MEAT EATING QUALITY - COLOR

COLOR

- Meat quality and quality meat. Meat quality are attributes of meat that can be measured and do not change while quality meat differs with location, race
- These meat quality attributes are color, water holding capacity, odor and tenderness

COLOR

- Myoglobin is the principle pigment in meat that is responsible for meat color
- Mb is purplish binds oxygen and becomes right red. It binds oxygen under low oxygen partial pressure compared to heamoglobin
- Quality, type of myoglobin, physical condition of other meat components determine the color of meat

COLOR

- Muscle activity determines amount of myoglobin. L. dorsi has 0.044 mg/g while Psoas major has 0.082mg/g
- Plane of nutrition of the animal is important. A diet with high content of iron will result in high amounts of myoglobin
- Age of the animal. The older the animal the higher amounts of myoglobin in the muscles compared to the young.

COLOR

- Calves have whitish meat compared to meat from 3 year old which have reddish meat
- Species. Species differences in the muscle content of myoglobin is evident . Rabbit 0.02%; sheep 0.25%; Pig 0.06%; Ox 0.50% and whale 0.91% mb/gm
- Chemical state of the iron in the myoglobin. The Fe++ binds oxygen and when in Fe+++ cannot bind.

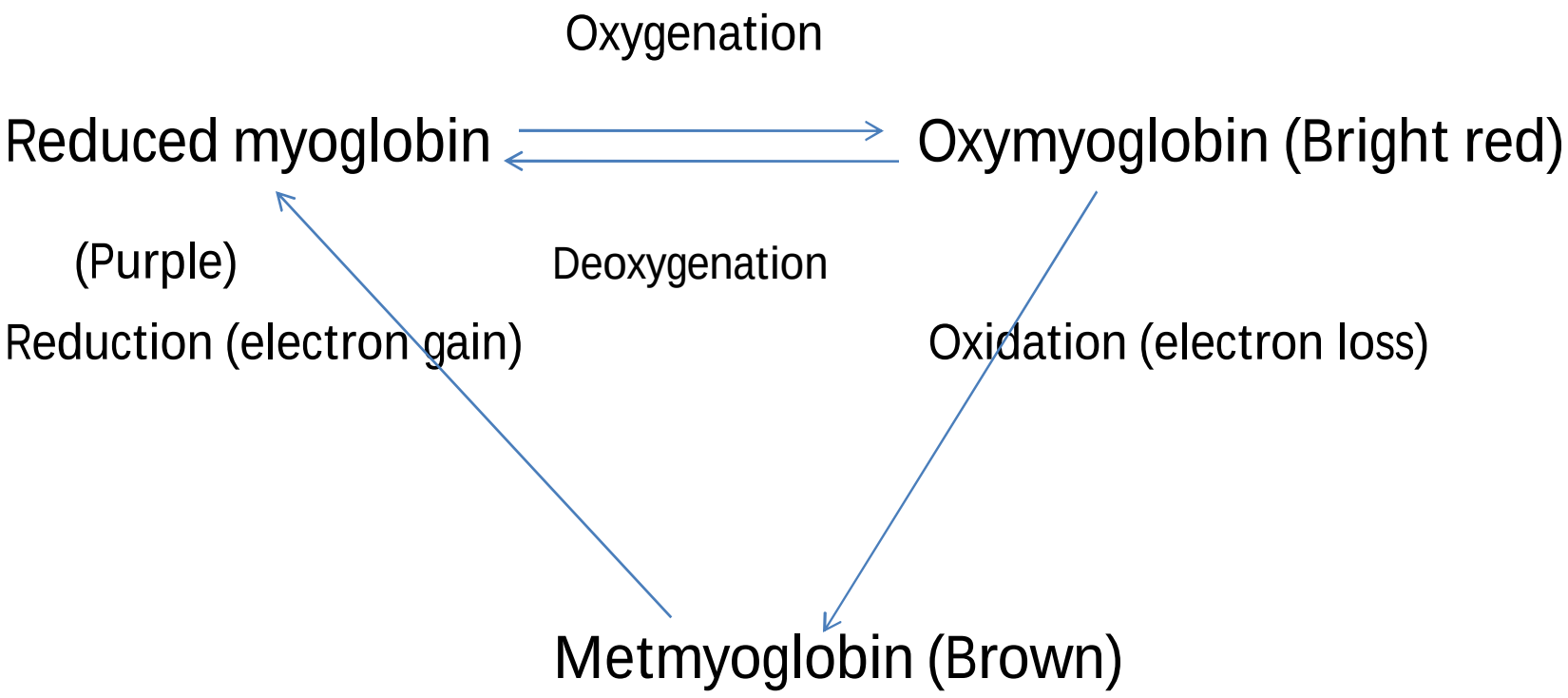
COLOR

- What ever oxidizes the myoglobin reduces its ability to bind oxygen
- The globulin if denatured this also reduces the binding ability of the myoglobin

COLOR

- When meat is exposed to high oxygen pressure, oxygen diffuses and binds myoglobin and a bright red layer of Oxymyoglobin is formed. The depth of this layer is determined by the oxygen pressure
- The oxymyoglobin under low oxygen pressure is reduced to oxidized form the brown metmyoglobin. This pigment is formed when the partial pressure of oxygen falls to 4mmHg.

COLOR


Oxygenation
Reduced myoglobin
Oxymyoglobin (Bright red)
(Purple)
Deoxygenation
Reduction (electron gain)
Oxidation (electron loss)
Metmyoglobin (Brown)

COLOR

- In fresh meat the red oxymyglobin layer fades. The fading is affected by oxygen utilization. The cytochrome enzymes consume oxygen and their residual activity in the muscle affect the depth of the oxymyoglobin layer. The more activity the smaller the depth of this layer.
- In Psoas muscle of the cattle 1200, hare 650 and rabbit 250

COLOR

- Refrigeration reduces the rate of fading of oxymyglobin. Low temperatures increase the rate of oxygen diffusion in the muscle hence a deeper oxymyoglobin layer. Depth is where diffusion equals utilization
- Low temperatures also reduce the residual activity of cytochrome oxidase enzymes. Reduction of temperature by 3-5^{o}C haves the rate of metmyoglobin formation
- Aged meat fades faster than fresh meat although it is brighter initially

COLOR

- Packaging of meat in oxygen impermeable films has the result of having a small oxymyoglobin layer formed at the surface and the purplish myoglobin predominates
- The residual activity of cytochrome oxidase enzymes depletes the thin layer of oxymyoglobin formed leading to fading of the meat

COLOR

- Cooking. Myoglobin is heat resistanrt and is not denatured until the internal temperature reaches 80- 85^{o}C. The oxymyoglobin is denatured and turned to grey heamichromogen the color associated with cooked meat. This is different compound from metmyoglobin (brown).

COLOR

- Curing.
  - Cured meats have a characteristic red color due to the conversion of myoglobin to nitrosomyoglobin. The compound is formed by combination of nitric oxide (nitrous acid) with myoglobin to form nitrosomyoglobin.
- Nitrosomyoglobin is unstable in presence of light and oxygen transformed to nitrosometmyoglobin

COLOR

- During curing compounds like ascorbates and nicotinamide are used and these slows the rate of nitrosometmyoglobin formation
- Pre-slaughter handling of animals may affect the meat color as seen in cases of DCB and PSE

COLOR

Discolorations of meat

- Bacteria growth on meats stored in vacuum packs produce H_2S which reacts with myoglobin to from a green pigment that discolors meat
- During curing catalase enzyme is destroyed. Lactobacillus produced peroxides which react with nitrosomyoglobin to form a green oxidized porphyrin

COLOR

- On the fats of cured meats occasionally are pink green discolorations as a result of deposition of metabolic by products of halophilic bacteria
- Also found in fats of cured meats is a yellow-brownish discoloration due to lipofuscin deposition
- Old dairy animals fat is colored yellow due to deposition of caretenoids

Revision

- Discuss animal factors that affect the color of meat
- Discuss the effect of ultimate pH on meat color
- Discuss the effects of meat preservation on color of meat

Refs

- Meat Science 4th Edition by R. A.Lawrie