



ONE FAMILY.  
ONE PURPOSE.



READY FOR THE  
**NEXT 100 YEARS**



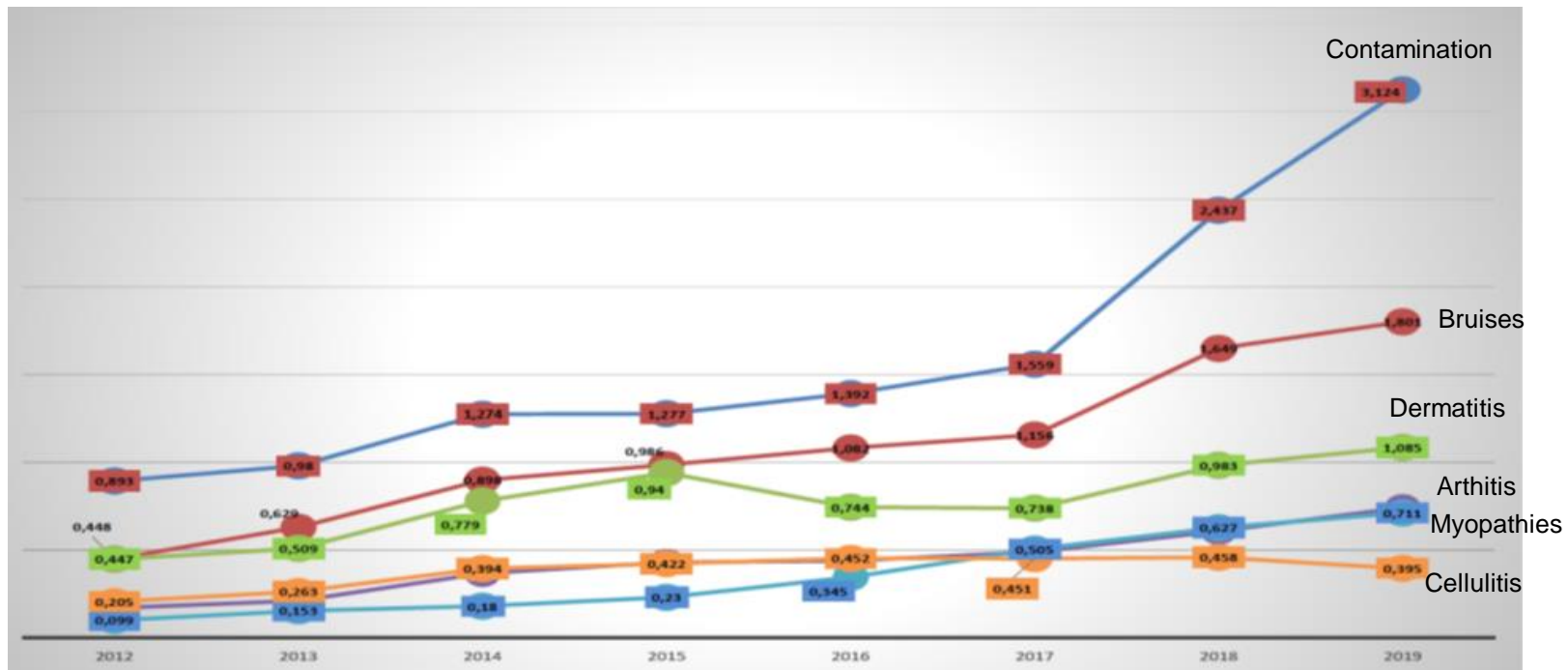
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**“Injuries and occurrences in the quality of carcasses related to poultry of high genetic performance and possible solutions”**

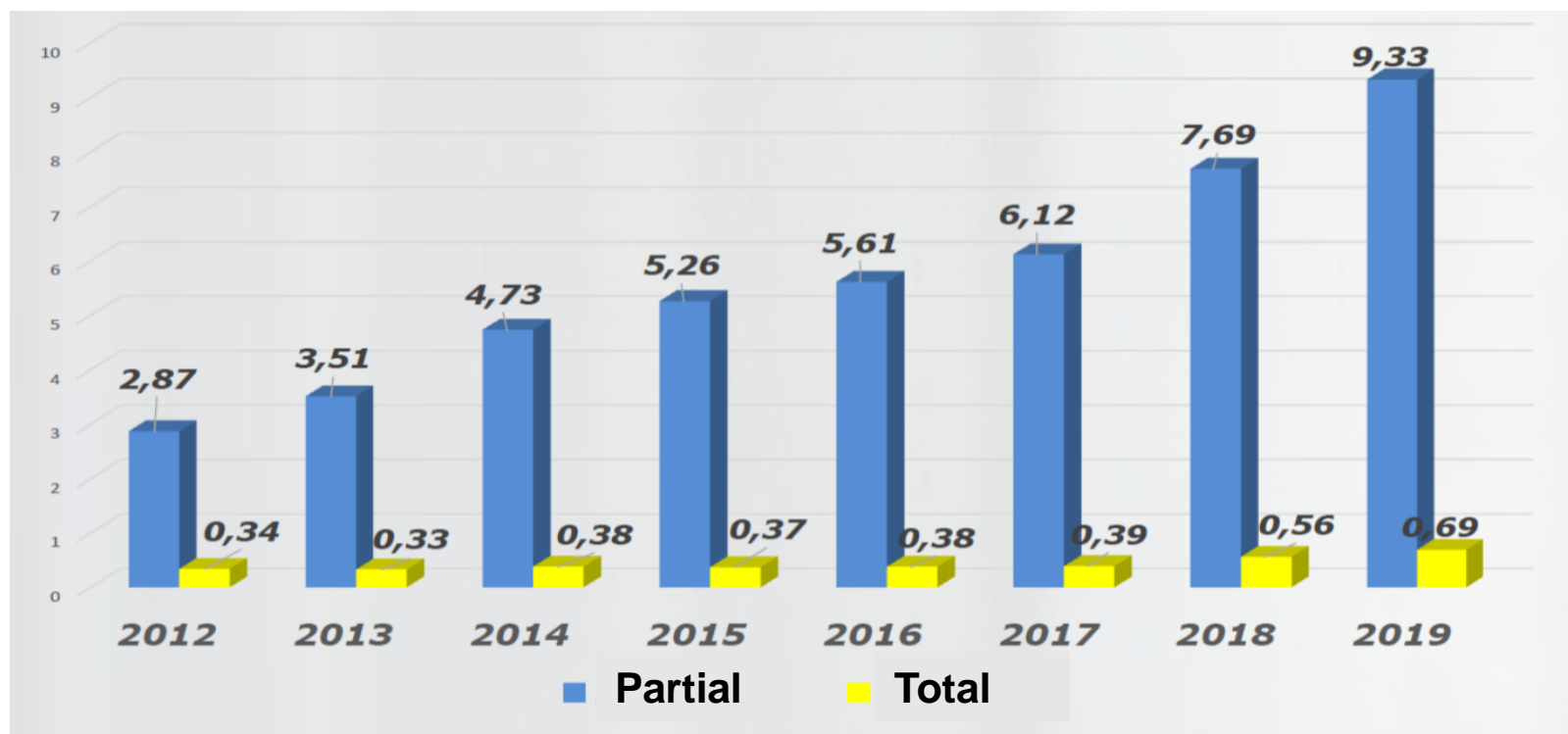
**[vitor.hugo@cobb-vantress.com](mailto:vitor.hugo@cobb-vantress.com)**

## Evolution of the percentage of partial condemnation in Brazil in heads (Since 2012 until June 2019)



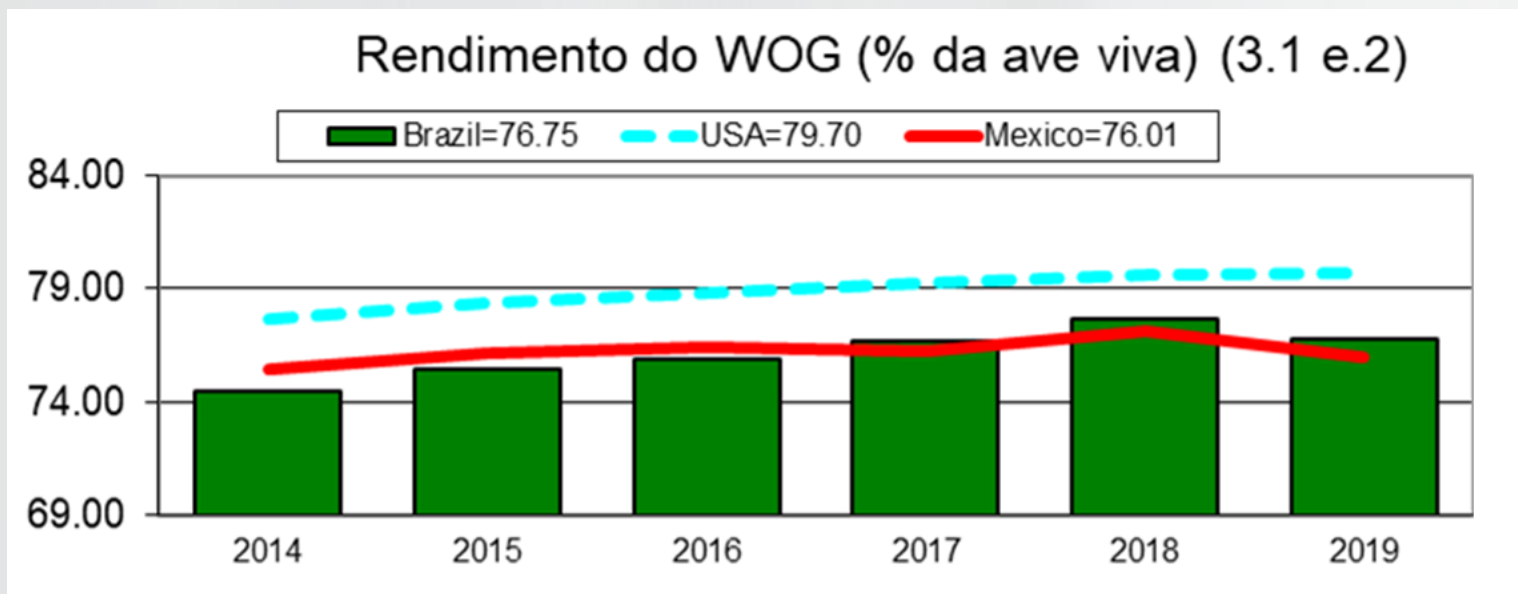
Source: Dipoa = SIGSIF

## Evolution of the percentage of condemnation in Brazil in heads (Since 2012 until June 2019)



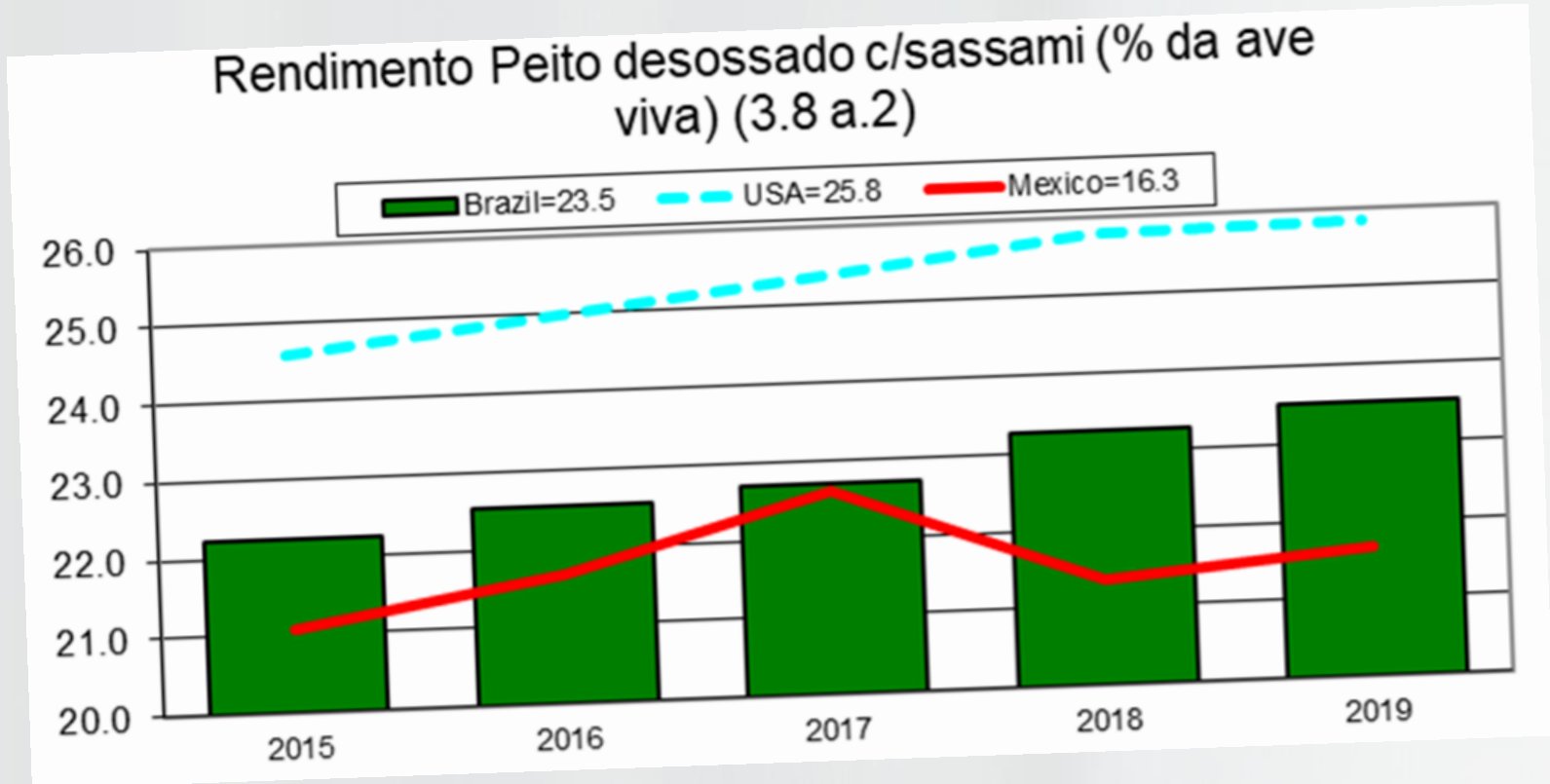
Source: Dipoa = SIGSIF

In the first half of 2019, WOG Yield was affected, reducing by approximately 1%!!





- **Breast Yield - Even with the highest condemnation, increased 0.3%!!**



Broering Alves, 2019



# Myopathies

Myopathies are muscle alterations that don't allow the muscles to work properly, which results in muscular weakness and damages to the carcasses!

Rutz (2017)

# Muscle Myopathies

- Green Muscle Disease
- Back Myopathy
- White Striping
- Spaghetti Breast
- Breast Hemorrhages
- Wood Breast
  - Feathered Tenders
  - Impact of Downgrades



# Deep Pectoral Myopathy



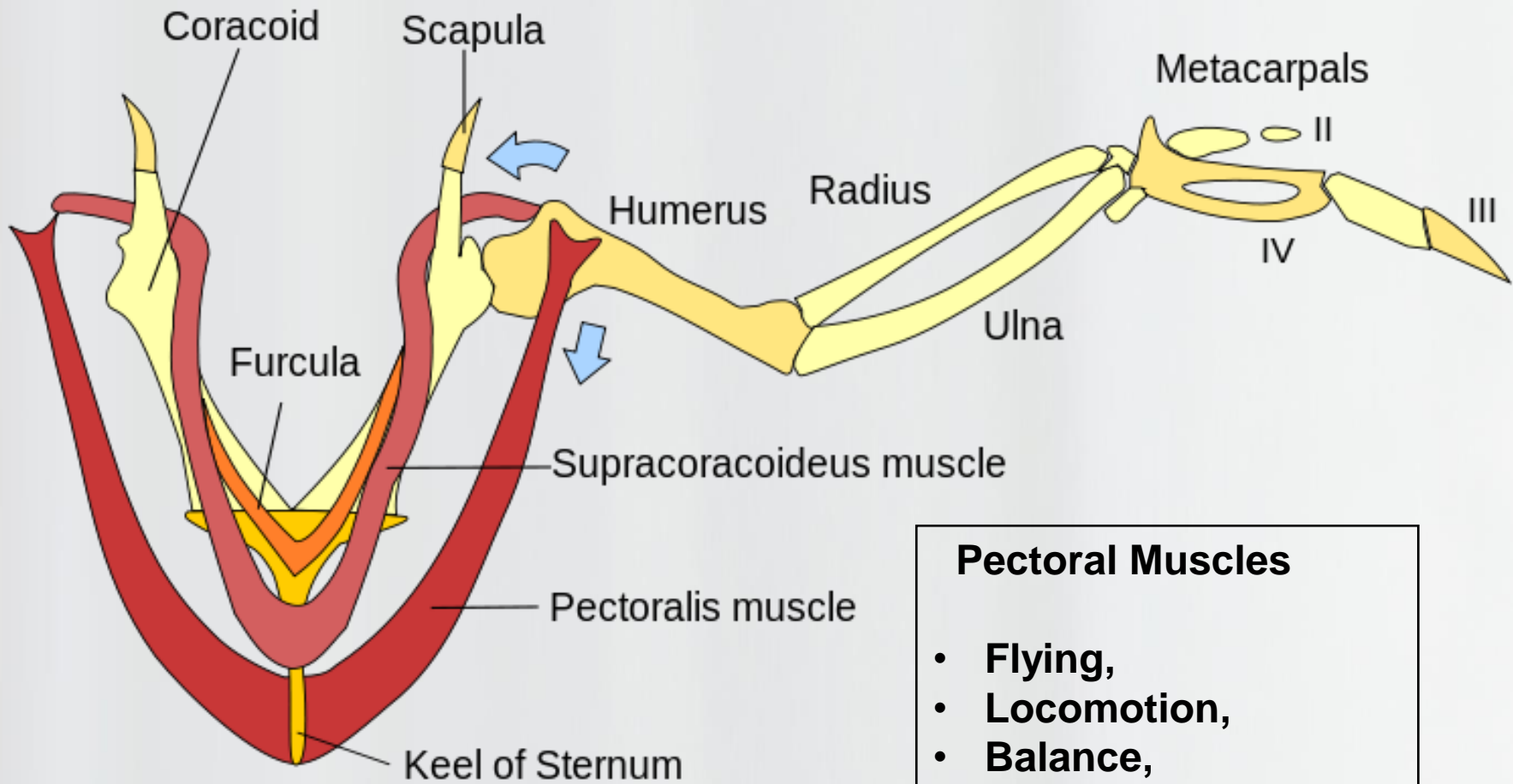
According to Bailey et al, 2015, one of the first myopathies ever registered was the DPM. Initially, it was seen in turkeys ([1975](#)) and then in broilers (Richardson et al., [1980](#)).

# Deep Pectoral Myopathy



Incidence: 1% (Bianchi et al., 2006)

Bailey et al (2015)

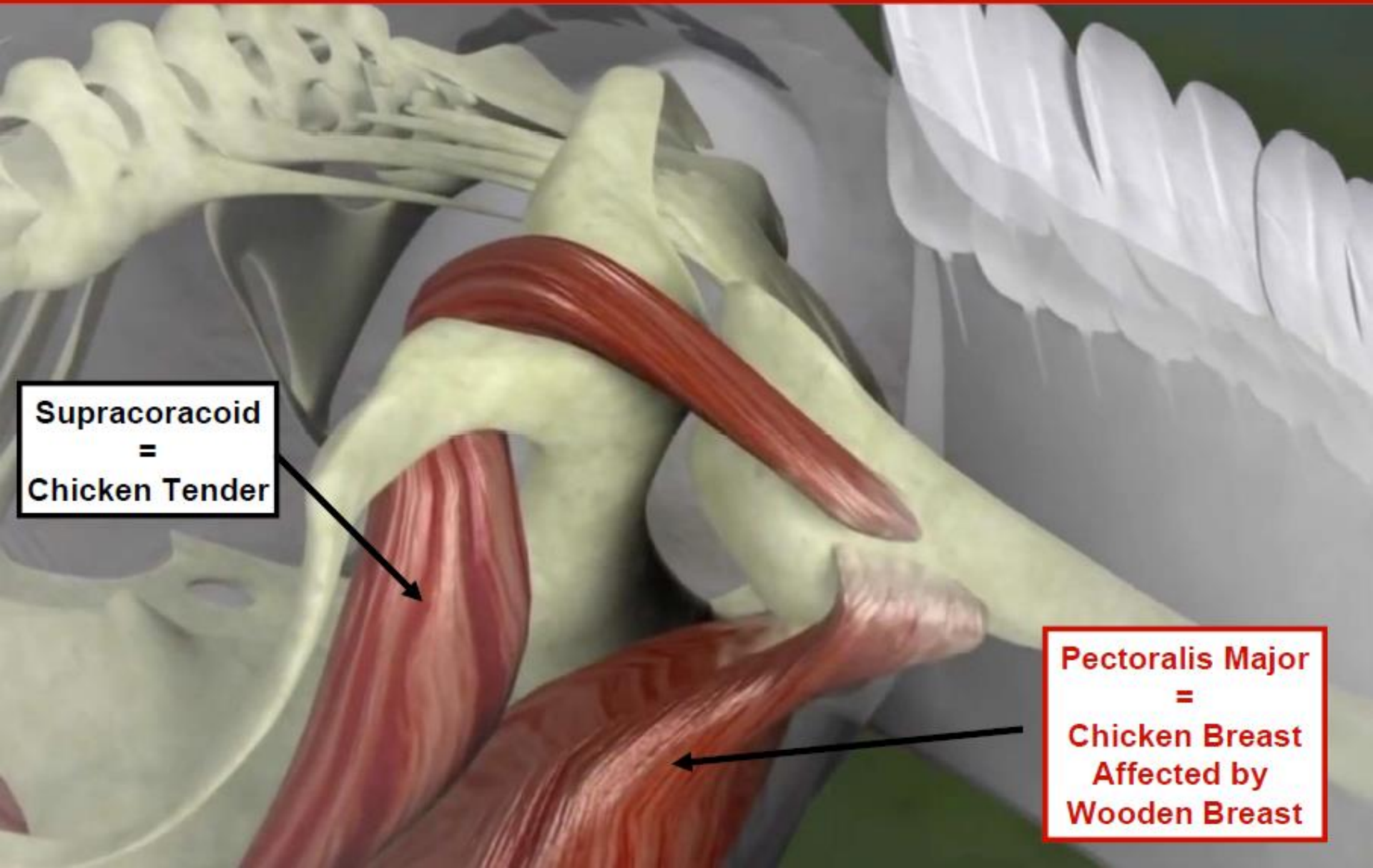


**Pectoral Muscles**

- **Flying,**
- **Locomotion,**
- **Balance,**
- **Behavior, etc..**

# The flight muscles of the birds

Source: Sezny Gall. 2019



**Supracoracoid**  
=  
**Chicken Tender**

**Pectoralis Major**  
=  
**Chicken Breast**  
**Affected by**  
**Wooden Breast**

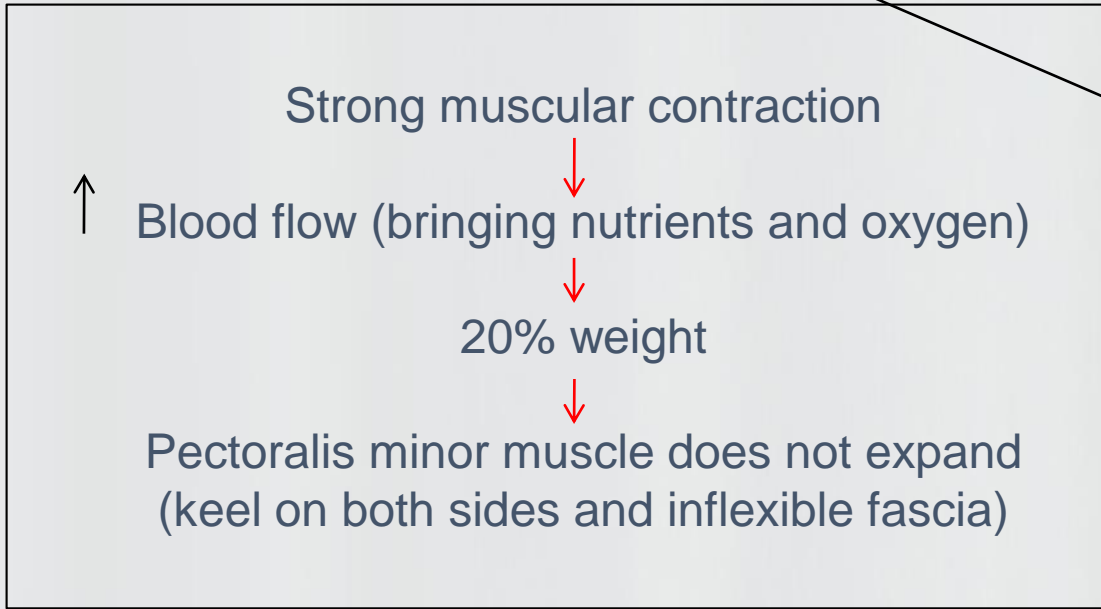
# Deep Pectoral Myopathy

Lack of feed or water

Intensity of light programs

Human activity

Loud noises



Nervous- flap wings -run

Activity

High growth rates

Males

Pectoralis Minor Muscle (tender)  
(Necrosis)

Edema or dry friable

Color

Pale  $\xrightarrow{24\text{ h}}$  yellow-greenish



## Deep Pectoral Myopathy: A Penalty of Successful Selection for Muscle Growth

WALTER G. SILLER

*Agricultural and Food Research Council, Poultry Research Centre,  
Roslin, Midlothian EH24 9PS, Scotland*

(Received for publication November 7, 1984)

**ABSTRACT** Deep pectoral myopathy (DPM) is a disease that affects commercial poultry selected for large breast muscle development. The muscle affected by the disease is the supracoracoid muscle and usually one side of the breast musculature atrophies. The necrotic muscle has a charac-

**Pathological changes can be detected within 15 minutes when broilers are induced to flap their wings for short periods of time. Myofiber degeneration sets in within an hour.**

(Wilson, 1990)

**Deep Pectoral Myopathy:  
a well known compartment  
syndrome in broilers and  
turkeys (asymmetrical)**





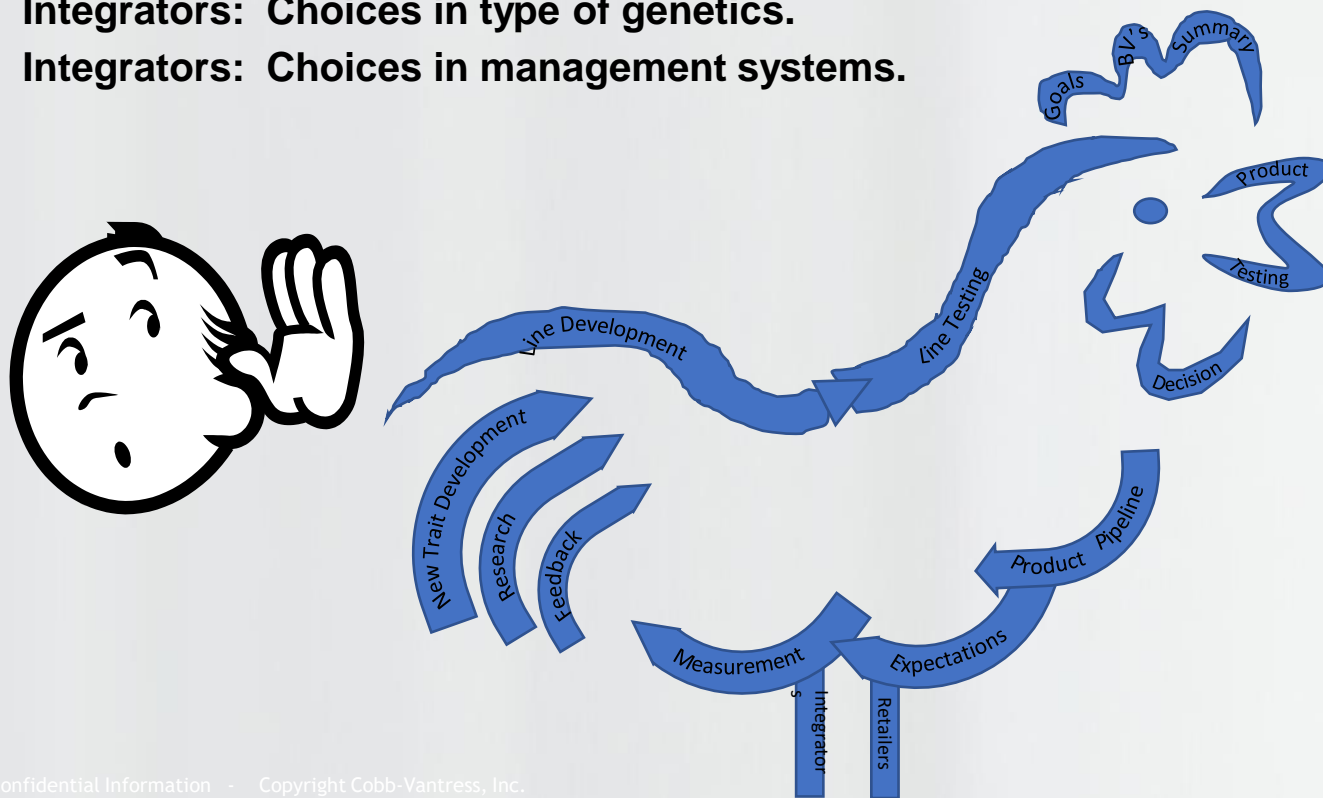
# Back Myopathy

- Back myopathy – management relate (flapping)
  - Seasonal effect? Some times more in summer



# The Customer Determines the Future

- **Public:** Voting with their ballot and their store purchase.
- **Retailers:** Choices in suppliers / products.
- **Integrators:** Choices in type of genetics.
- **Integrators:** Choices in management systems.



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Cooper, 2019



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# Market Feedback

Cooper, 2019

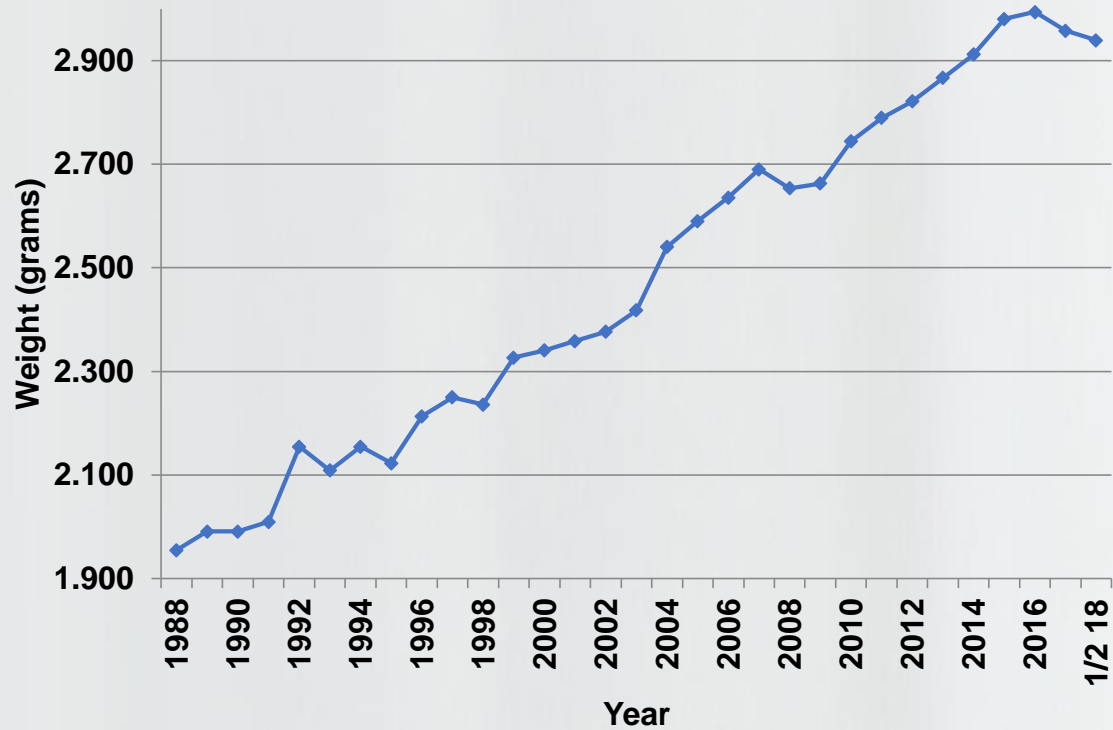
## Brazil Labor Costs: > 10% per Year



- No custo industrial, os itens mais relevantes são: mão de obra, embalagem, energia e custo dos investimentos.
  - **Mão de obra:** Enquanto o custo de mão de obra no Brasil aumentou 127% em dólares de 2006 a 2018, nos principais países competidores o aumento foi muito mais baixo, de 31% nos Estados Unidos, 23% na Tailândia e 15% na Europa. A desvalorização cambial em 2015, não foi suficiente para compensar os elevados aumentos salariais ocorridos nos últimos 12 anos.

# Market Trends

## Average Processing Weight in USA



Cooper, 2019



# Market Trends & Legislation

## Hot Off The Press

[www.Bloomberg.com](http://www.Bloomberg.com) (February 28, 2019)

Markets

# Big Birds Are So 2017. The Money Is Now in Smaller, Tender Chicken

- Only 2 large primary breeding companies left

Cooper, 2019

Average Processing Weight in USA







**Wooden Breast (WB)**



**White Striping (WS)**



**Spaghetti Breast (SM)**

- The onset and severity of each anomaly are influenced by the same factors: Genotype (High > Standard Breast Yield) (Petracci et al., 2013<sup>a</sup>; Alnahhas et al., 2016), Gender (Males > Females) (Lorenzi et al., 2014), Growth Rate (Fast > Slow) (Kuttappan et al., 2012b), Diet (High > Low Energy) (Cruz et al., 2016), and *P. major* Weight (Heavy > Light) (Petracci et al., 2014; Mutryn et al., 2015; Chatterjee et al., 2016).

J.R. Griffin et al, 2017

## What is the incidence of these myopathies?

- Incidence of Moderate and Severe WB in commercial US plants, 2016 (Casey Owens, UofA)
- 5 – 10% in 7 lb (3.17 Kg) broiler.
- 20 – 25% in 8.5 +lb (> 3.86 Kg) broiler.



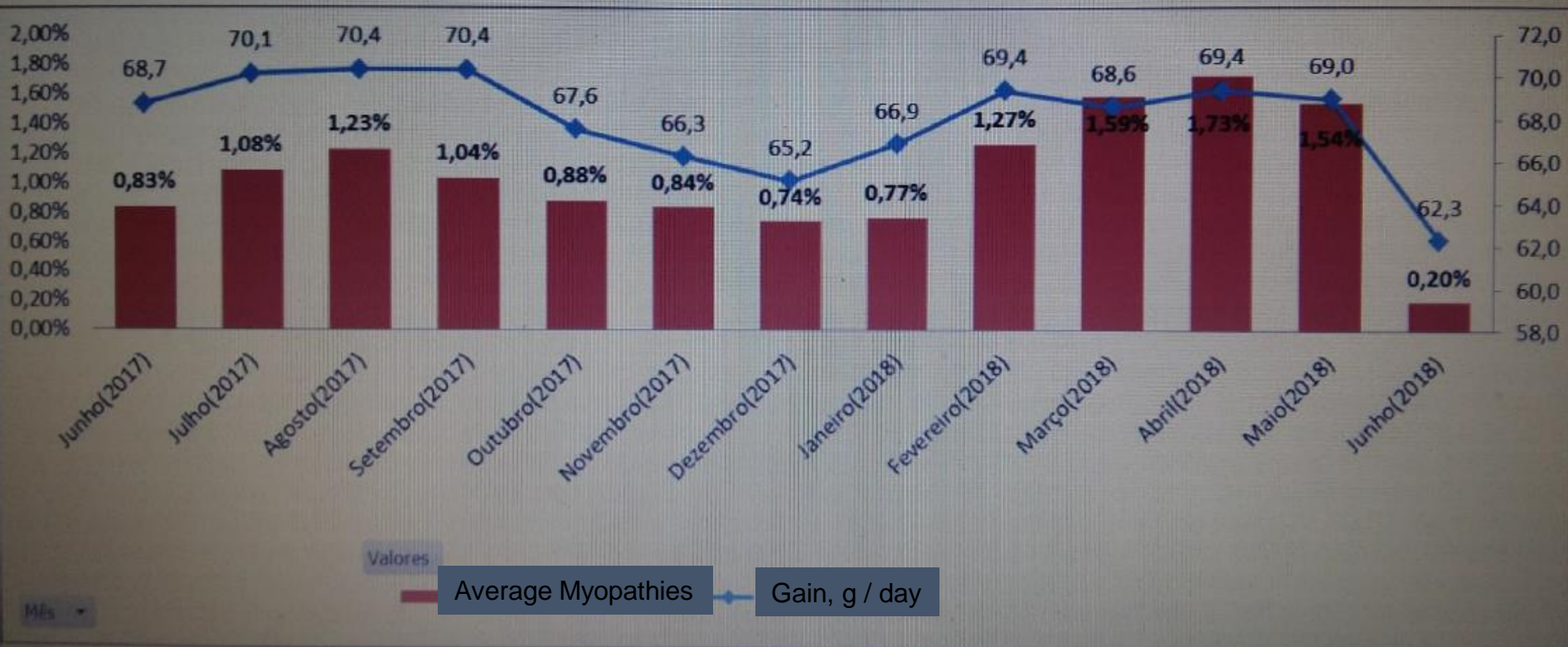
## Incidence (Brazil)

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- In general terms, condemnation levels are around 3 to 4%.
- Incidence may be higher.
- It increases in winter – improves performance (GPD)

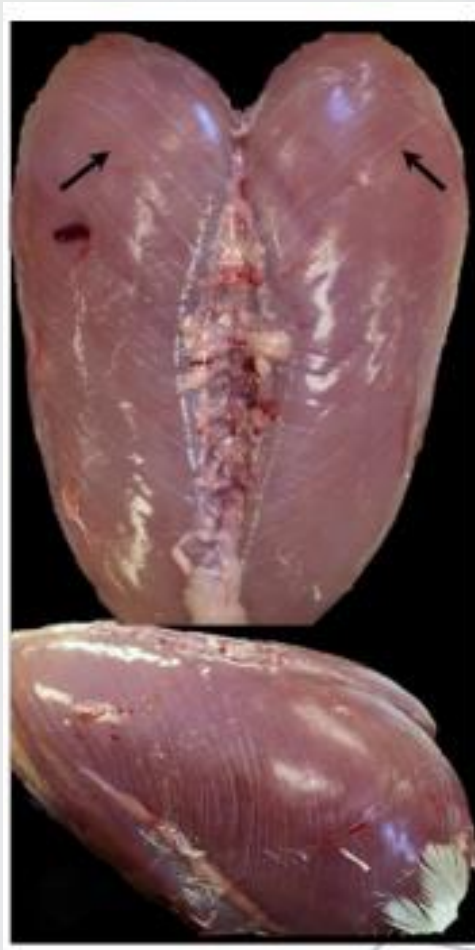


## Relation of Breast Myopathies (Total x Partial) with Daily Weight Gain (Condemnation)



Barbon. 2018

# 1) WS



Starting with the onset of WS on day 16.



J.R. Griffin et al, 2017



## 2) Petechial Epimysium Hemorrhages



On day 18, was the initial onset of SM and surface (epimysium) petechial hemorrhages.

J.R. Griffin et al, 2017

### 3) Intramuscular hemorrhages



(Deep intramuscular Hemorrhaging (bruising) on day 21.

J.R. Griffin et al, 2017

## 4) Ischemia (WB)



Occurred on day 23 and was characterized as a *P. major* muscle that was extremely pale in color with a ridge-like bulge on the caudal end. More severe cases of WB were observed beginning on day 30 and this include prominent changes in muscle. Shape (firm and flat with a prominent ridge on the caudal end), interstitial viscous fluid accumulation, and severe hemorrhaging (surface and intramuscular). In the most severe cases, affected muscles were completely void of any vascularization throughout the entire *P. major muscle* with a thick, viscous yellow interstitial exudate surrounding the muscle.



## Spaghetti Breast (SM)

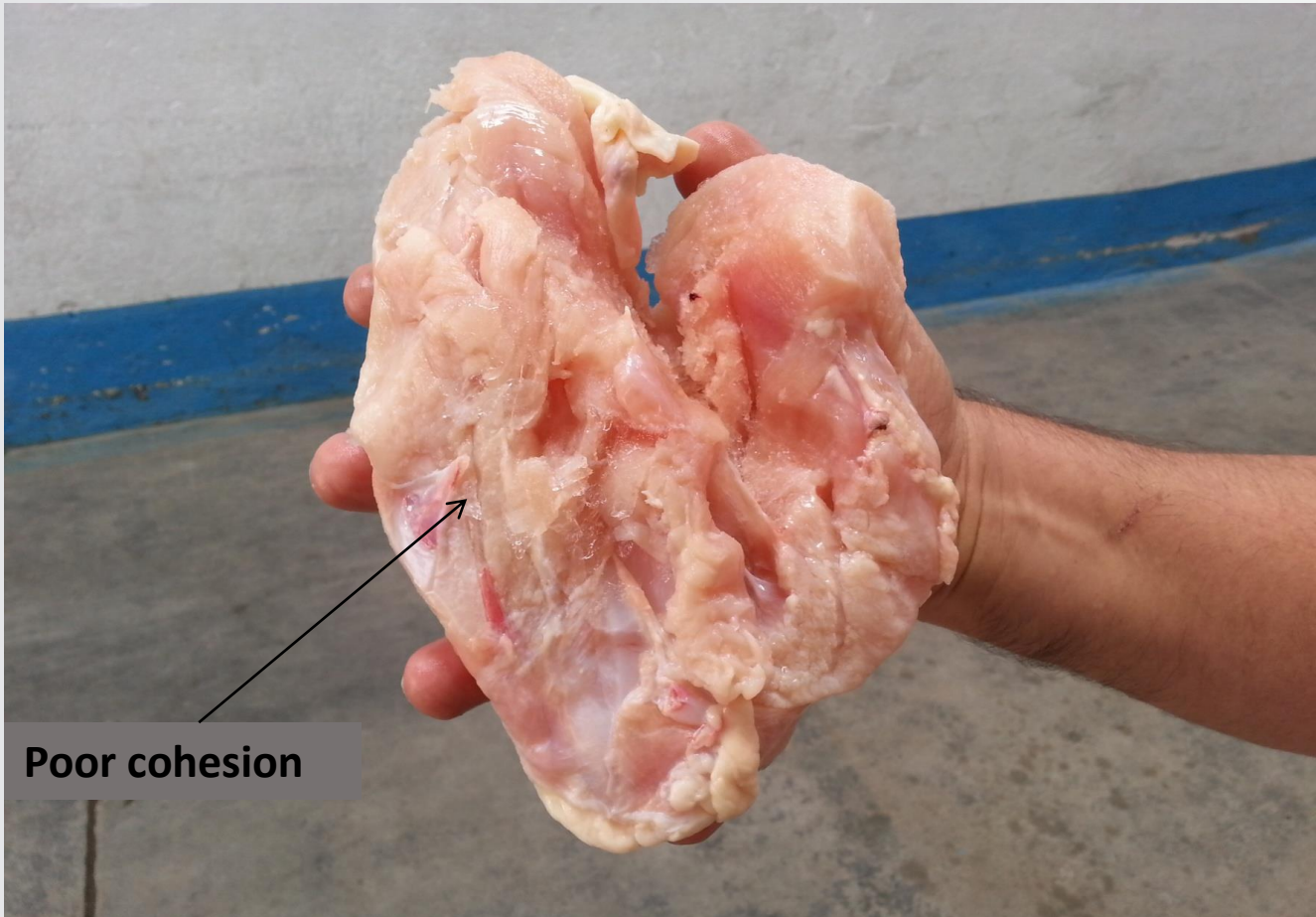


Lastly, a more recent muscular abnormality to be reported in the P. major of modern broilers, has been termed Spaghetti Meat (SM), myopathy due to altered structural integrity of the P. major, characterized by poor fiber uniformity (Baldi et al., 2017). SM has been previously shown to be associated with WS (Baldi et al., 2017). The initial onset of SM occurred after (day 18) the initial onset of WS (day 16) and coincided with the initial onset of epimysium hemorrhages. The occurrence of SM myopathy is variable among birds and often difficult to detect visually in the photographs.

J.R. Griffin et al, 2017



## Immature intramuscular connective tissue



Poor cohesion

Breast meat in natura with fragile structure (disintegrated))

# “Spaghetti” Meat



## Macroscopically:

Pectoralis major, extremely soft and friable when palpated after chilling.

## Other characteristics:

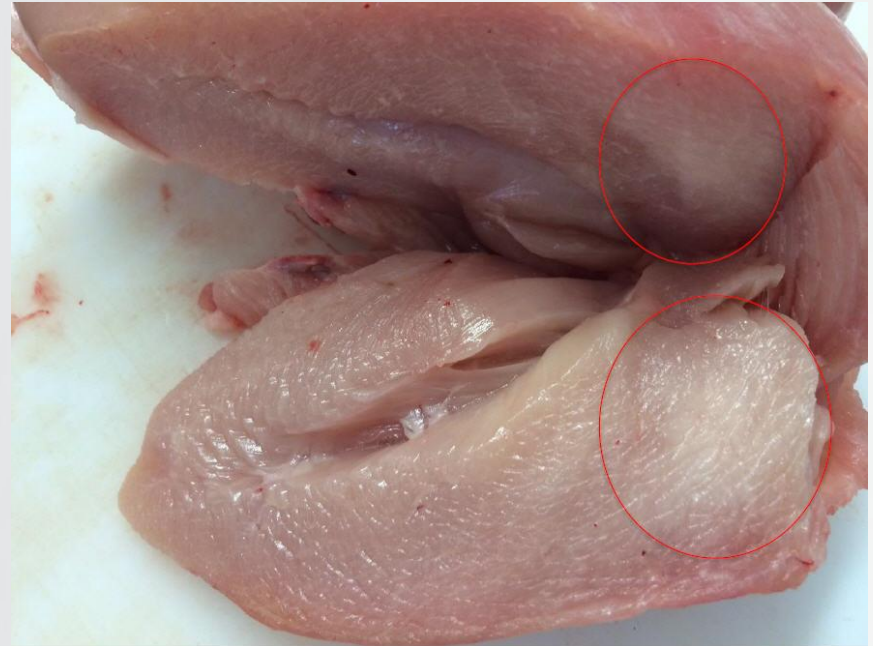
Because of impaired appearance, poultry plants tend to downgrade it and potentially divert the meat into processed products with high economical losses

Affects typically females  
Growth related myopathy

Source: Auburn University – Sarge Bilgili; University of Arkansas - Owens, 2016

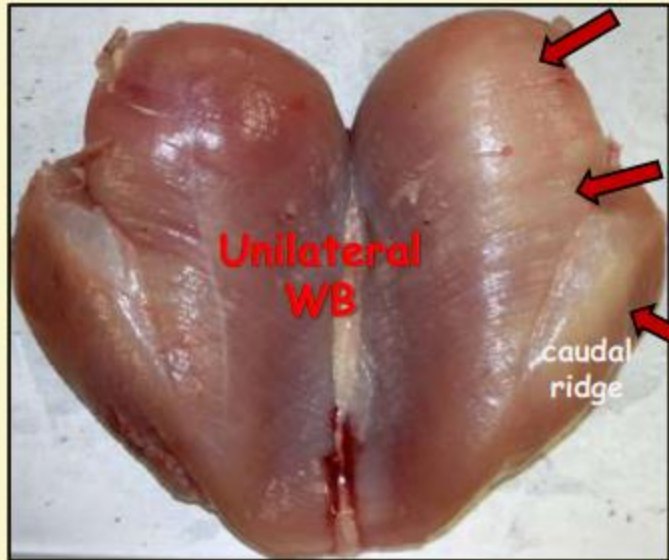
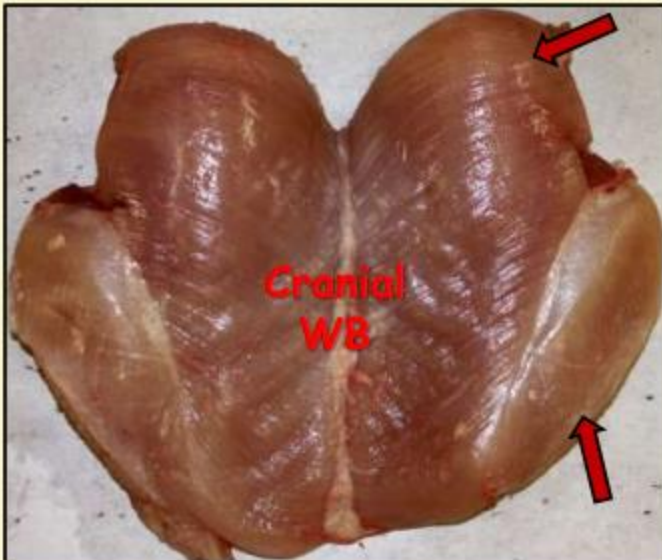
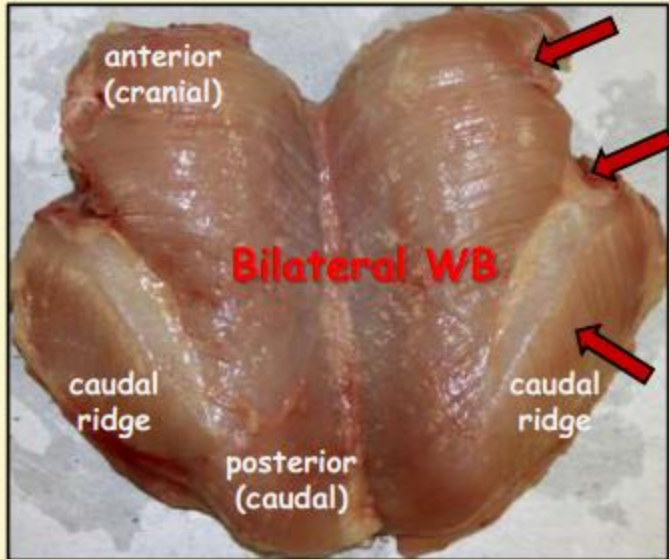
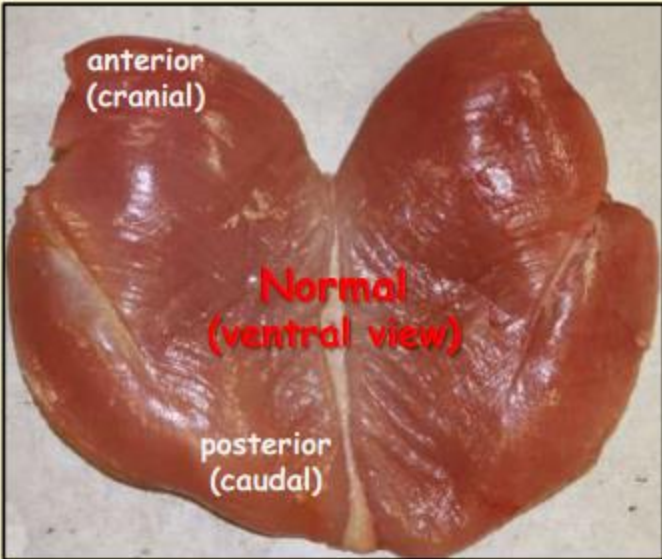


# What is Wooden Breast?



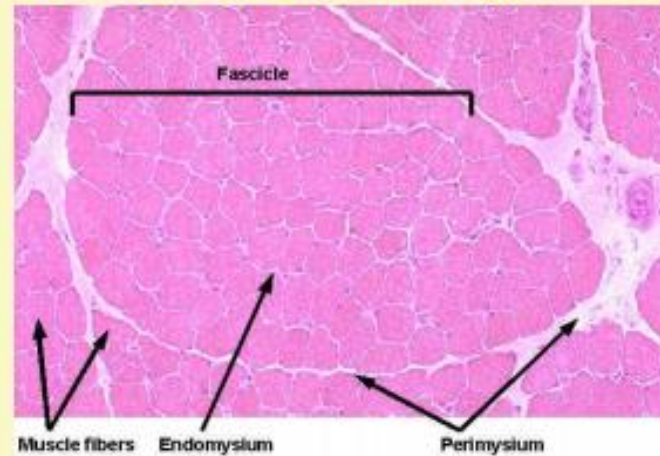
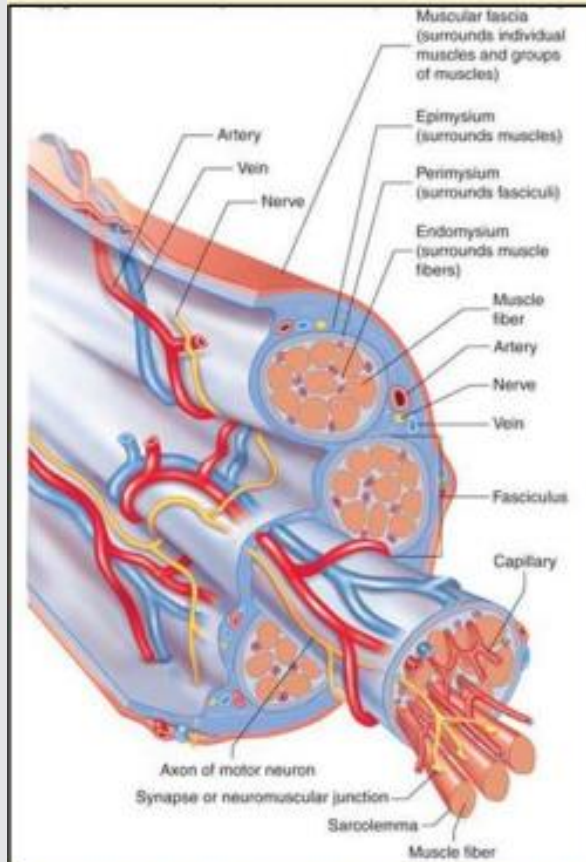
**Ischemic Aseptic Necrosis!**

**(Bilgili, 2016)**



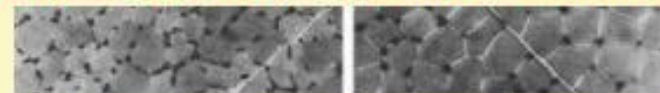


## Microvascular Limitations of the *Pectoralis major*



**↑ fiber area = ↓ capillary density**

**↓ capillary density = ↑ diffusion distance**

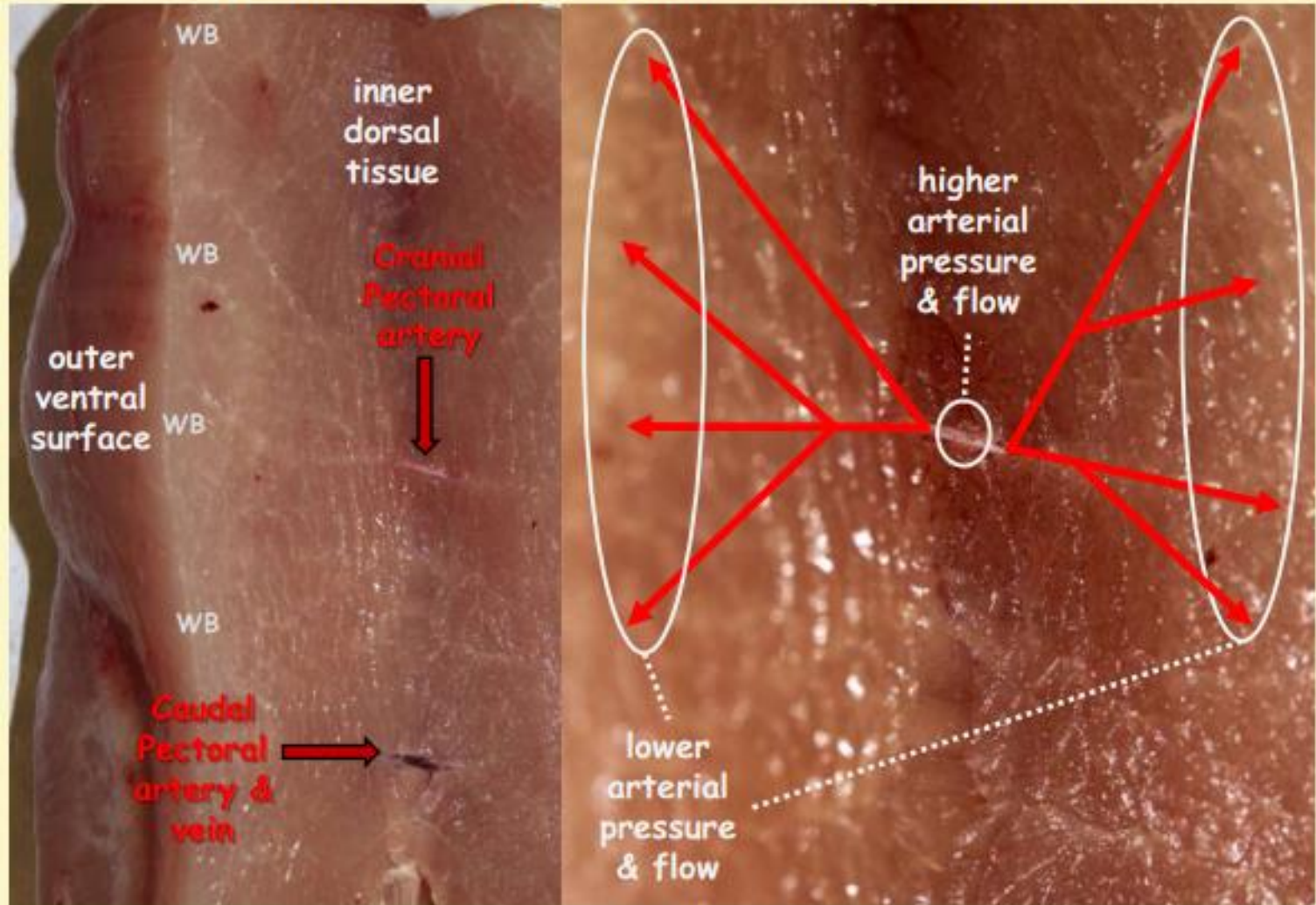


Snyder, D. K., 1990. Capillarity and diffusion distances in skeletal muscles in birds. *Journal of Comparative Physiology B* 160:583-591.



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# Dorsal-to-Ventral Flow of Arterial Blood





# Problems down the line.....

Appearance - tray pack



Portioning Shape



Bindability/texture - Further processing?



Fibrous texture



Shape - finished product

**Product Formulations**



# SCORING SYSTEM FOR THE NUTRITION RESEARCH



*Courtesy: Casey Owens - University of Arkansas, USA*

# Tender Grading\*



Normal  
(0)



Slight  
(0.5, one split)



Moderate  
(1, multiple splits)



Severe?  
(2, multiple splits,  
fragile)

\*grades for feathering/"gaping"

A. R. Jackson and C.M. Owens

Cooper, 2019

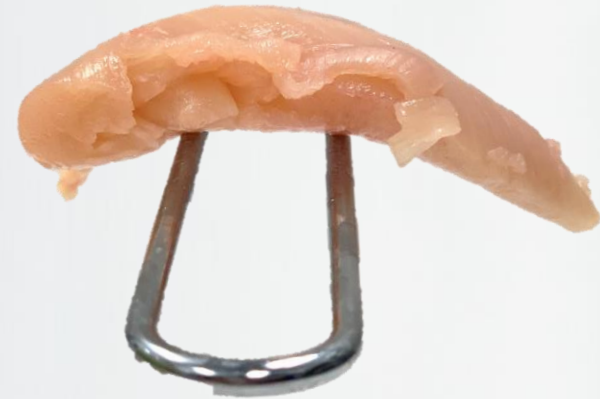
# Tender Grading\*



Normal  
(0)



Slight  
(0.5)



Moderate  
(1)

\*Woody characteristics

A. R. Jackson and C.M. Owens

Cooper, 2019



# Meat Quality

Cooper, 2019



# Cobb focus to eliminate WB

- Hard goals to improve our pedigree and pipeline birds for meat quality (2014 onwards).
- Employ a combination of invasive (during dissection) and non-invasive (during field selection) to detect wooden breast and eliminate birds.
- Selectors trained on a repeatable scoring system to palpate breast meat on live birds and score for normal, hard and woody breast.
- Family information used and high incidence families are completely eliminated.
- Meanwhile: We have been working with researchers on 3 continents to identify management solutions, identify new technologies or selection techniques, or to identify causes of Wood Breast.



# Dissection Practices



Siewerdt, 2019

# Imaging Systems

Siewerdt, 2019

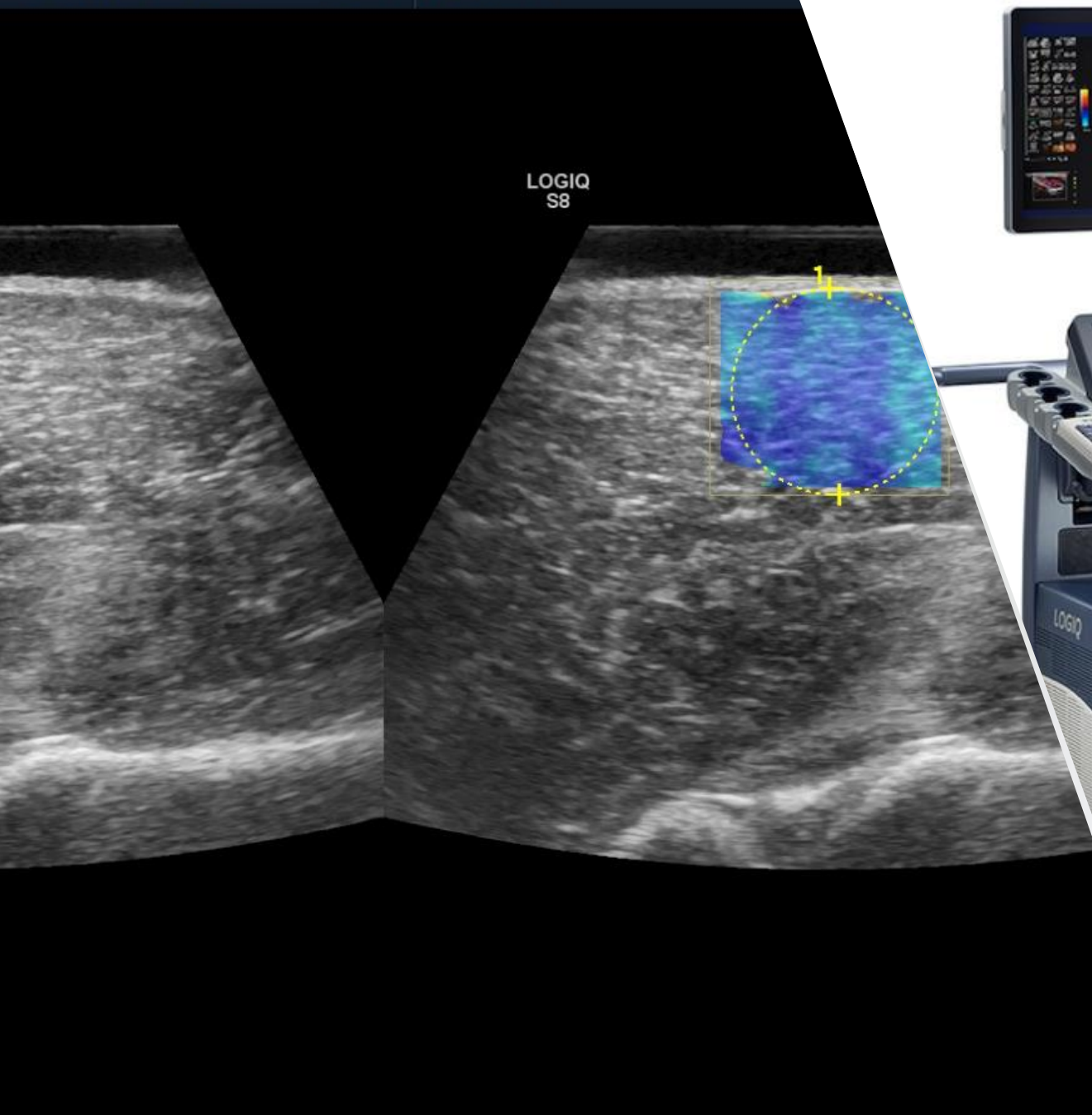
- X-rays
- Ultrasound
- CT scanners



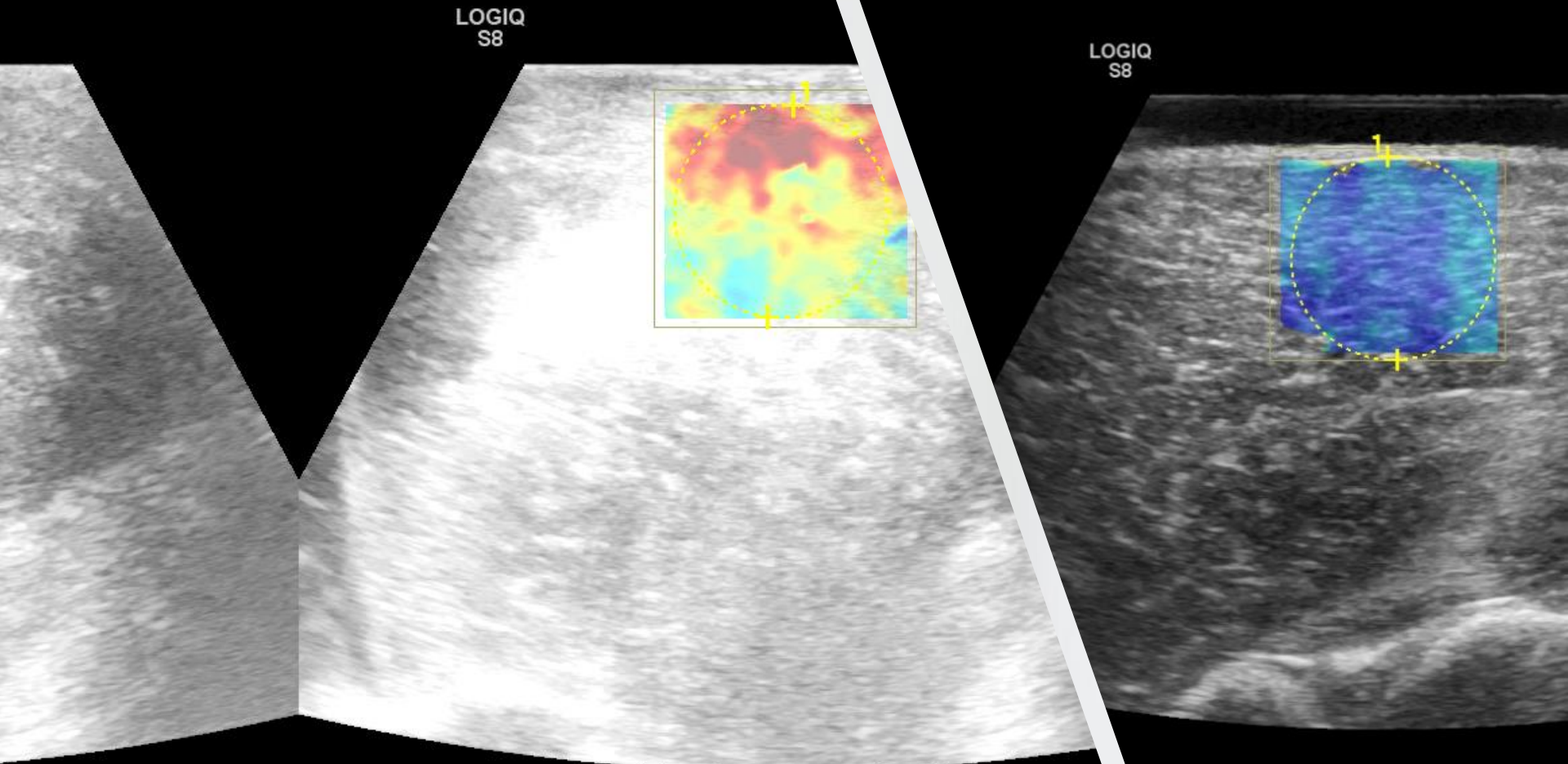
## Requirements

- Throughput
- Safety
- Precision

# Better Meat Quality (Elastography)







# Elastography – Meat Quality

# Cobb's Woodyrator®





# Percent Wood Breast

*by Breed & Company*

Comparison between the 2 available breeds in each complex.

| Breed               | Company A       | Company B       | Company C       |
|---------------------|-----------------|-----------------|-----------------|
| Cobb500™            | 14.6%           | 3.4%            | 0.9%            |
| Competitor (High Y) | 37.7%           | 8.9%            | 7.2%            |
| Avg. Weight         | 4.01Kg (8.85lb) | 3.47Kg (7.64lb) | 2.67Kg (5.88lb) |

Company A: both breeds were from the same grower

**500 fillets per breed per comparison**

Cooper, 2019



# Scoring Wooden Breast

Degree 0



Degree 1



Degree 2



Degree 3



Degree 4



Source: Universidade Federal Do Rio Grande Do Brazil

FROM: Livia Pegoraro

DATE: August 28, 2019

SUBJECT: Summary of CVB Pen Broiler Trial BZ 061919

**PURPOSE**

To compare broiler performance between MVxC500S and **Competitor** Brazil Ipigua Research Farm, House 1. The objective is look for results at “griller” bird (1.5 kg to Middle East) and “broiler” (3.4 kg).



**Table 9. Yield results by treatment in Males with 7 weeks of age.**

| Treatment  | Yield Age | % Fillet | % Breast | Score WB* | % Wing  |
|------------|-----------|----------|----------|-----------|---------|
| MVxC500S   | 50d       | 21.86%   | 26.67% a | 3.06 b    | 7.76% a |
| Competitor | 48d       | 21.46%   | 25.68% b | 3.45 a    | 7.38% b |

\* Score WB = Mean of the Wooden Breast score in each treatment. The results range from 0 to 4 where 0 is absence and 4 is the most severe score.

# 4 lbs: 2017 Cobb700 vs Cobb500



Cooper, 2019



# 4 lbs: 2017 Cobb500 vs 1956 broiler



Cooper, 2019

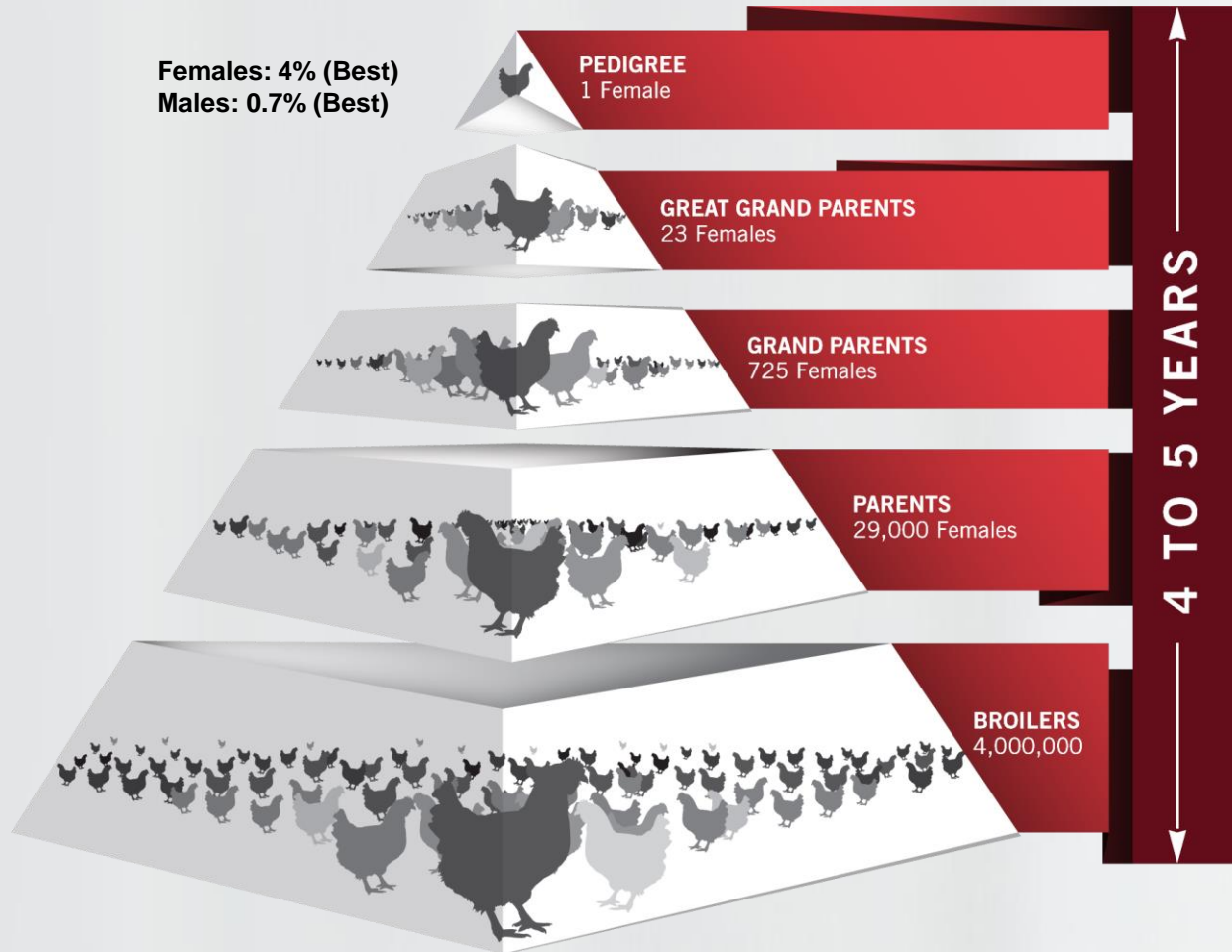




# 48d (4)



# Production Pyramid



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Cooper, 2019



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# Balanced Selection of Breeding Stock



Cooper, 2019

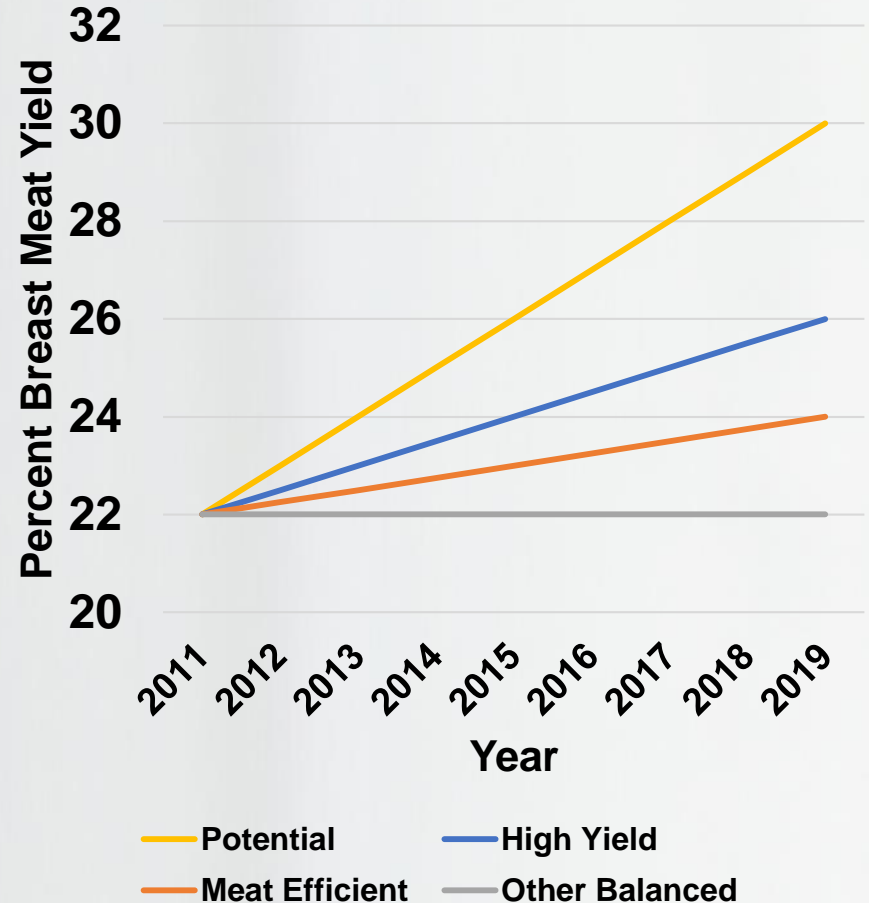
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# Balanced Selection of Breeding Stock

- We actually sacrifice breast meat yield progress to make sure that we keep steady pressure on the improvements in meat quality!!!
- HOWEVER – If we fall too far behind our competition on breast meat yield, we will be out of business if the customer is not willing to pay for better quality meat.



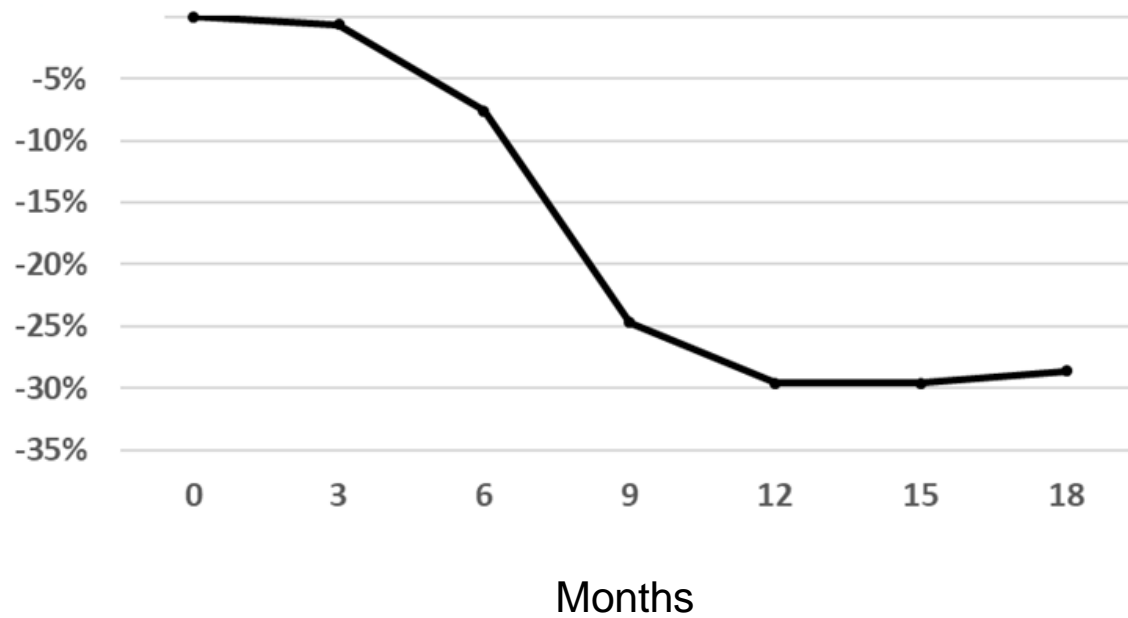
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## Changes in Breast Meat Yield by Weight Class

- The change in breast meat yield in Agri Stats **Large Bird Debone** category has increased at an average rate of **0.55%** per year since 1997  
(0.41%/year for the last 5 years).
- The change in breast meat yield in Agri Stats **Tray Pack** category has increased at an average rate of **0.44%** per year since 1997  
(0.39%/year for the last 5 years).
- The change in breast meat yield in Agri Stats **Fast Food** category has increased at an average rate of **0.33%** per year since 1997  
(0.27%/year for the last 5 years).



## WB reduction compared to initial incidence!!



# Chicken Choices that affect Chick-fil-A

- How Big → Bigger is Cheaper, but also affects probability of WB
- High Yield versus Meat Efficient

## Remember

- At the same weight, every year the birds have thicker breast fillets
- The thickness increases faster at heavier weights & in HY breeds

# Woody Breast (WB) – Research Highlights

## Growthout - Possible solutions:

- **Higher levels of Lysine, increases the condition, but there is also increased gain and yield (Cobb Brazil, 2016)**
- **Broilers raised with Meat and Bone meal, Feather Meal and Poultry Byproduct meal diets have less incidence of WB (Cobb Brazil, 2017).**
- Higher Glycine during 1-14 days doesn't reduce the condition (Cobb US, 2017).
- **Reducing 15% of Protein/Amino acids during 12-24d, partially reduced WB score 3 at 45d without compromising BW gain, FCR, and yield (Jason Lee, ANC 2016).**
- **Reducing 10% of Protein/Amino acids during 11-21d, partially reduced WB score 3 at 42d without compromising BW gain, FCR, and yield in males broilers (Cobb Brazil, 2017).**
- Activity didn't affect WB occurrence (ongoing study, UofA)

# Woody Breast (WB) – Research Highlights

## Growthout - Possible solutions:

### ➤ Nutrients associated with oxidative stress:

- Vitamin C, Vitamin E, Se (inconsistent results)
- Minerals: Zn, Se, Cu, Mn. (Sirri et al, 2016) found no effect between normal and WB fillets.
- **+ Super dose phytase due to release of trace minerals?**

All together as a premix has partially reduced WB, but it didn't disappear it  
(York, 2017)

PARECER: Com base no exposto, as miopatias de peito de frango White striping e Woode breast não apresentam risco a saúde pública. Os peitos de frango acometidos com lesões restritas, sendo legislação vigente, devem ser retiradas apenas as lesões e somente os peitos caracterizados como lesões extensas, com graus de severidade 4, nos quais apresentam alterações organolépticas que comprometem o aspecto (“repugnante”) do corte/carcaça, devem ser condenados.

Autor: Docente da Instituição de pesquisa: Liris Kindlein, Professora Associado IV, Departamento de Medicina Veterinária Preventiva, Faculdade de Veterinária, UFRGS, CRMV-RS 6760.



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**PARECER TÉCNICO DO PONTO DE VISTA SANITÁRIO SOBRE PEITOS DE FRANGO  
DE CORTE ACOMETIDOS COM MIOPATIA WOODEN BREAST - AMADEIRADO**

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**MIOPATIA WOODEN BREAST – AMADEIRADO (BREVE REVISÃO)**





Any questions?