**2nd Lecture/ Theory**

**Animal Resource Dept., 4th class**

**Poultry Products & Technology**

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**QUALITY CHARACTERISTICS OF POULTRY PRODUCTS**

Poultry consumption has more than doubled over the last 50 years and continues to grow. In the 1970s the average person consumed 22 kg of poultry every year. In 2008 that number was projected to be about 47 kg per person according to the Economic Research Service and the United States Department of Agriculture (USDA). Of this total, it is predicted that 39 kg will be chicken and 7.5 kg will be turkey. Chicken and turkey are among the most commonly consumed types of poultry.

**The poultry market has grown substantially due to various marketing practices, such as selling individual cuts. A prime example of this is the chicken wing,** which has become very popular in recent years. In 2007, 1 billion kilograms of chicken was marketed solely as wings. **Another reason for the increased popularity of poultry is its low fat and cholesterol contents.** White meat from the breast with the skin removed is a very lean cut. Poultry products are especially lean compared to other animal products, such as pork or beef. **Turkey was once thought to be solely a holiday product that was in demand only a few times in a year.** The turkey industry is now a booming business that offers more than the conventional whole bird. Now, whole breasts, breast cutlets, tenderloins, and legs, along with ground turkey, are seen regularly in retail stores. The popularity of these products has made them a competitor of other protein products year round. Turkey consumption has increased more than 100% since the 1970s, and production has doubled to accommodate this increase. Consumer interest in natural or organic products is increasing at a fast rate and has contributed to the increase in poultry consumption. Some consumers believe that natural or organic products have a superb quality, far above that of traditional products. Many poultry producers have met consumer needs by producing new products, such as antibiotic- or hormone-free meat. Many retail packages have the “free range” claim right on the product. There are many criteria that drive a consumer decision to purchase certain products, including appearance, taste, aroma, and texture.

**POULTRY CARCASSES**

Poultry converts the nutrients in low value feedstuffs into high value meat and eggs. Both these **poultry products are highly palatable, easily digestible and easily marketed**.

**Live Bird**

Blood, feathers, feet, head and neck

**Plucked carcass**

**Eviscerated** **carcass**

Inedible viscera e.g. lower digestive tract, lungs, spleen, and reproductive tract

Edible offal e.g. heart, gizzard, fat and liver

**Carcass**

Skin

**Meat**

Bone

**Breast meat**

**Back and other meat**

**Wing meat**

**Leg and thigh meat**

Inedible contents

**Edible contents**

**Fig. 1: The contents of a poultry carcass**

**SENSORY ATTRIBUTES OF POULTRY PRODUCTS**

**Color Characteristics**

Color is a very important quality attribute considered by consumers when choosing a meat product. **Poultry skin and muscle color are affected by a variety of factors, including age, environment, and diet. The color of poultry skin can vary from cream-colored to yellow. The color of raw muscle ranges from pink to red due to hemoglobin and myoglobin within the muscle. The more a muscle is used, the more myoglobin is present in the muscle.** When cooked, the meat from frequently used muscles is known as dark meat. Dark meat typically comes from the legs or thighs of a bird. Muscles that are used less, like the breast, are lighter in color and thus referred to as light meat. **The birds fed strictly wheat diets tended to have breast fillets that were lighter in color, whereas birds fed strictly milo seed diets tended to have fillets that were more red. Birds on strict corn diets tended to have breast fillets that were slightly yellow in color.**

Another important factor affecting color is the pH of the meat. **Lower pH levels in the muscle are associated with lower water-holding capacity, due to alterations in the structure of myofibrils within the muscle when in a low-pH environment.** If a muscle can hold more water, it typically will be lighter in color.

**Postmortem, biochemical changes occur in the muscle that causes rigor mortis to develop along with a drop in pH. The decline in pH is a result of lactic acid being produced in the muscle when oxygen is not available. If the pH of the muscle declines rapidly while the temperature of the carcass is still high, there will be protein denaturation in the muscle fibrils, causing the meat to be pale. This defect, known as pale, soft, and exudative (PSE) meat, is a growing problem in the turkey and poultry industry.** The paleness occurs due to increased sarcoplasmic protein denaturation, which in turn leads to increased scattered light, causing the meat to be lighter. Age is also an important factor that affects meat quality. **As chickens and other animals age, the level of myoglobin in the muscle increases, resulting in darker colors.**

**Flavor and Aroma Characteristics**

Raw meat has a distinctive flavor very unlike its cooked form. Generally, raw meat has a bloody, metallic, salty taste, with an aroma resembling blood serum. The flavor is changed drastically once cooked. **Flavor develops during cooking through complex reactions between components found in raw meat combining with heat. The primary components of flavor may include reducing and phosphorylated sugars, amino acids, thiamine, and lipids. Chemical compounds found in the meat also undergo thermal degradation, resulting in flavor formation.**

Several of the compounds contributing to aroma and flavor have been isolated and identified. According to Aliani and Farmer (2005), **ribose** may be the most important compound in chicken aroma. **Thiamine** has also been shown to be an important precursor of a wide range of sulfur compounds.

**The diet source of the bird has a noticeable effect on the flavor of broiler breast meat.** Three diets with different primary carbohydrate sources (corn, milo, and wheat) were fed to 28-day-old broilers in a study. The birds were processed between 42 and 52 days of age, and the breasts were removed and frozen. Thawed breasts were cooked to an internal temperature of 80◦C and evaluated for 18 characteristics by a sensory panel. **Meat from birds fed corn, however, scored significantly higher flavor for both than meat from birds fed milo or wheat.**

**Muscle pH**

The pH is commonly used as an indicator of meat quality. As rigor mortis develops within the cell after slaughtering, ATP concentration declines and lactic acid begins to be built up due to glycolysis, thus decreasing the overall pH of the muscle. **A rapid pH decline may cause protein denaturation, resulting in a decrease in tenderness and juiciness as well as a less intense (pale) color of the muscle.**

**Texture Properties**

Acceptance of meat is driven by several factors, texture, particularly tenderness, being one of the most important.

Tenderness has been noted as the most important factor in consumer perception of quality of a meat product and as the single most important quality attribute in determining consumer’s ultimate satisfaction for a whole cut of poultry muscle. Furthermore, consumers have come to expect a high level of palatability, particularly tenderness, in the meat that they purchase. Therefore, understanding the biological and physiochemical inter-relationships that influence tenderness is required to produce tender meat.

Many factors influence the ultimate tenderness of broiler breast meat including age, sex, location, cooking method and pH.

**Rushing glycolysis can cause an increase in buildup of lactic acid in the muscle tissue and cause a more rapid drop in pH of the meat. A rapid postmortem drop in pH has been found to cause a decrease in tenderness due to the changes in solubility of the protein and changes to the enzymes within the meat after slaughter.**

**A decreased pH leads to a decreased activity of calpains and Cathepsins, enzymes that break down the protein structure and reduces postmortem tenderization causing toughening of the meat.**

**As meat ages, it tends to become tough**, which results in its economic value decreasing by limiting its use as a whole muscle food. Tenderness decreases with age, due to the nonenzymatic glycosylation of tissue protein. During glycosylation, saccharides are added to proteins present in the muscle. This contributes to the formation of cross-links leading to the deterioration of collagen. Over time there is an accumulation of these cross-links, which contributes to the toughness of meat from aged animals.

The effect of outdoor access (free range) and conventional methods on poultry meat tenderness has been noted by many researchers. Some argue that birds with outdoor access will produce tougher meat as a result of the increased mobility, and others believe that there is no difference in texture compared to conventional birds.

**Water-Holding Capacity and Cooking Loss**

Cooking loss is a very important characteristic for the processing industry as water retention is a main point of profit. The main determinants of water-holding capacity of meat are pH and protein denaturation. The isoelectric point of the major water binding protein, myosin is 5.1-5.3 and at this pH, water binding will be minimal.

Since decreased water holding capacity is one indicator of PSE meat, researchers have used drip loss and water holding capacity along with L\* values and pH decline as characteristics to evaluate meat quality. A high L\* value and a low ultimate pH (5.7<) have been found to be indicative of broiler breast meat that was both pale in color and low water-holding capacity.