

The Color of Meat and Poultry

I've just opened a package of fresh chicken and the skin looks blue. Is it safe to use?

My package of ground beef is dark in the center. Is this old meat?

The turkey was cooked according to the directions, but the breast meat is pink. Will it make us sick?

These are just a few of the many questions received at the U.S. Department of Agriculture's Meat and Poultry Hotline concerning the color of meat and poultry. Color is important when meat and poultry are purchased, stored, and cooked. Often an attractive, bright color is a consideration for the purchase. So, why are there differences in the color and what do they mean? Listed below are some questions and answers to help you understand the color differences.

1. What factors affect the color of meat and poultry?

Myoglobin, a protein, is responsible for the majority of the red color. Myoglobin doesn't circulate in the blood but is fixed in the tissue cells and is purplish in color. When it is mixed with oxygen, it becomes oxymyoglobin and produces a bright red color. The remaining color comes from the hemoglobin which occurs mainly in the circulating blood, but a small amount can be found in the tissues after slaughter.

Color is also influenced by the age of the animal, the species, sex, diet, and even the exercise it gets. The meat from older animals will be darker in color because the myoglobin level increases with age. Exercised muscles are always darker in color, which means the same animal can have variations of color in its muscles.

In addition, the color of meat and poultry can change as it is being stored at retail and in the home (see explanation in [question 5](#)). When safely stored in the refrigerator or freezer, color changes are normal for fresh meat and poultry.

2. Does a change in color indicate spoilage?

Change in color alone does not mean the product is spoiled. Color changes are normal for fresh product. With spoilage there can be a change in color—often a fading or darkening. In addition to the color change, the meat or poultry will have an off odor, be sticky or tacky to the touch, or it may be slimy. If meat has developed these characteristics, it should not be used.

3. If the color of meat and poultry changes while frozen, is it safe?

Color changes, while meat and poultry are frozen, occur just as they do in the refrigerator. Fading and darkening, for example, do not affect their safety. These changes are minimized by using freezer-type wrapping and by expelling as much air as possible from the package.

4. What are the white dried patches on frozen meat and poultry?

The white dried patches indicate freezer burn. When meat and poultry have been frozen for an extended period of time or have not been wrapped and sealed properly, this will occur. The product

remains safe to eat, but the areas with freezer burn will be dried out and tasteless and can be trimmed away if desired.

THE COLOR OF MEAT

5. When displayed at the grocery store, why is some meat bright red and other meat very dark in color?

Optimum surface color of fresh meat (i.e., cherry-red for beef; dark cherry-red for lamb; grayish-pink for pork; and pale pink for veal) is highly unstable and short-lived. When meat is fresh and protected from contact with air (such as in vacuum packages), it has the purple-red color that comes from myoglobin, one of the two key pigments responsible for the color of meat. When exposed to air, myoglobin forms the pigment, oxymyoglobin, which gives meat a pleasingly cherry-red color. The use of a plastic wrap that allows oxygen to pass through it helps ensure that the cut meats will retain this bright red color. However, exposure to store lighting as well as the continued contact of myoglobin and oxymyoglobin with oxygen leads to the formation of metmyoglobin, a pigment that turns meat brownish-red. This color change alone does not mean the product is spoiled (see explanation in [question 2](#)).

6. Why is pre-packaged ground beef red on the outside and sometimes grayish-brown on the inside?

These color differences do not indicate that the meat is spoiled or old. As discussed earlier, fresh cut meat is purplish in color. Oxygen from the air reacts with meat pigments to form a bright red color which is usually seen on the surface of ground beef purchased in the supermarket. The interior of the meat may be grayish-brown due to the lack of oxygen penetrating below the surface.

7. A beef roast has darkened in the refrigerator, is it safe?

Yes, it is safe. The darkening is due to oxidation, the chemical changes in myoglobin due to the oxygen content. This is a normal change during refrigerator storage.

8. Can cooked ground beef still be pink inside?

Yes, ground beef can be pink inside after it is safely cooked. The pink color can be due to a reaction between the oven heat and myoglobin, which causes a red or pink color. It can also occur when vegetables containing nitrites are cooked along with the meat. Because doneness and safety cannot be judged by color, it is very important to use a food thermometer when cooking ground beef. To be sure all harmful bacteria are destroyed, cook raw ground beef to an internal temperature of 160 °F as measured with a food thermometer.

9. What causes iridescent colors on meats?

Meat contains iron, fat, and other compounds. When light hits a slice of meat, it splits into colors like a rainbow. There are various pigments in meat compounds that can give it an iridescent or greenish cast when exposed to heat and processing. Wrapping the meat in airtight packages and storing it away from light will help prevent this situation. Iridescence does not represent decreased quality or safety of the meat.

10. What causes grayish or green color on cured meats?

Exposure to light and oxygen causes oxidation to take place, which causes the breaking down of color pigments formed during the curing process. Chemicals in the cure and oxygen, as well as energy from ultraviolet and visible light, contribute to both the chemical breakdown and microbial spoilage of the product. Cure, such as nitrite, chemically changes the color of muscle. Curing solutions are colored in order to distinguish them from other ingredients (such as sugar or salt) used

in fresh and cured meat products. For example, cured raw pork is gray, but cured cooked pork (e.g., ham) is light pink.

THE COLOR OF POULTRY

11. What is the usual color of raw poultry?

Raw poultry can vary from a bluish-white to yellow. All of these colors are normal and are a direct result of breed, exercise, age, and/or diet. Younger poultry has less fat under the skin, which can cause the bluish cast, and the yellow skin could be a result of marigolds in the feed.

12. What causes the differences in color of raw ground poultry?

Ground poultry varies in color according to the part being ground. Darker pink means more dark meat was used and a lighter pink means more white meat was included (or skin was included). Ground poultry can contain only muscle meat and skin with attached fat in proportion to the whole bird.

13. What causes dark bones in cooked poultry?

Darkening of bones and meat around the bones occurs primarily in young (6-8 weeks) broiler-fryer chickens. Since the bones have not calcified or hardened completely, pigment from the bone marrow seeps through the bones and into the surrounding area. Freezing can also contribute to this darkening. This is an aesthetic issue and not a safety one. The meat is safe to eat when all parts have reached a safe minimum internal temperature of 165 °F as measured with a food thermometer.

14. What color is safely cooked poultry?

Safely cooked poultry can vary in color from white to pink to tan. For safety when cooking poultry, use a food thermometer to check the internal temperature. For a whole chicken or turkey, check the internal temperature in the innermost part of the thigh and wing and the thickest part of the breast. All the meat—including any that remains pink—is safe to eat as soon as all parts reach at least 165 °F as measured with a food thermometer.

15. Why is some cooked poultry pink?

Chemical changes occur during cooking. Oven gases in a heated gas or electric oven react chemically with hemoglobin in the meat tissues to give it a pink tinge. Often meat of younger birds shows the most pink because their thinner skins permit oven gases to reach the flesh. Older animals have a fat layer under their skin, giving the flesh added protection from the gases. Older poultry may be pink in spots where fat is absent from the skin. Also, nitrates and nitrites, which are often used as preservatives or may occur naturally in the feed or water supply used, can cause a pink color.

16. If fully cooked smoked poultry is pink, is it safe?

Poultry grilled or smoked outdoors can be pink, even when all parts have attained temperatures well above 165 °F as measured with a food thermometer. There may be a pink-colored rim about one-half inch wide around the outside of the cooked product. Commercially prepared, smoked poultry is usually pink because it is prepared with natural smoke and liquid smoke flavor.