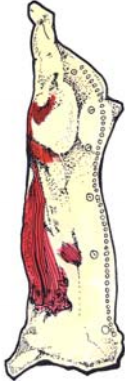


MEATS

Quality attributes
 Texture even
 Fat distribution even
 Color: meat deep red or pale (non-beef); fat white
 Tenderness dependent on age: younger animals preferred
 Flavor and texture dependent on marbling
 Mild odor, if any

Quality retention
 Refrigerate at 30°F
 Frozen storage at ≤0°F, not fluctuating
 First in, first out (FIFO)



1214
10/27/2005 1908 59

1214

Meat Quality Attributes

Texture. The even texture of meat is obtained through control of heredity (breeding), size, and age of the animal, individual muscular activity, and intramuscular fat content (marbling).

Color is dependent on the oxidation-reduction potential of the environment (packaging), maturity, and chemical state of hemoglobin and myoglobin (pigments responsible for meat color) in meat. The color of vacuum-packaged fresh meat is dark purple. This color indicates that no oxygen is present within the package. Vacuum packaging of meat assures a maximum shelf life of 15 to 25 days, depending on the microbiological quality of the meat, which is a direct reflection of sanitation during slaughter and packaging.

Note: If a vacuum package has been punctured and a bright cherry red color is evident, the product should be used as soon as possible, or wrapped tightly in freezer wrapping material and frozen for future use.

Tenderness and texture depend on several factors, which include:

1. Size of meat fibers: Older animals tend to have large muscle fibers; hence, the meat is coarser in texture.
2. Activity of the muscle: Cuts of meat taken from areas of a carcass that receive much exercise (e.g., chuck roast taken from the shoulder area) contain more connective tissue and are less tender than cuts such as tenderloins obtained from the interior portions of a carcasses and have received little or no exercise.
3. Amount, kind and distribution of connective tissue.
4. Degree of natural aging: This is the holding of meat after slaughter and passage of rigor mortis. It also influences tenderness. Some connective tissue will break down chemically when meat is "aged" naturally. As a result the meat becomes more tender.
5. Mechanical means (pounding, cubing, and grinding); marinades (soaking meats in wine, soy sauce, or vinegar); and enzyme treatments (use of meat tenderizers which can either be injected into carcasses or applied to the surface of cuts): These procedures can make cuts of meat more tender.

Flavor of meat is dependent on:

1. Age of the animal: Meat obtained from older animals tends to have more flavor. Often this is affected by the amount of fat deposition within the muscled areas. For example, veal and lamb are marketed at a very early age and are milder in flavor than meat taken from 2-year old beef animals or sheep.
2. "Aging" (holding of meat after slaughter): Compounds that influence the flavor and odor of the meat are also formed during aging. Beef and lamb carcasses are often aged (even for short periods of time, under controlled conditions). Veal and pork carcasses are never aged.
3. Growth of spoilage microorganisms: These microorganisms alter the color, flavor, and odor of meat.

Meat Storage

Meat and meat products must be stored at 28 to 30°F to ensure maximum shelf life and optimum flavor. Frozen meats should be stored at 0°F or less for short periods of time and at -10°F or less for long periods of time. Colder temperatures will slow the oxidation of fat, which causes rancidity, and development of off-flavors in meat.

Temperature fluctuations during freezer storage causes ice crystal development and subsequent excess drip losses from meat when it is thawed. Frozen meat products should be packaged in material that conforms to the product and does not allow the evaporation of moisture and entrance of air.

Meat products stored improperly are more likely to have rapid development of off-flavors and will have a shorter shelf life.

References

- Charley, H. 1982. Food Science. John Wiley and Sons. New York, NY.
- Ingram, M., and Simonson, B. 1980. Meats and meat products. In Microbial Ecology of Foods, Vol. II. Food Commodities. Academic Press. New York, NY.
- Labropoulous, A.E., and Kelly, R.F. 1978. Delayed chilling of beef--A review. J. Food Protect. 41:483-485.
- Levie, A. 1979. The Meat Handbook, 4th ed. Avi Publishing Co. Westport, CT.
- Price, J.F., and Schweigert, B.S. 1971. The Science of Meat and Meat Products. 2nd ed. W.H. Freeman and Co. San Francisco, CA.
- Terrell, M.E. 1979. Professional Food Preparation 2nd Ed. John Wiley & Sons. New York, NY.

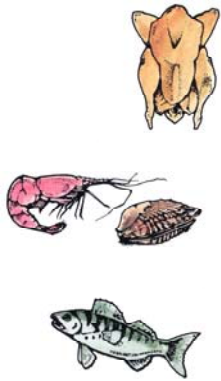
POULTRY, FISH, AND SEAFOOD

Quality attributes

- Full-fleshed, meaty, firm
- Appropriate color, including fat on poultry
- Not bruised
- No rancid or off-odors
- Crustacea alive;
- mollusks tightly closed, if fresh
- Shellfish tagged

Quality retention

- Avoid prolonged storage
- Frozen storage at -10 to 0°F
- Avoid cross-contamination and contact with reactive container
- Separate fish from their drip



1217
10/27/2005 1908 60

1217

Poultry, Fish, and Seafood - Quality Attributes and Quality Control Storage

Poultry Quality Attributes

The quality of poultry is determined by the muscle development or fleshing. A thin, even coating of fat on the entire exterior provides flavor and basting, rather than fat within the muscle. Big chunks of fat are a waste and should be removed.

Poultry Quality Retention

Chicken and other types of poultry have higher pathogenic and spoilage bacterial counts than almost any other food. Poultry should be ordered in quantities that will be used within a short period of time, so that there is rapid turnover and no prolonged storage. Fresh poultry should be refrigerated at 28 to 30°F and packed in ice.

When poultry is frozen, it should be packaged in tight-fitting, impermeable bags to prevent dehydration and rancidity. Freezer storage temperatures should remain at less than 0°F.

Quality Attributes of Fish and Seafood

The appearance and odor of fish are clues to its freshness. The skin of a fresh fish is shining and iridescent. The eyes are full and bright. The gills are bright pink. The flesh of fish, once rigor has passed, is soft and flabby and does not pit when pressed with a finger as does fish that is no longer fresh. The flesh is translucent and shimmering when cut, rather than dull and milky in appearance. The aroma of fresh fish is not unpleasant and is often described as "seaweed," in contrast to the "dead fish" odor of fish too long out of water. Fresh seafood has a maximum quality shelf life of about 2 to 3 days, depending on its microbiological load and temperature controls used after catch.

Some crustacea such as lobsters and some shellfish are purchased in the live state for maximum freshness and quality. Most shrimp usually have better quality if they are glaze frozen and then thawed properly and handled at the retail level. Fresh shrimp has a shelf life of only 24 hours or less.

Fish Quality Retention

Spoilage occurs rapidly in fish, even at refrigeration temperatures. Fish is contaminated with microorganisms that

grow at refrigeration temperatures, causing the development of off-flavors and odors and textural changes in the flesh of fish. Fresh fish should be stored refrigerated no longer than 2 to 3 days. If it is to be stored longer, it should be frozen.

When fish is frozen, the fat (lipid portion) is susceptible to oxidative changes, which cause rancidity to develop, as evidenced by the development of off-flavors. Undesirable textural changes also take place in frozen fish. Often times, frozen fish loses water and becomes quite dry and stringy when it is cooked.

Frozen seafood should be stored below -10°F. Many frozen fish suppliers "glaze" (i.e., dip in water and then refreeze to provide a protective coating of ice on the surface) frozen fish to extend the shelf life of these products.

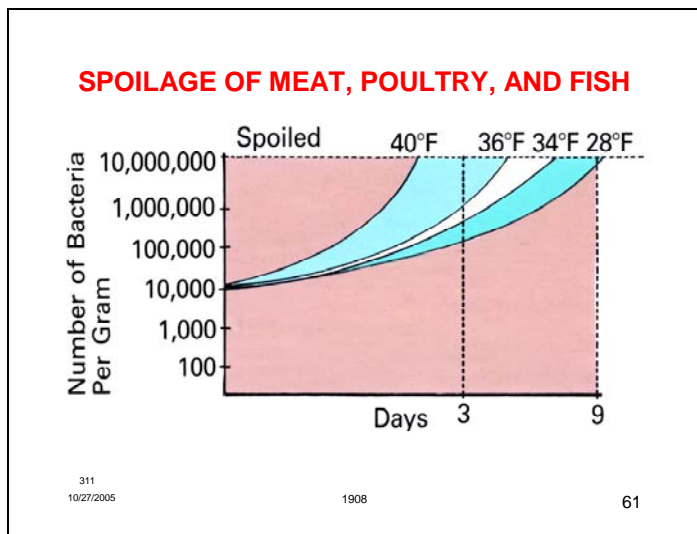
Summary

Time and temperature are the most important factors in maintaining the quality of seafood.

- Fresh fish should be chilled or frozen immediately after it is gutted. Commercial methods super-chill fish and seafood products rapidly by bringing the surface temperature just below 0°F. The seafood is then vacuum packaged and frozen rapidly in blast freezer units.
- Fresh fish should be consumed within 2 to 3 days.
- Thawed frozen seafood should be consumed within 24 hours.

References

- Charley, H. 1982. Food Science. John Wiley and Sons. New York, NY.
- Haverstock, D. October, 1987. Fresh vs. Frozen: Is One Superior? Restaurant Management. Cleveland, OH.
- Hendrickson, R.L. 1978. Meat, Poultry and Seafood Technology. Prentice-Hall, Inc. Englewood Cliffs, NJ.
- Liston, J. 1980. Fish and shellfish and their products. In Microbial Ecology of Foods, Vol. II Food commodities. Academic Press. New York, NY.
- Terrell, M.E. 1979. 2nd ed. John Wiley & Sons. New York, NY.



311

Spoilage of Meat, Poultry, and Fish

Rate of Deterioration

The rate of deterioration of meat, poultry, and fish is directly related to the temperature, bacterial load and type, and pH. These products provide good media for spoilage and pathogenic bacterial growth. As can be seen from the illustration above, these products will spoil more rapidly due to the bacterial growth if they are stored at 40°F in contrast to storage at 28°F (2 1/2 days storage, in contrast to 9 days). The length of time these products can be stored under refrigeration is related to the effectiveness of temperature control and the numbers and types of bacteria present on these products.

If the pH of meat, poultry, and fish is 6 to 7, microbial growth will be more rapid than when the pH is lower, approximately around 5.6.

Importance of Sanitary Slaughtering Operations

Sanitation during slaughtering and gutting operations determines the quantities of bacteria in the end products. Processors must aim to keep the microbial counts on meat, poultry, and seafood as low as possible. Longer product shelf life is determined not only by storage temperatures of 28 to 30°F, but also adequate sanitation of the slaughtering and dressing operations.

References

Ingram, M., and Simonsen, B. 1980. Meat and meat products. In *Microbial Ecology of Foods, Vol. II. Food Commodities*. Academic Press. New York, NY.

DAIRY PRODUCTS (MILK, CHEESE, YOGURT, FROZEN DESSERTS, ETC.)

Quality attributes

- No undesirable flavors or odors
- Appropriate color
- No undesirable fermentations
- No crystallization in frozen products

Quality retention

- Refrigerated at 41°F; butter at 28°F
- Rotate rapidly
- Freeze at <0°F without fluctuations
- Do not refreeze once tempered
- Do not store with strong-aroma foods



1220
10/27/2005

1908

62

1220

Dairy Products - Quality Attributes and Quality Control Storage

Quality Attributes

The safety of milk for human consumption is achieved when milk is pasteurized. This heat treatment effectively destroys microorganisms that might cause illness. A high-temperature short-time process (161°F for 15 seconds) is commonly used today. Raw unpasteurized milk is a source of pathogenic microorganisms that can cause severe illnesses. No raw milk or raw milk products should be served or used in any foodservice facility. Some spoilage bacteria survive pasteurization. The expiration date on milk cartons and other dairy products is an estimate of the time needed for the growth of acid-producing bacteria and other microorganisms to multiply enough to affect the flavor adversely.

High quality dairy products have no undesirable flavors or odor. They possess no off-colors and have a color that is appropriate for the product. No undesirable fermentations have taken place (e.g., milk sours and curdles due to the growth of lactic acid bacteria). Frozen products are smooth and have a light creamy texture; no large ice crystals are present.

Quality Retention

If stored properly, dairy products will retain high quality characteristics for a longer period of time. Storage temperatures of less than 41°F (approximately 35°F) are best to slow the growth of spoilage microorganisms, which include lactic acid bacteria, yeasts, and molds. Milk should be kept away from light in order to prevent the loss of riboflavin and oxidation of the fat components.

The fat in butter will undergo oxidation when butter is stored for long periods of time and a rancid flavor will develop. Butter should be kept as cold as possible (28 to 30°F) but should not be frozen. The lipid (fat) components of butter, cream, and cheese will absorb flavors and aromas of other foods. These products should be stored in containers or sealed in packaging materials that prevent this from occurring.

Fermented milk products (e.g., sour cream, buttermilk, yogurt, all cheese) are produced by culturing these products with appropriate bacterial cultures. These bacterial cultures are not

only useful in producing different types of dairy products but are beneficial in minimizing the growth of pathogenic bacteria. The pH of the dairy food (e.g., sour cream, cheese, yogurt) is decreased to a level that is unfavorable for the growth of pathogenic bacterial.

Spoilage does occur in these products as a result of mold growth. Propionates and sorbates are commonly added to prevent mold growth and increase the refrigerated shelf life of these products.


To retain optimum quality in ice cream and other frozen dairy products, they must be stored at -10 to 0°F until needed for use. If frozen dairy products are stored at higher temperatures or if the freezer storage temperature fluctuates to a great extent, large ice crystals will form and products will become grainy with a "gummy" texture. Hard ice cream should be allowed to temper at 10 to 15°F for 24 hours prior to dipping and rolling.

References

- Charley, H. 1982. Food Science. John Wiley and Sons. New York, NY.
- Olson, J.C., and Mocquot, G. 1980. Milk and milk products. In Microbial Ecology of Foods, Vol. II. Food Commodities. Academic Press. New York, NY.
- Terrell, M.E. 1979. Professional Food Preparation. 2nd ed. John Wiley & Sons. New York, NY.
- USDA. Standards for grades of cheeses. Consumer and Marketing Service, Dairy Div. Washington, D.C.

EGGS

Quality attributes
 Thick white height
 Yolk height
 Shell shape
 Weight
 Cleanliness of shell
 Grades: USDA AA, A, B, C



Quality retention
 Store at 41°F, 70% relative humidity
 Avoid prolonged storage
 Keep away from other strong odors

1218
 10/27/2005

1908

63

1218

Eggs - Quality Attributes and Quality Control Storage

Quality Attributes

The interior quality of fresh, in-shell eggs is determined by candling (i.e., holding the egg in front of a beam of light). Candling can determine the size of the air cell and if the yolk is centered. The yolk membranes extend from both ends of the yolk and are attached to the ends of the shell. This rope-like membrane (chalazae) stretches as the egg ages, thus allowing the yolk to move off center or even affix itself to the inside of the shell. The size of the air space at the top of the egg is also an indicator of age. The older the egg, the more moisture is lost and the greater the air space. The amount of thick white around the yolk decreases with egg age. Yolk centering, air space, and white height have no effect on the baking performance of an egg, but do influence the appearance of fried, poached, and shirred eggs. Exterior quality attributes include a well-formed shape and a sound, clean shell.

Eggs are graded according to size and quality. Eggs vary in size and are classed as one of 6 sizes: jumbo, extra large, large, medium, small, and peewee. The smallest eggs, peewee, are half as large as jumbo eggs. When a recipe calls for eggs, it is appropriate to weigh or measure the volume of eggs used in the product.

Quality grades of eggs are AA, A, B, and C. Eggs of grade AA or A quality have a small air space, a large amount of thick white, and a well-centered yolk. Although eggs may be graded and labeled as grade AA or A quality, the USDA allows 20% of the number in a carton or case to be of lower quality. The USDA also allows eggs to reach a temperature of 60°F (15.6°C) during storage and distribution. At this temperature, egg quality declines rapidly.

Since 1987, it has become evident that the yolk of intact Grade A shell eggs produced by diseased flocks of hens can carry *Salmonella enteritidis*. These diseased eggs have been responsible for outbreaks of *Salmonella* in Europe and the United States. As a result of these outbreaks, the FDA in August of 1990 classified intact shell eggs as potentially hazardous.

In order to prevent an outbreak of *Salmonella enteritidis*, foodservice establishments should:

1. Buy eggs from producers who certify that the flocks of hens producing the eggs are *Salmonella*-free.
2. Use only pasteurized, liquid egg products whenever possible in the preparation of food items requiring eggs.
3. Cook uncertified shell eggs to 145°F or above for 15 seconds in order to inactivate any *Salmonella* that might be present in the egg.
4. Never use raw eggs as an ingredient in the preparation of uncooked, ready-to-eat menu items.
5. Buy eggs that have been maintained in refrigerated storage at less than 41°F since shortly after being laid.

Quality Retention

To prevent dehydration and retain quality, refrigerate eggs at 41°F and 70% relative humidity. In order to retain the microbiological quality of eggs as well as maximum quality for use as a food product, eggs must not be allowed to remain at temperatures above 41°F. Eggs should not be stored near foods with strong odors because eggs absorb off-flavors and odors.

References

- Board, R.G. 1983. A Modern Introduction to Food Microbiology. Blackwell-Mosby Book Distributors. St. Louis, MO.
- USDA. Egg Grading Manual. Agric. Handbook No. 75. USDA Food Safety and Quality Service. Washington, D.C.