

Meat Chemistry and Cuisine: The ABC's of Meat Processing and Cookery

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Interested in Meat Production From “Farm to Fork”

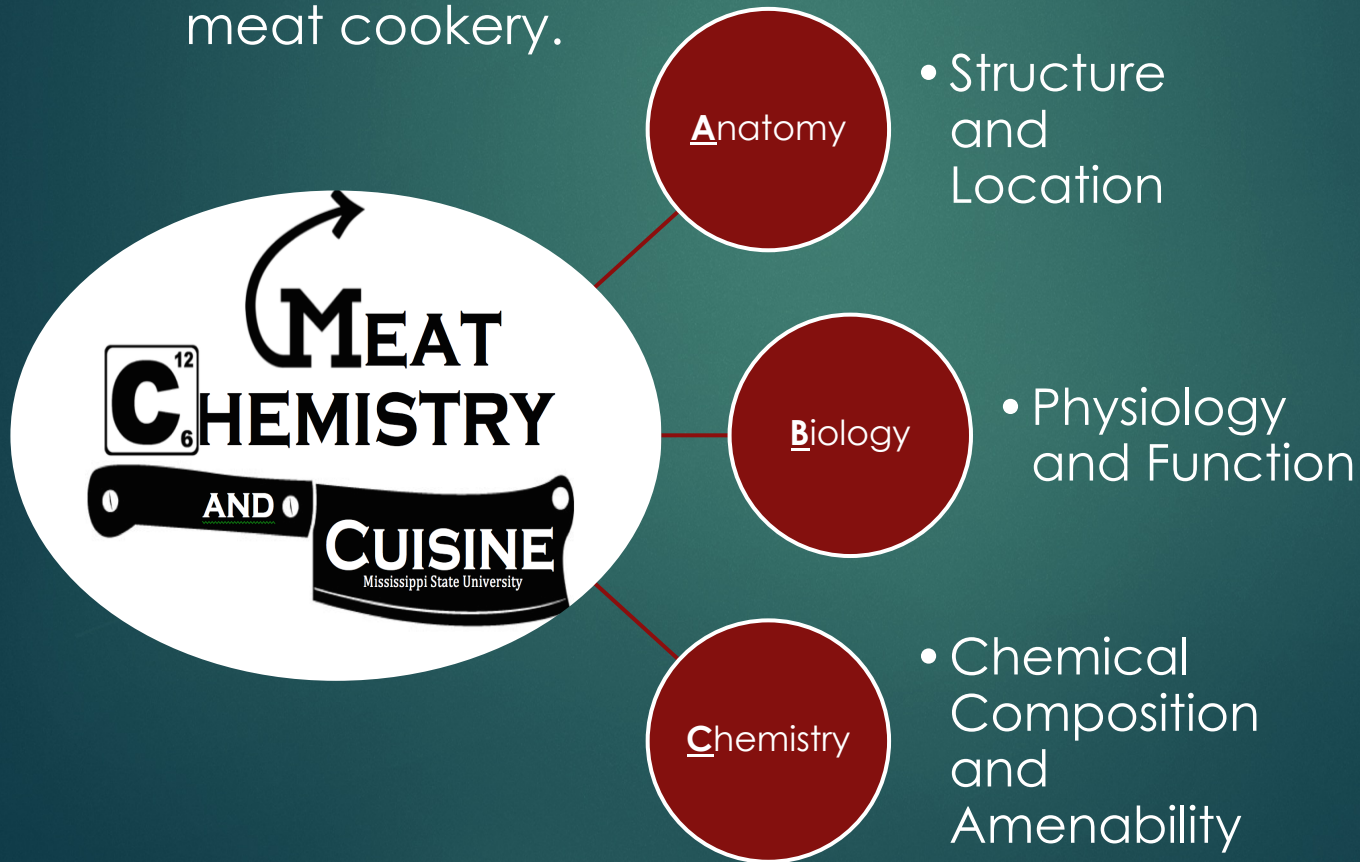
- ▶ Prenatal Programming
- ▶ Production Efficiency
 - ▶ Energy Metabolism/Partitioning
 - ▶ Carcass Yield and Quality
- ▶ Chemical Composition
 - ▶ Fatty acids, flavor compounds
 - ▶ Structural Compounds and Metabolites
- ▶ Processing and Packaging
 - ▶ Shelf Life
 - ▶ Meat Color
- Consumer Eating Experience
 - ▶ Organoleptic Qualities
- ▶ Consumer Health
 - ▶ Alternative to traditional meats



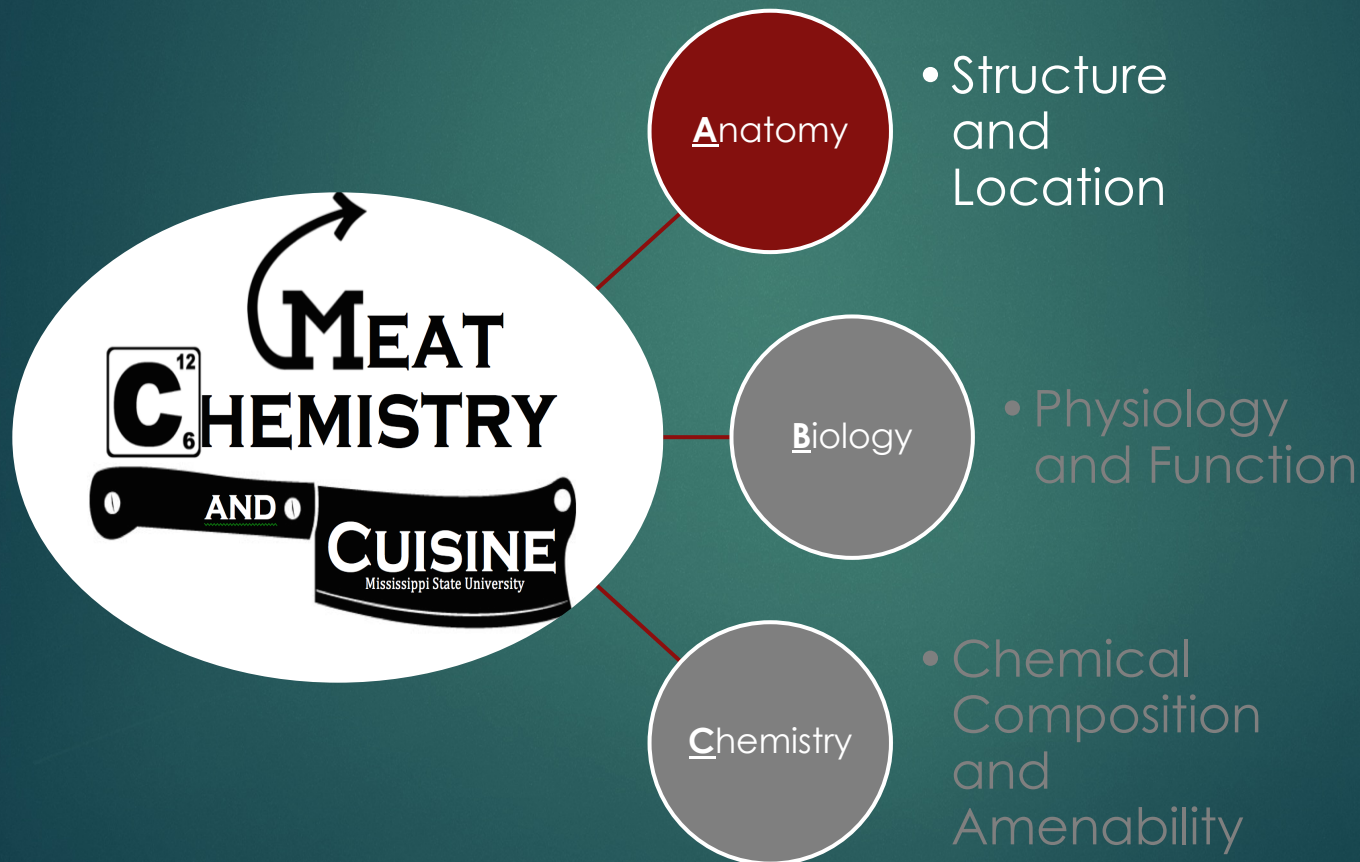


MeatCookery: As simple as ABC

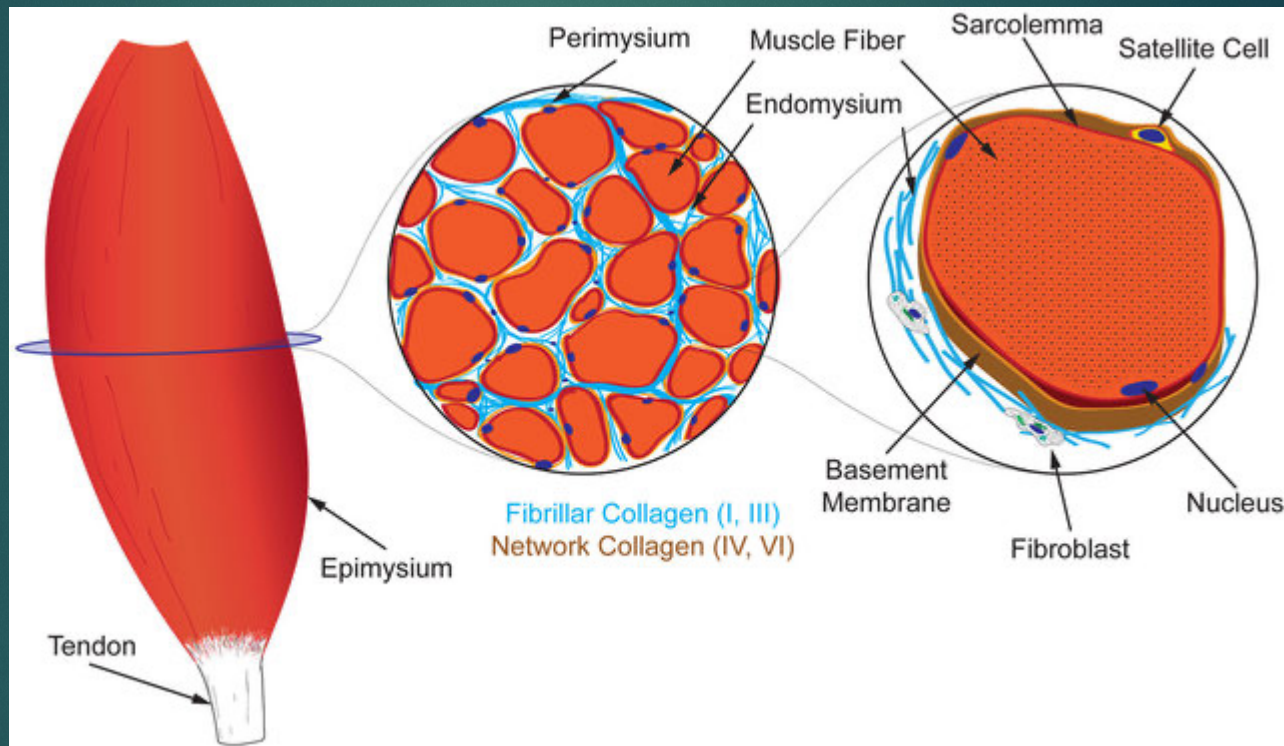
- ▶ With any species, the ABC's of Meat Chemistry and Cuisine dictate the optimal strategy for goat meat cookery.



A is for: Anatomy

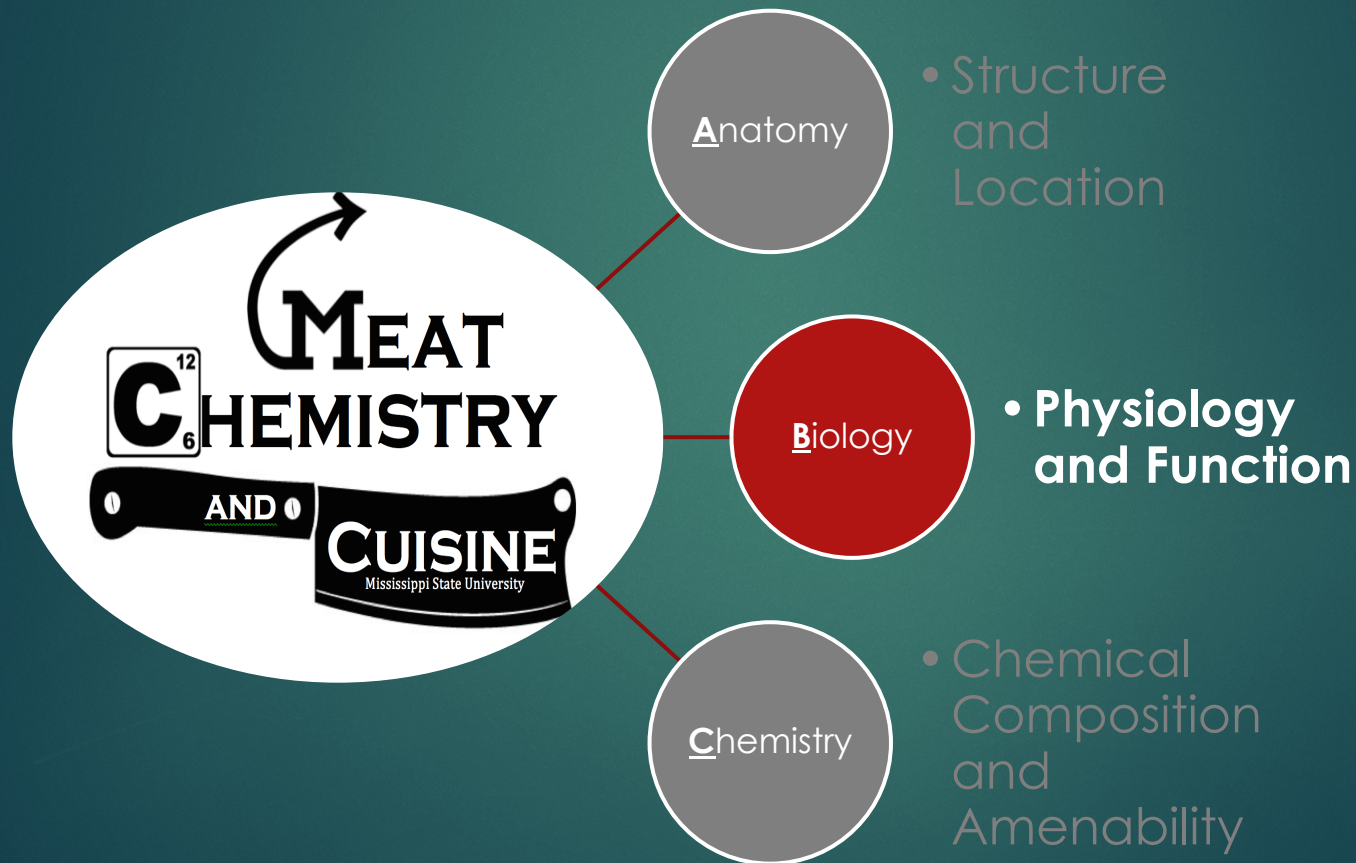


Ultrastructure of Skeletal Muscle

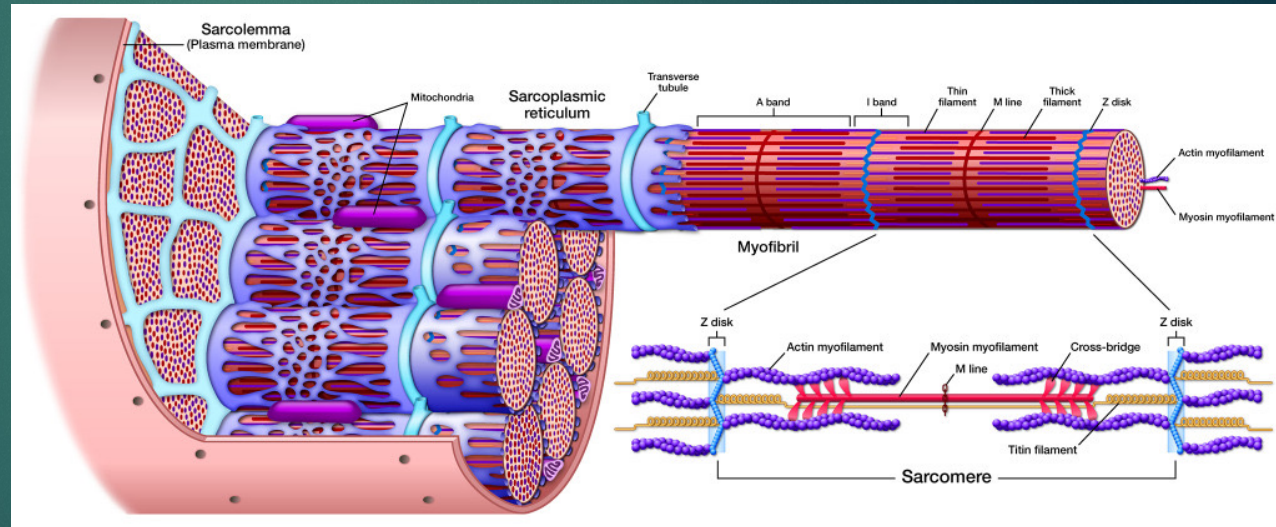
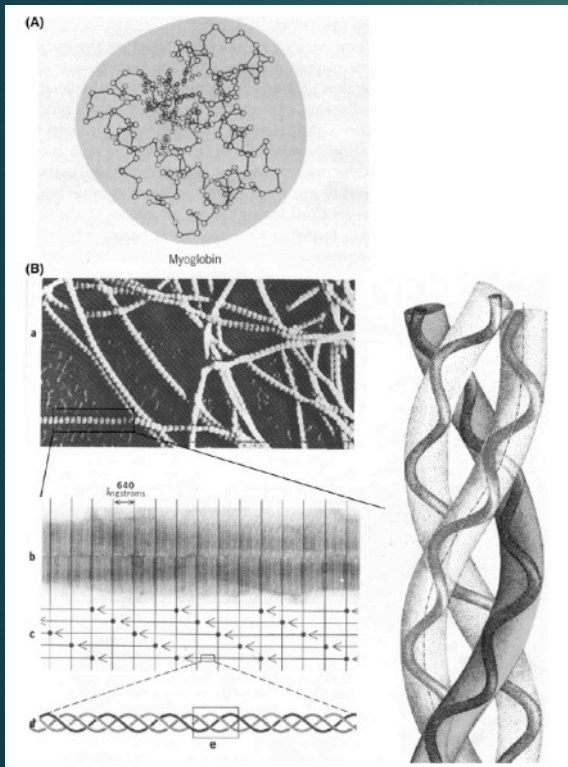


Dueweke et al., J Sport Rehabil. 2017 April ; 26(2): 171-179. doi:10.1123/jsr.2016-0107.

B is for: Biology



Structural and Functional Skeletal Muscle Proteins



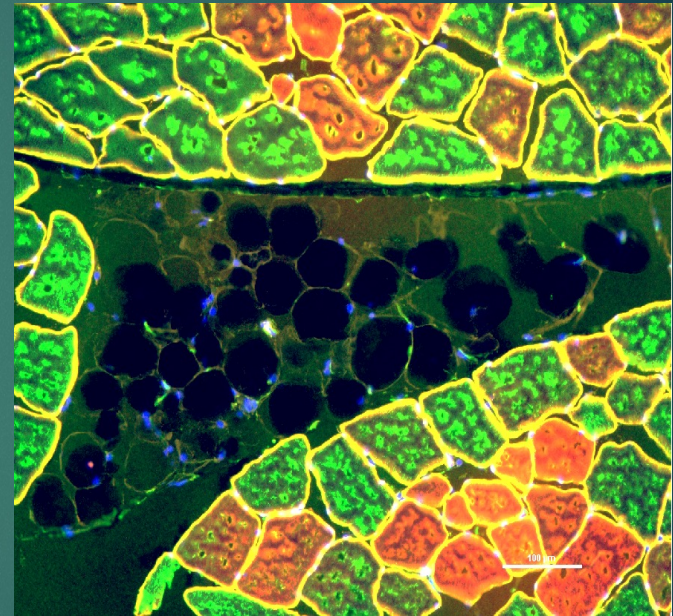
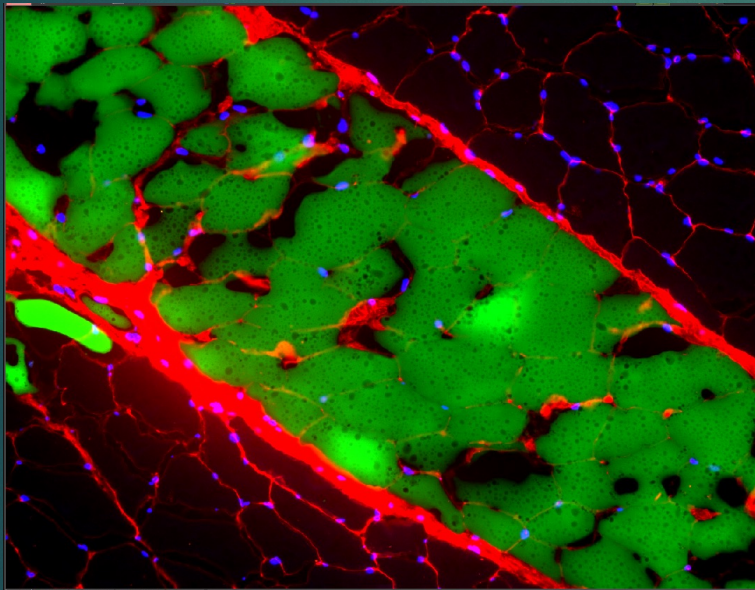
[Sarcomere-Shorter.jpg \(2048x844\) \(artandsciencegraphics.com\)](#)

Types of Muscles

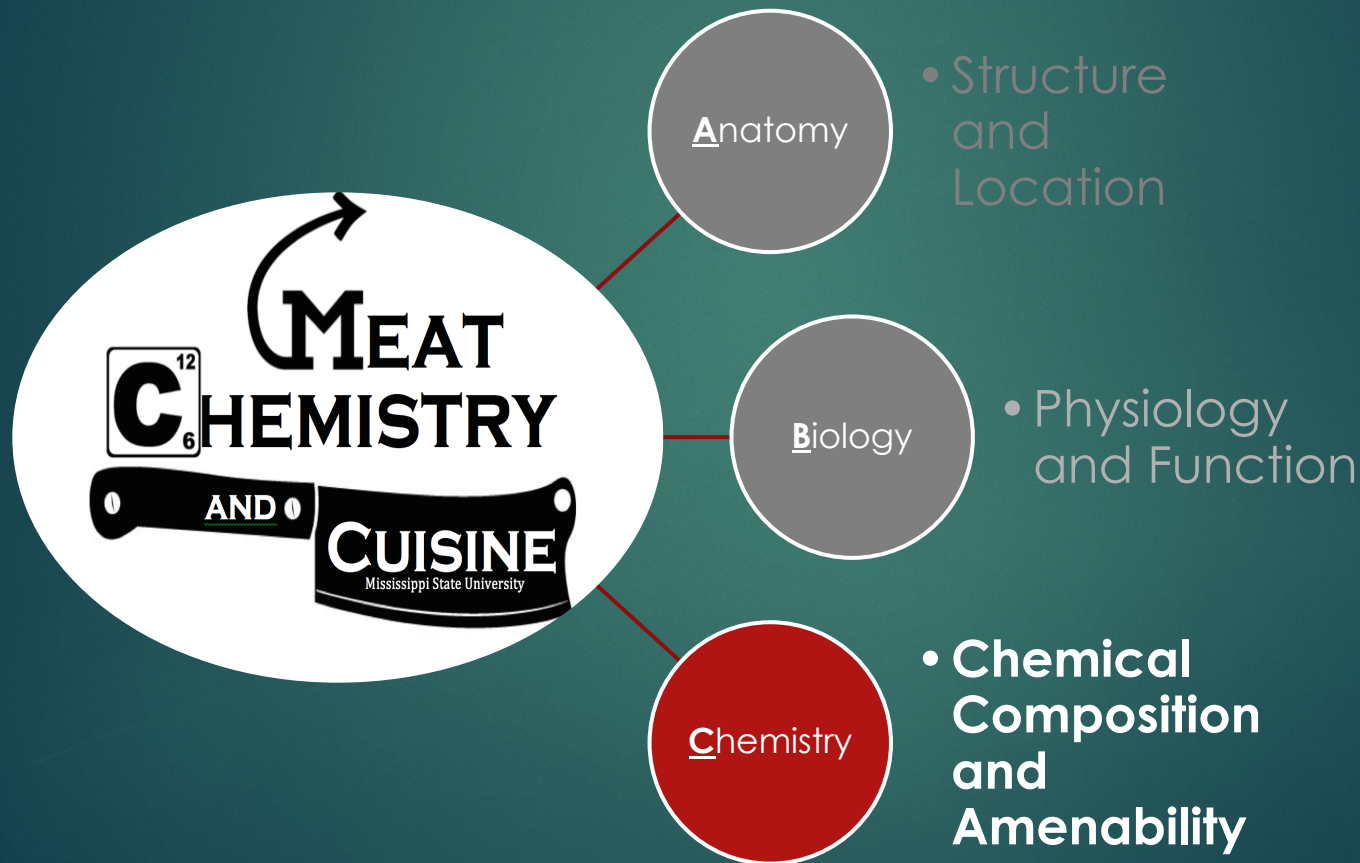
- ▶ Skeletal muscle functions in movement, stature, and metabolic homeostasis in the live animal.
- ▶ Several Methods of Classification
 - ▶ Oxidative/Glycolytic Metabolism
 - ▶ Fiber Type, etc.
- ▶ Some Muscles do more than others
 - ▶ Locomotive Muscles
 - ▶ Stabilizing Muscles
 - ▶ <https://youtu.be/jpVCHaUJ1Qk>



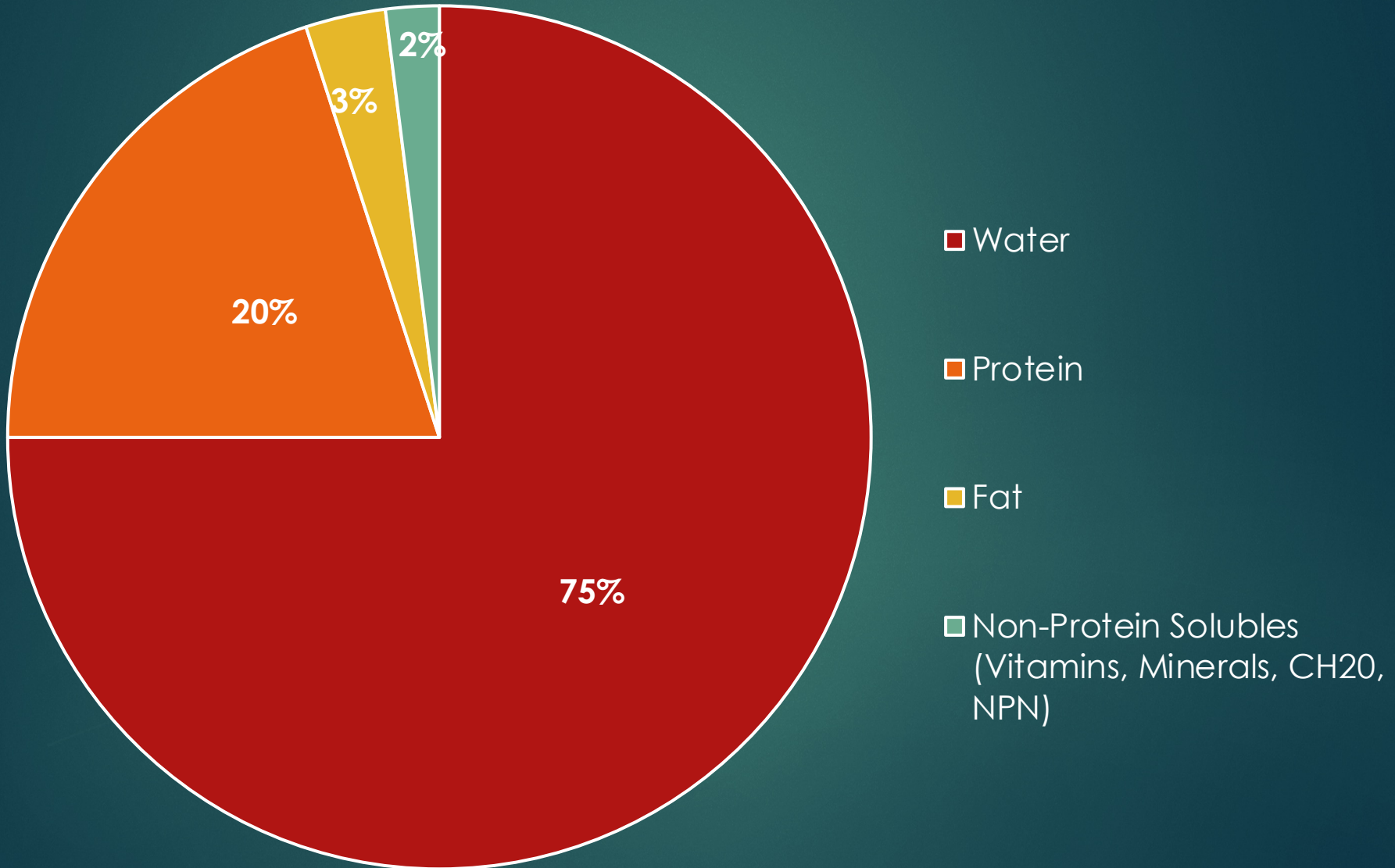
Muscle meets Fat: Intramuscular Fat

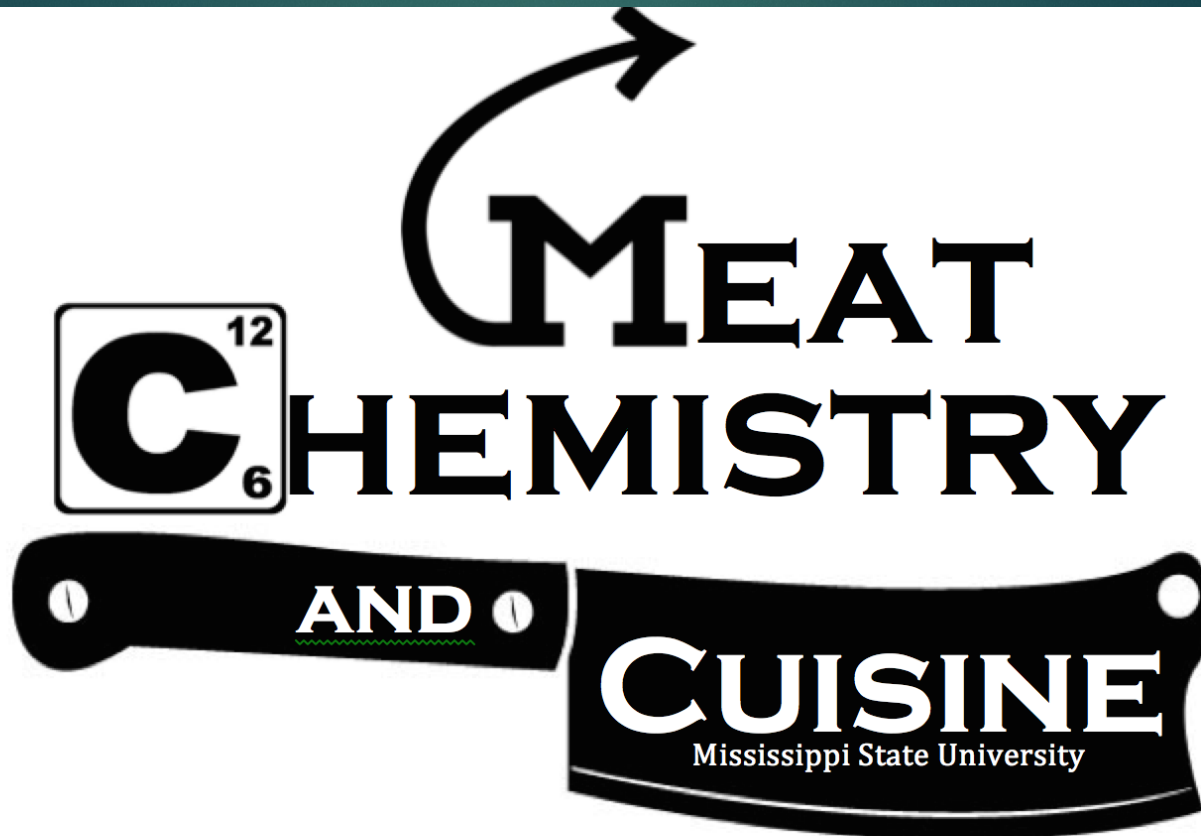


C is for: Chemistry



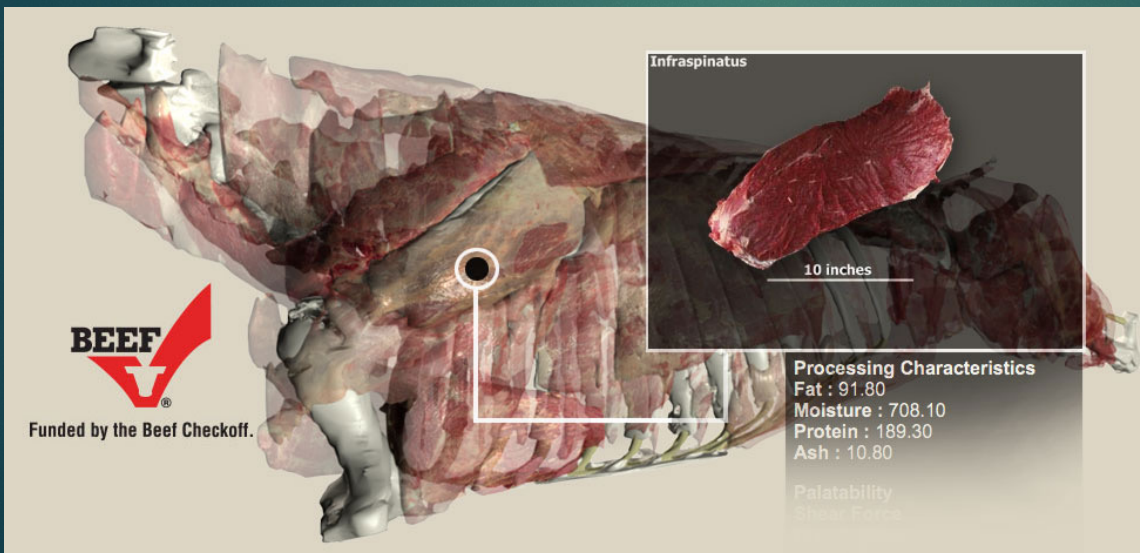
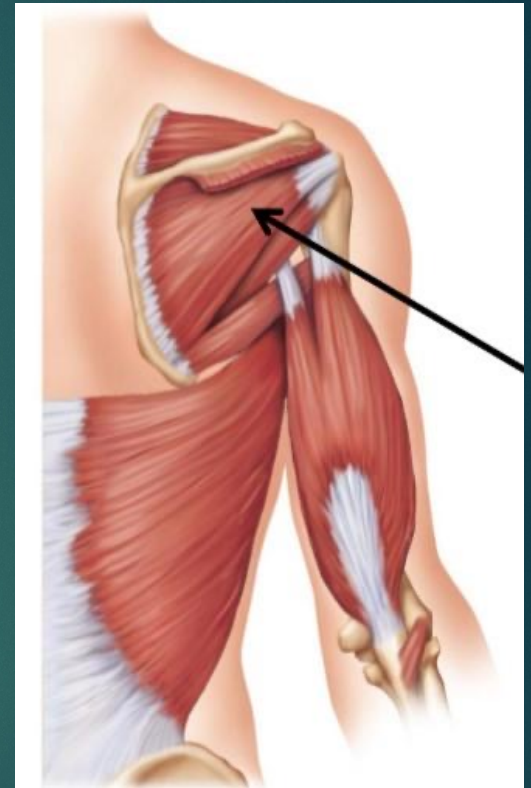
Composition of Skeletal Muscle





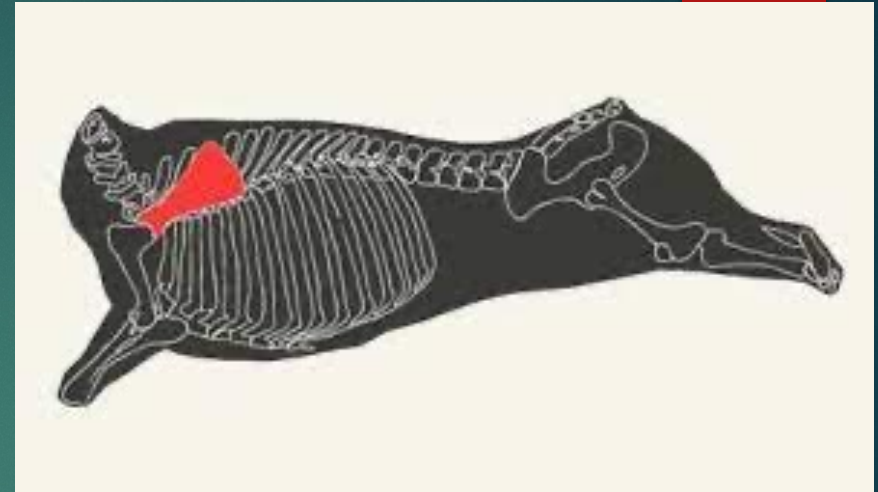
Anatomy of the Flatiron Steak

- Infraspinatus muscle
- Located in the Chuck Primal of the Beef Animal



The Biology of the Flatiron Steak

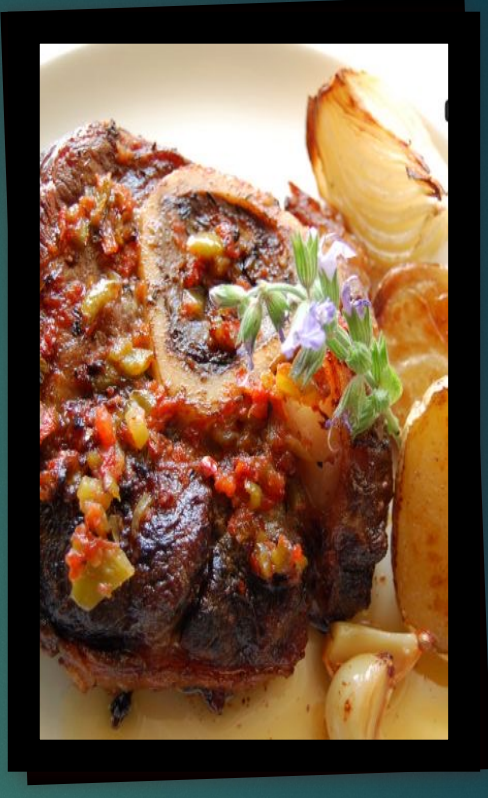
- Functions to rotate the humerus and stabilize the shoulder joint
- Stabilizing muscles are usually more tender
- Because cows don't move their arms sideways, this is a very tender muscle



The Chemistry Flatiron Steak

- ▶ Marbling lipid content increases flavor
- ▶ Connective tissue to support locomotion
 - ▶ Collagen turns to gelatin @ $>160^{\circ}$
 - ▶ Should be removed to improve palatability
 - ▶ Sugars and amino acids that create aromatic compounds
- ▶ Cooked with salt and fresh cracked black pepper for flavor enhancement and aromatics





Goat Shanks– From Start to Finish

Meat Chemistry and Cuisine

Anatomy of the Goat Shank

- Goats are artiodactyl ungulates
- Fore shank and Hind shank
- The muscles of the shank surround the tibia.
 - Digital Flexors
 - Extensor carpi radialis
 - Biceps brachii
 - Flexor digitorum superficialis
 - Peroneus tertius



From Wu et al., 2020, Kansas State University Cattlemen's Day

The Biology of Goat Shanks

- A portion of the leg, which is used extensively for locomotion
- Numerous small muscles surrounded by epimysial connective tissue
- Imagine walking on your tip-toes all day!!!!



The Chemistry of Cooking

Braised Goat Shanks



- ▶ Moist heat: Collagen gelatinization
- ▶ Dry rub: intense flavor (osmosis)
- ▶ Tomatoes Paste
- ▶ Salt: flavor enhancement
- ▶ Sugar: caramelization
 - ▶ Flavor
 - ▶ Color
 - ▶ Brown sugar: moist, better color development, mild caramelization
 - ▶ Caramelization: dehydration and polymerization of sugar
- ▶ Other ingredients: paprika, garlic, black pepper



Meat Cookery

It's FUN

It's EASY

It's all about the

ABC's



Chevon Rib Chops from Start to Finish

Meat Chemistry and Cuisine

Anatomy: The Goat Rib



Biology: The LM and Rib Muscles

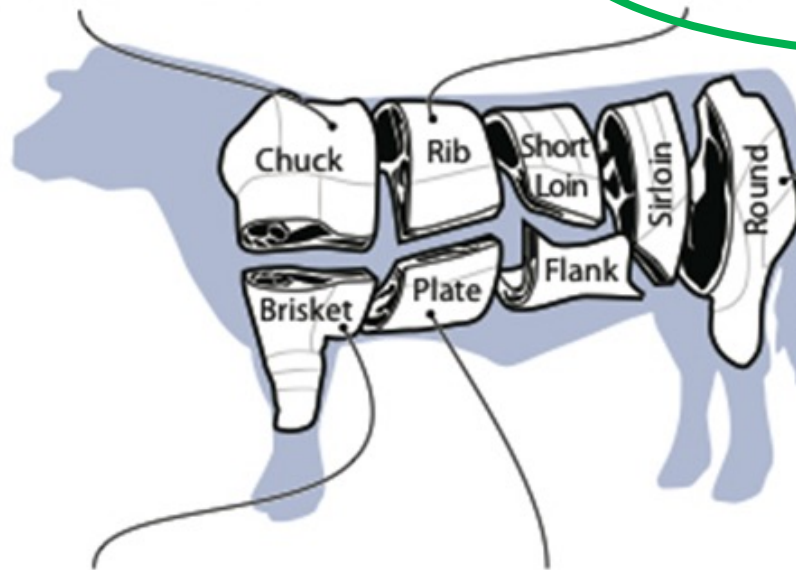
- ▶ Includes LM and Intercostal Muscles
- ▶ Involved in movement of the rib cage during breathing
- ▶ Flexing of the spinal column
- ▶ Stabilization



Chemistry: The Goat Rib

Chuck Eye = *Longissimus Dorsi*
10% collagen
Moist cook 2–3 hours

Rib Eye = *Longissimus Thoracis, Longissimus Dorsi*
9.4% collagen
3.5 hours on barbeque



Eye of Round = *Semitendinosus*
~7.4% collagen
Moist cook ~3 hours

Brisket = *Deep Pectoral*
~10.3% collagen
Moist cook 2–3 hours

Short Ribs + Stew Beef = *Serratus Ventralis*
~8.2% collagen
Moist cook 4–6 hours

When cooking a piece of meat, if it's from a part that is responsible for supporting the animal's weight (primarily muscles in the chuck, rib, brisket, and round), it'll probably be higher in collagen and thus need a longer cooking time.



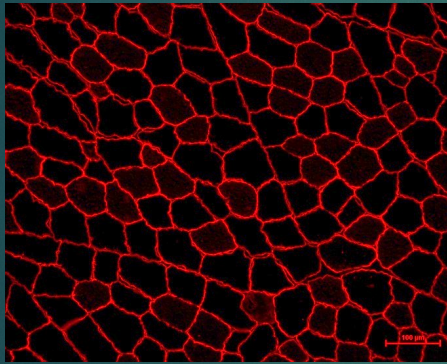
Goat Sausage: The ABCs

Meat Chemistry and Cuisine

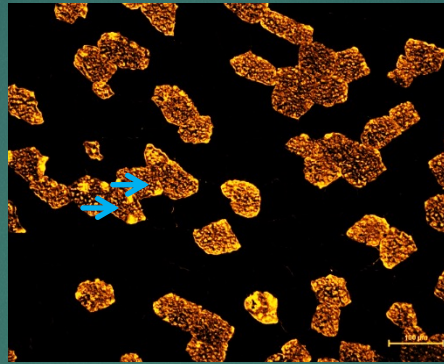
Anatomy: Which muscle makes sausage???



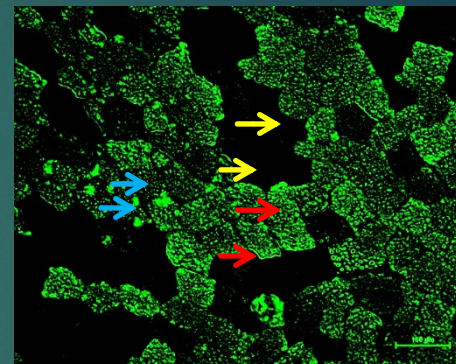
Biology: Muscle fibers are the cellular unit of skeletal muscle



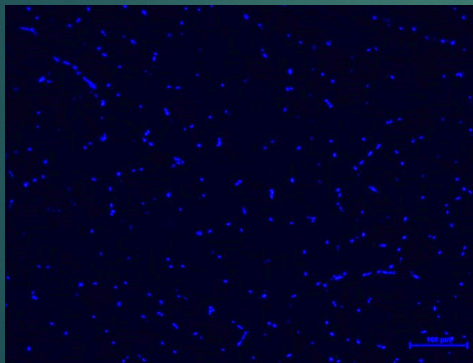
Dystrophin



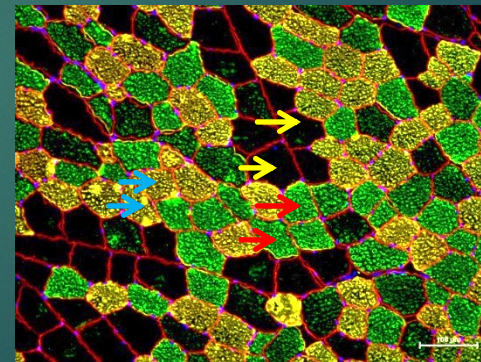
BAD-5
(Type I)



BF-35
(All but Type IIX)



DAPI
(Nuclei)



Merged

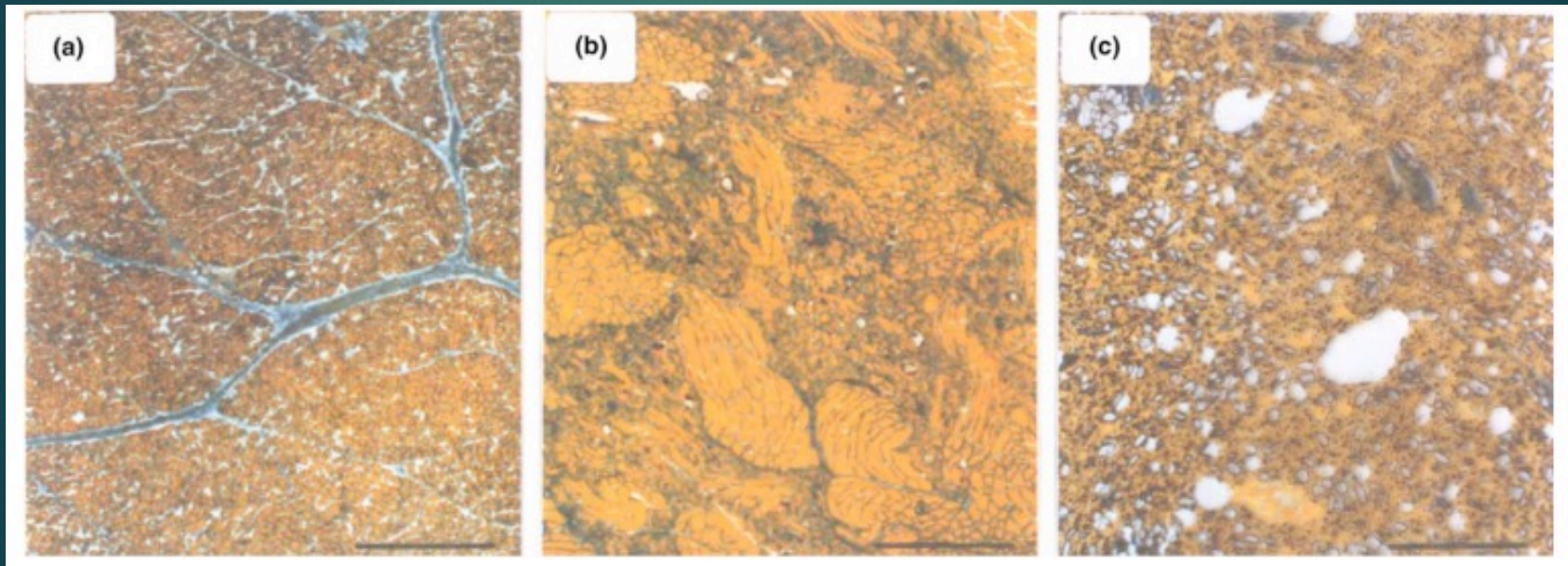
Grinding the Trim = Disrupting the Cells

- ▶ Reduces Particle Size
- ▶ Mechanical Tenderization
- ▶ Changes the Structure of the muscle tissue
- ▶ Can be used to improve the quality or add value to low value cuts.
- ▶ \$0.70/lb. (trim) vs. \$7.99/lb. (sausage)



Changes to Muscle Protein Structure During Processing

- ▶ Intact vs. Ground vs. Sausage Emulsion

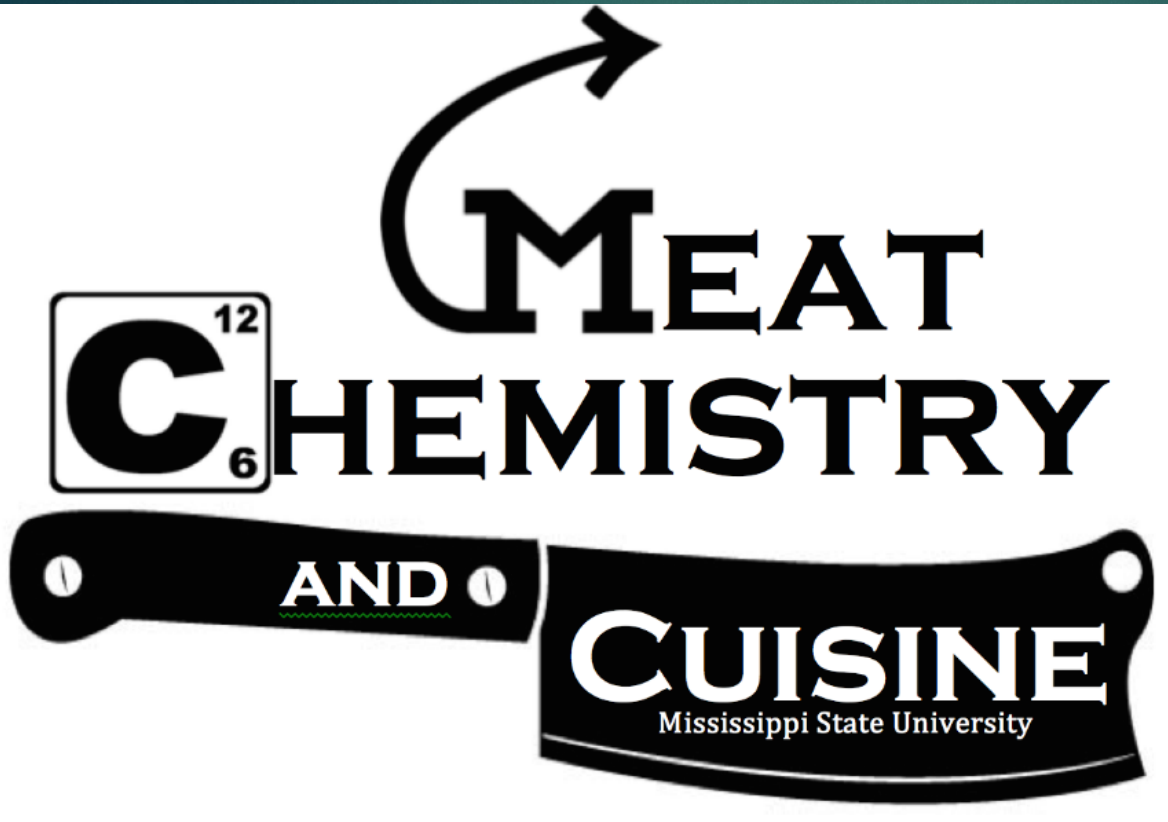


Chemistry: Making the Sausage

- ▶ Sausage making is all about chemistry!!!
- ▶ Changes interactions between components
- ▶ Physical disruption
- ▶ Protein extraction
- ▶ Curing
 - ▶ Flavor
 - ▶ Color
 - ▶ Antimicrobial
 - ▶ Shelf-life
- ▶ Culturing to Reduce pH (Shelf-stable)







Goat Meat
Cookery

It's FUN

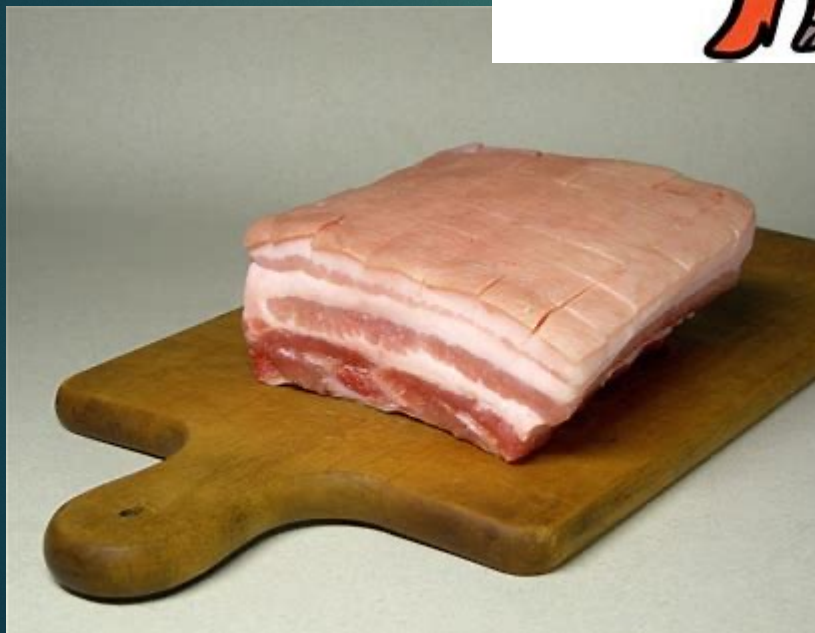
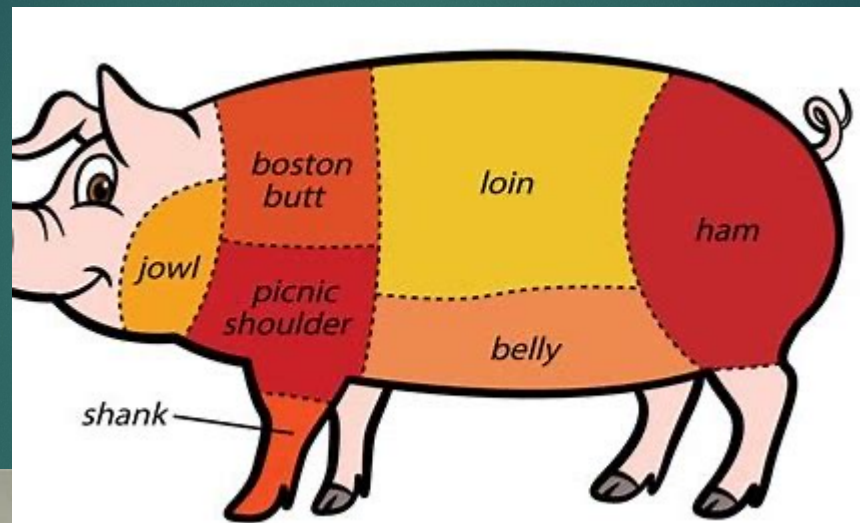
It's EASY

It's all about the

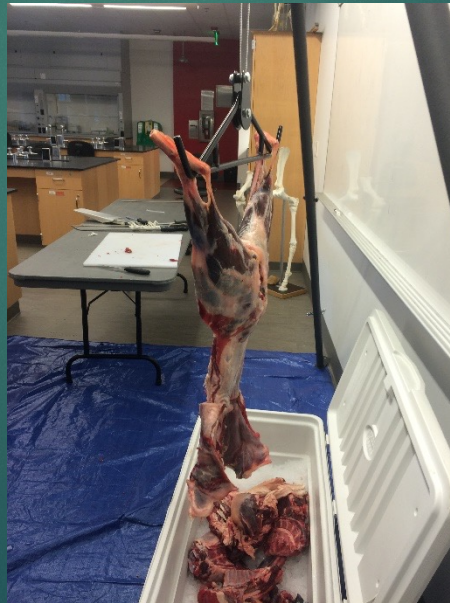
ABC's



Pork Belly or Bacon?



Meat Chemistry and Cuisine: The Beginnings





Meat **C**hemistry
and **C**uisine

Come Learn about the chemical processes involved in creating Meat Masterpieces!

How are sausages made?

What's the difference between Grilling, Smoking, and Barbecuing?

What does Brining do to Meat?

What is Pyrolysis?

What's a Maillard Reaction?

How do you Flambé a steak?

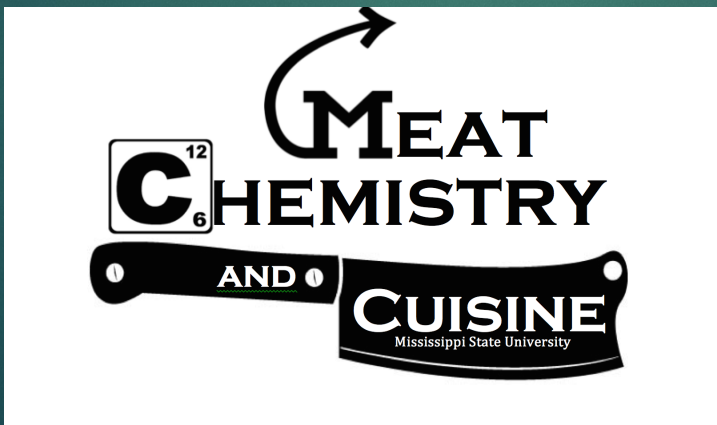
What is Sous-Vide Cooking?

Come join us for our first meeting where we will start to answer these questions and more with exciting, hands on demonstrations and taste tests!!!

When: Monday September 13, 2015 at 6pm

Where: Ballew Hall

Please **RSVP** to DDB362@msstate.edu

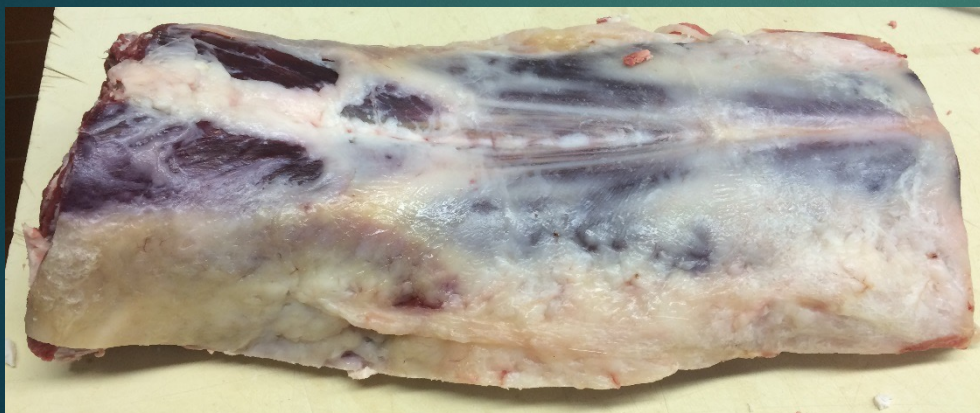


Mississippi State University Mobile Meat Processing Unit



- ▶ Meat Chemistry and Cuisine: Using a proven method to train extension agents and other professionals serving small-scale and limited resource producers
- ▶ Supported by 2020 Southern SARE Professional Development Program subaward number ES20-156.

What's for Lunch?



Thank You!



Derris D. Burnett
Mississippi State University
Department of Animal and Dairy Sciences

Acknowledgements



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