















## Connective Tissue

### Tendons (sinew) and Ligaments

- Major component is are two proteins called collagen and elastin
- · Physical harness for tissues
- Amount of connective tissue is directly related to toughness of meat
- Older muscles have more cross-links in the collagen making it less likely to dissolve with heat AND more difficult to break apart with teeth



Elastin – stretchy connective tissue protein – found in blood vessels and other "rubbery" meats and tissues Gelatin – slow heating collagen digests the tissue into thick protein solution

- Used to make Jello, stew and soups where it thickens and stabilizes food
- · Also used in low-fat foods to give a fatty feel to the mouth
- Used to create theatre color gels and capsules of meds







## Collagen and cuts of meat

# Weight-bearing muscles and muscles that are used constantly are high in collagen

- Cows and pigs have high collagen in legs, chest and rump
- Pigs are typically more tender as they are slaughtered at a younger age so their muscles are less well developed
- Thus less collagen



## Its about the proteins!

#### What makes a cut tender?

Thin fibers from low filament content

- Exercised muscles with have high filament content
- Collagen and elastin content
- Exercised muscle will have higher content of both
- Older tissue has more collagen cross-links Fish collagen has a different percent of amino acids leading to a lower denaturation point
- Human (118°F/48°C) : Beef/pork (98.6°F/32°F) : Fish 68°F/28°C)









































### Health Consequences

For centuries has slowed down botulinal toxin (Botulism), developed interesting meat flavor and saved meat from spoiling.

Nitrosamines – breakdown of proteins into amino acids can react with nitrates to form nitrosamines – many different types

- Some of these reactants bind to DNA and cause damage to genetic material
- Some of the damage is not repaired by cell and <u>MAY</u> lead to cancer



• While the reaction with nitrosamines and DNA does occur, the extent in humans is unclear

