normal or superovulatory)
 - No other lesions
 - Diagnosis made by exclusion
- Poorly defined – no published description

Field Study 2005

- Two breeder houses
 - ~12,500/house (1♂:10♀)
 - Evaluated for 4 wks (25-28 wks of age)
- Blood weekly: healthy & affected
- Necropsy weekly: affected & fresh mortality
 - Affected = impaired mobility
 - Lethargy, ataxia, tremors, paralysis
 - No other visual clinical signs (including leg lesions)
 - Calcium tetany suspects
 - On necropsy, shelled egg in shell gland
 - **NO OTHER LESIONS**
 - Clinically normal birds not necropsied



- ### Field Study 2005
- Necropsy findings
 - Calcium tetany suspect
 - Back persecution
 - Superovulation, ovarian regression
 - Peritonitis



- ### Field Study 2005 – Conclusions
- Impaired mobility in this case was not calcium tetany
 - Other metabolic alteration?
 - Rapid onset of egg production
 - Respiratory disease?
 - Pullet house issues (dust & ventilation)
 - Incited by reproductive stress
 - Multiple etiologies?
 - 'Impaired mobility syndrome' (IMS)

Questions

- Isolation and treatment of affected birds?
 - Anecdotal information
- Why are birds out of production?
- Further testing?
 - Ionized calcium, phosphorus, potassium, magnesium, blood pH/gasses, parathyroid hormone levels
 - Normal levels
- Healthy vs. affected hens?

I-Stat – Sampling procedure

- Fresh blood or in anticoagulant
 - Fresh blood – clotting issues (ERROR)
 - Lost 50% of cartridges
 - Anticoagulant (lithium heparin)
 - Not EDTA or sodium heparin
 - Blood should be processed within 15 minutes of collection
 - What is the affect of waiting longer?

I-Stat Machine

- Blood chemistry
 - Common in private practice veterinary medicine
- I-Stat used in animal ICU
 - Rapid results for critical animals
 - Electrolytes, blood gasses, etc.

I-Stat – Sampling procedure

- Fill well on cartridge (1ml syringe)
 - If under filled – ERROR
 - If over filled – ERROR
 - Harder to get error
 - Blood on outside of cartridge ok
 - If I-stat too hot (or cold) – ERROR
 - If cartridge too cold (or hot) – ERROR
 - If cartridge squeezed – ERROR
 - If low battery on machine - ERROR

Blood Testing - I-Stat

- Cartridge CG 8+
 - Electrolytes
 - **Ionized Calcium**, Potassium, Sodium
 - Glucose
 - Hematocrit & hemoglobin
 - Acid/base balance
 - pH, bicarbonate, base excess
 - Blood gasses [venous]
 - P(CO₂), T(CO₂), P(O₂), S(O₂)

I-Stat – Sampling procedure

- Enter operator #
- Enter ID #
 - Coded date (i.e. today = 102606)
 - Coded variety of chicken (i.e. Ross 708 = 11)
 - Coded group (i.e. normal = 1)
 - Coded individual bird number (i.e. bird 1 = 01)
 - Coded reproductive status (i.e. egg = 0)
- 102606111010 = today, Ross 708, normal, bird 1, egg

I-Stat – Baseline data

- Establish what normal values would be for broiler breeders
 - 30-35 weeks of age
 - No history of excessive early lay mortality
 - No history of calcium tetany
- Normals from suspect calcium tetany flocks
 - 25-30 weeks of age
 - Paired clinically normal birds

Field Study: Site 1 – Background

- Two farms, one breeder house each
 - ~9,000 hens/house (1♂:10♀)
 - Increased mortality and drops in egg production
 - Evaluated one week only
 - Farm 1: 31 weeks of age
 - Farm 2: 45 weeks of age
- Two trips
 - Working on I-Stat technique
- I-Stat blood collection
 - 15 normal birds
 - 3 down birds
- Necropsy
 - Clinically affected

I-Stat – Baseline data

- Want to get at least
 - 30 birds from each breeder major variety
 - 2-3 different companies/variety
 - 5-7 varieties
- What we have
 - Lots of Ross 708
 - Starting to get baseline data on other varieties

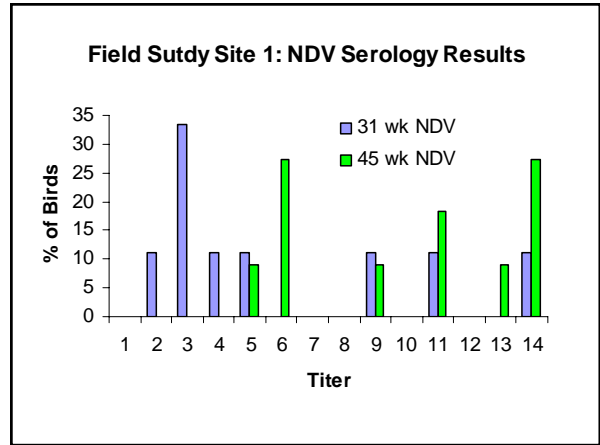
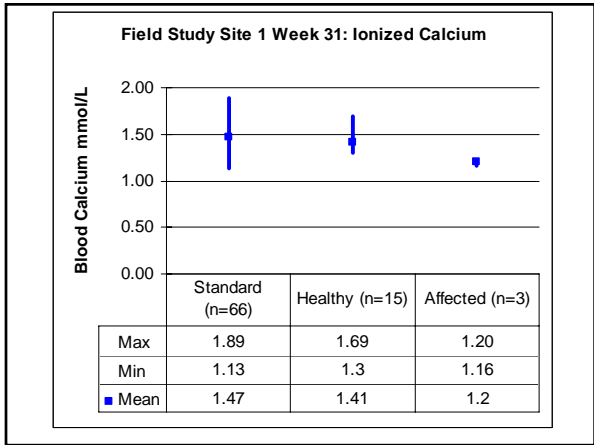
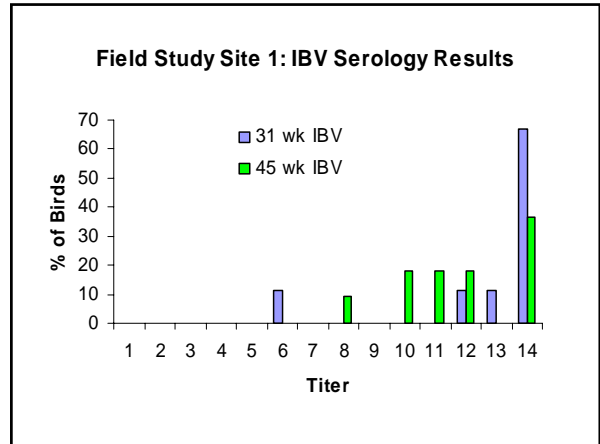
Field Study: Site 1 – Diagnostics

- Necropsy findings: 3 down birds
 - Musculoskeletal problems
 - Ruptured tendons, scoliosis, etc.
 - Regressed ovaries
- Blood work
 - I-Stat data
 - IBV, NDV titers

I-Stat – Baseline data

		Na	K	iCA	Glu	Hct	Hb	pH	PCO2	PO2	HCO3	TCO2	BE	SO2
All normals n=66	Mean	147.4	4.86	1.47	253	26.8	9.1	7.43	38.0	44.6	25.3	26.4	1.3	81.0
	SD	3.0	0.4	0.15	11.2	2.4	0.8	0.07	6.1	5.6	3.7	3.7	4.2	5.7
	Max	157	5.9	1.89	263	33	11.2	7.57	55.9	61	37.1	38	15	93
	Min	142	4.1	1.13	209	22	7.5	7.24	25.4	32	17.7	19	-9	64
Baseline n=30	Mean	148.4	4.89	1.41	235	26.5	9.0	7.44	35.8	44.1	23.9	24.9	-0.3	81.2
	SD	2.9	0.4	0.11	11.9	1.5	0.5	0.08	6.0	4.0	2.7	2.8	3.4	5.1
	Max	157	5.9	1.69	263	30	10.2	7.57	49.2	53	28.1	29	6	88
	Min	144	4.2	1.13	212	24	8.2	7.24	25.4	36	17.7	19	-9	65





Field Study: Site 1 – I-Stat Results

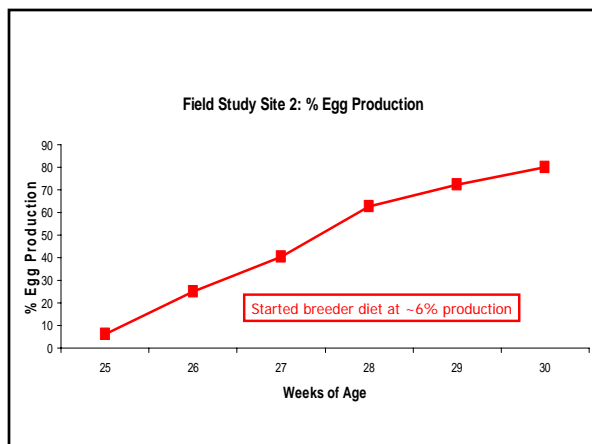
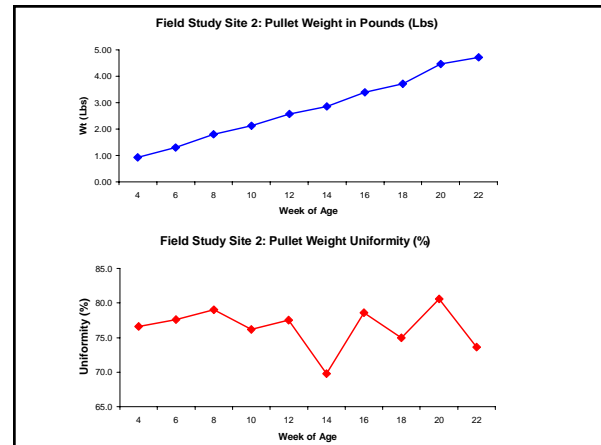
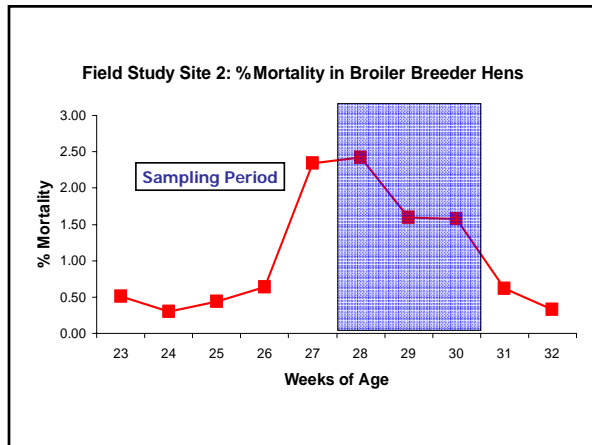
		Na	K	iCA	pH	PCO2	HCO3	TCO2
All normals n=66	Mean	147.4	4.86	1.47	7.43	38.0	25.3	26.4
	Max	157	5.9	1.89	7.57	55.9	37.1	38
	Min	142	4.1	1.13	7.24	25.4	17.7	19
Down Birds n=3	Mean	161	4.1	1.20	7.52	25.1	20.0	21

- ### Field Study: Site 2 – Background
- One breeder house
 - ~9,200 hens (1♂:10♀)
 - Evaluated for 3 wks (28-30 wks of age)
 - Blood weekly: healthy & affected
 - Necropsy weekly
 - Clinically affected
 - Down hens without obvious leg lesions
 - Fresh mortality
 - Normal controls
 - Week 28 & 29 only



Field Study: Site 2 – Feeding Schedule

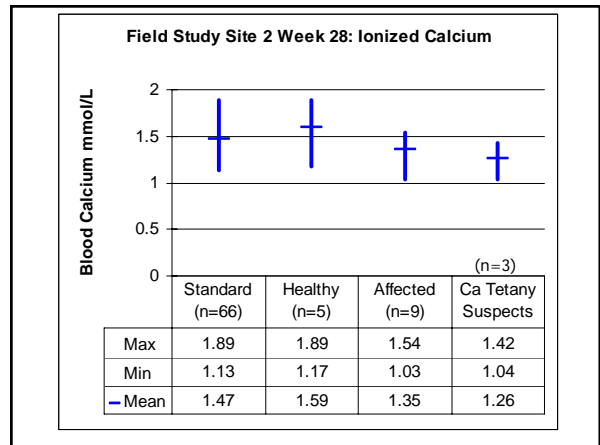
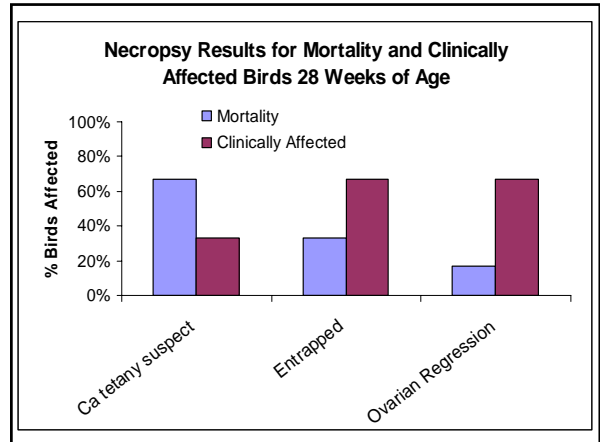
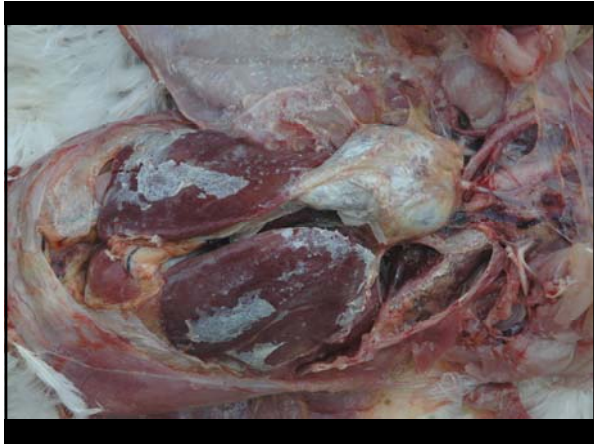
- Breeder feed at 25 weeks of age
 - Ca = 3.25, P=0.65
- Changed at 26 weeks of age
 - Ca = 3.4, P=0.73
- Intermittent Ca + Vit D supplementation starting at 26 weeks of age
 - On Ca 2-4 days then off 4-5 days



Field Study: Site 2

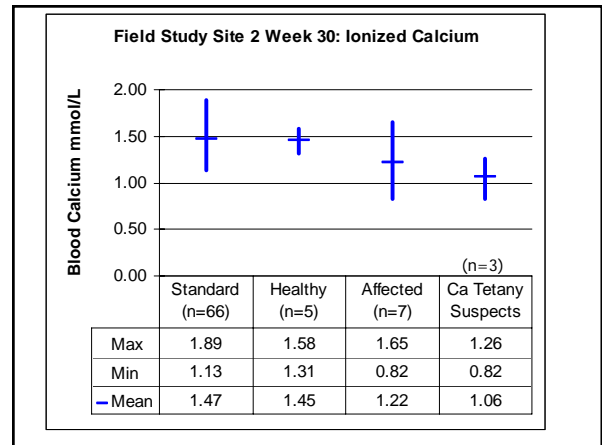
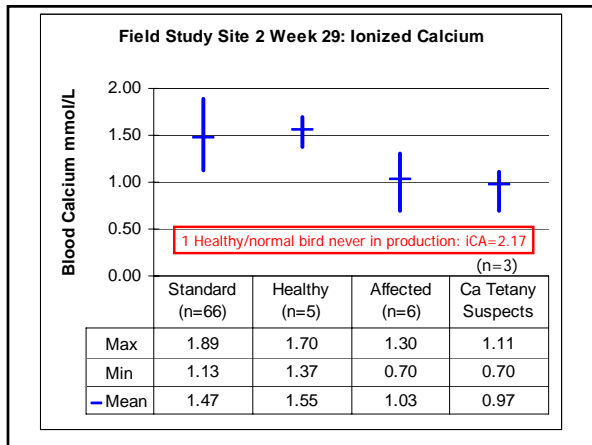
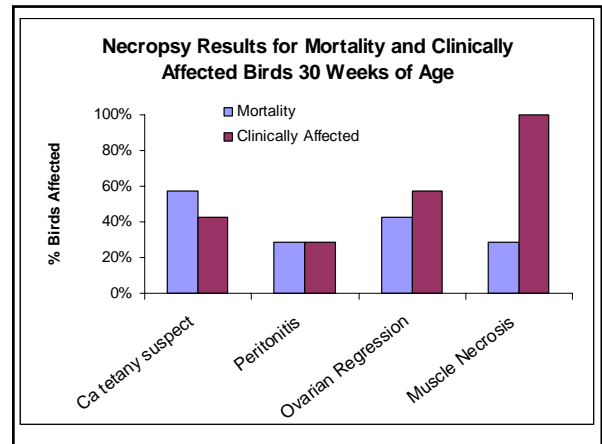
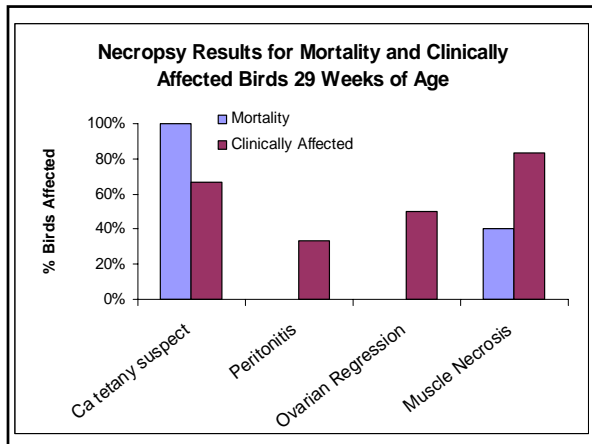
- Necropsy findings
 - Calcium tetany suspects
 - Ovarian regression
 - Superovulation
 - Entrapped
 - Muscle necrosis
 - Breast
 - Adductor





- Field Study: Site 2 – Feeding Schedule Before Wk 28**
- Supplemental calcium and Vitamin D
 - ~200 lbs of shell/day X 3 days
 - Vit D for 3 days
 - 4 days no supplementation
 - Supplemental calcium and Vitamin D
 - Just re-started 100 lbs of shell + Vit D

- Field Study: Site 2 – Feeding Schedule Before Wk 29**
- Supplemental calcium and Vitamin D
 - ~100 lbs of shell/day X 2 days
 - Vit D for 1 day
 - 4-5 days no supplementation
 - Supplemental calcium and Vitamin D
 - Just re-started 100 lbs of shell + Vit D



- ### Field Study: Site 2 – Feeding Schedule Before Wk 30
- Supplemental calcium and Vitamin D
 - ~100 lbs of shell/day X 2 days
 - ~50 lbs of shell/day X 2 days
 - Vit D for 1 day
 - 5 days no supplementation

- ### Field Study Site 2 – Histopathology
- Breast muscle
 - Adductor muscle
 - Sciatic nerve
 - Brain
 - Spine
 - Bone (thigh)
 - Kidney
 - Liver
 - Lung
 - Heart
 - Thyroid/parathyroid

Field Study 2: Week 29 of Age – Histopathology

- Muscle necrosis
 - Breast and/or adductor
 - All dead and affected birds
 - Microscopic lesions in birds without gross lesions

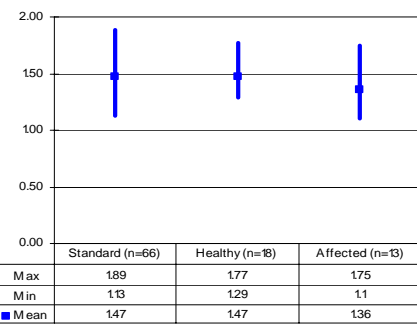
Field Study: Site 3 – Background

- Two breeder houses
 - ~ hens/house (1♂:10♀)
 - Evaluated for 5 wks (25-29 wks of age)
- Blood weekly: healthy & affected
- Necropsy weekly
 - Clinically affected
 - Fresh mortality
 - No normal birds sampled as mortality appeared to be routine

Field Study 2: Week 29 of Age – Histopathology

- Muscle necrosis
 - Breast and/or adductor
 - All dead and affected birds
 - Microscopic lesions in birds without gross lesions
- Respiratory disease
 - Only in healthy and affected birds
 - Not dead birds

Field Study Site 3 Weeks 25-28: Ionized Calcium



Field Study 2: Week 29 of Age – Histopathology

- Muscle necrosis
 - Breast and/or adductor
 - All dead and affected birds
 - Microscopic lesions in birds without gross lesions
- Respiratory disease
 - Only in healthy and affected birds
 - Not dead birds
- Neuropathy
- Kidney Disease

Field Study Site 3 – I-Stat Data

		Na	K	ICA	Glu	Hct	Hb	pH	PCO2	PO2	HCO3	TCO2	BE	SO2
All normals n=66	Mean	147.4	4.86	1.47	233	26.8	9.1	7.43	38.0	44.6	25.3	26.4	1.1	81.0
	Max	157	5.9	1.89	263	33	11.2	7.57	55.9	61	37.1	38	15	93
	Min	142	4.1	1.13	209	22	7.5	7.24	25.4	32	17.7	19	-9	64
Examples	149	3.1	1.39	81	35	11.9	7.643	26.7	42	28.9	30	8	88	
	148	8.8	1.62	308	29	9.9	7.036	22.3	64	8.0	7	-26	81	
	155	3.3	1.10	34	25	8.5	7.853	24.3	44	26.9	28	6	89	
Undetermined	144	4.4	1.46	268	21	7.1	7.654	31.4	40	27.9	29	6	83	



Field Study 2006 – Conclusions

- Did see Impaired Mobility Syndrome (IMS) flock with hypocalcemia
 - Possibly predisposed by diet/uniformity
- Slightly different presentation
 - Dietary control poor
 - Uniformity issues?
 - What is too much?
 - Muscle necrosis
 - Cause or effect?
 - Microscopic lung, kidney, and nerve involvement
 - Cause or effect?



Field Study 2006 – Conclusions

- Have seen some IMS flocks without hypocalcemia
 - Keep other possible diagnoses open
 - Try to view immobile birds early in morning
 - Good complete necropsy is recommended
 - **VIEW SPINE**
 - Open all joints in legs
 - Blood work and histopathology may be helpful when there are no clinical signs



Finally...

- There is more work to be done
 - Evaluation of flocks before supplemental calcium and vitamin D provided

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