

Avian Muscular System

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If you raise poultry for meat, it is always a good idea to have an understanding of the muscular system of poultry so you can better understand any problems that may occur and how to correct them.

All animals have three types of muscles: smooth, cardiac, and skeletal. **Smooth muscle** is controlled by the **autonomic nervous system** (ANS) and is found in the blood vessels, gizzard, intestines and organs. **Cardiac muscle** is the specialized muscle of the heart.

Skeletal muscle is the type of muscle responsible for the shape of birds and for voluntary movement. The poultry meat you eat is skeletal muscle.

The breast meat of chicken is frequently referred to as **white meat**. White meat is white because of the minimal activity of these muscles. Since chickens do not fly, breast muscles are not used as often as they would if chickens could fly. The thigh and leg meat are typically referred to as “**dark meat**.” Dark meat is dark because the muscles are used for sustained activity—in the case of a chicken, chiefly walking. The higher activity of leg muscles increases their need for oxygen. The darker color of more active muscles comes from a chemical compound in the muscle called **myoglobin**, which is important for oxygen transport. Other species of poultry capable of flight (such as ducks, and geese) have dark meat throughout (i.e., the breast, thigh and drumstick).

American consumers, in general, have a preference for white chicken meat, and it is this part of the chicken typically used in value-added products such as chicken nuggets and chicken fingers. White meat is often considered the healthier of the two types of chicken meat. White chicken meat is leaner, has more protein and less fat than dark meat. The higher fat content of dark chicken meat is what gives it more flavor.

Green Muscle Disease, or Deep Pectoral Myopathy, was first identified in commercial turkey production and involves the death of the breast tenderloin but does not cause the death of the chicken. The dead tenderloins begin to decay resulting in the appearance of a yellowish-green color. The tenderloin (pectoralis minor) is deep in the breast and if the carcass is sold whole the problem typically goes unnoticed. It is only discovered when the roasted chicken is carved for dinner.

Green Muscle Disease is believed to result from vigorous activity of breast muscles (pectoralis major and minor). During vigorous activity, muscles normally swell with increased blood flow to supply the oxygen and nutrients needed by the muscles. Compared to other muscles, the tenderloins have a more rigid muscle cover and are confined to a tight space within the body such that they cannot expand to accommodate this increased blood flow. The net result

of the muscle being confined and compressed is self-strangulation, suffocation, and eventually death of the muscle.

The incidence of Green Muscle Disease increases with increasing market weight in broilers, and more cases are reported in higher yielding crosses, especially the males. Increased broiler activity induced by such factors as feed or water outages, lighting programs, catching and live-haul, and even excessive noise, may result in an increased incidence of Green Muscle Disease. The increased activity associated with free-range broiler production, especially if there are predators in the area, has resulted in an increase incidence of Green Muscle Disease in this industry.

Converting Muscle to Meat

Once poultry are slaughtered, plucked, and gutted there are changes the muscles need to go through to become “meat.” After slaughter, the heart is no longer pumping and supplying oxygen to the muscles. With the decline in blood supply, lactic acid starts to accumulate in the muscle and the pH declines (i.e., becomes more

A bit of trivia: *Does the wing have white or dark meat? Chicken wings, like the breast, are white meat.*

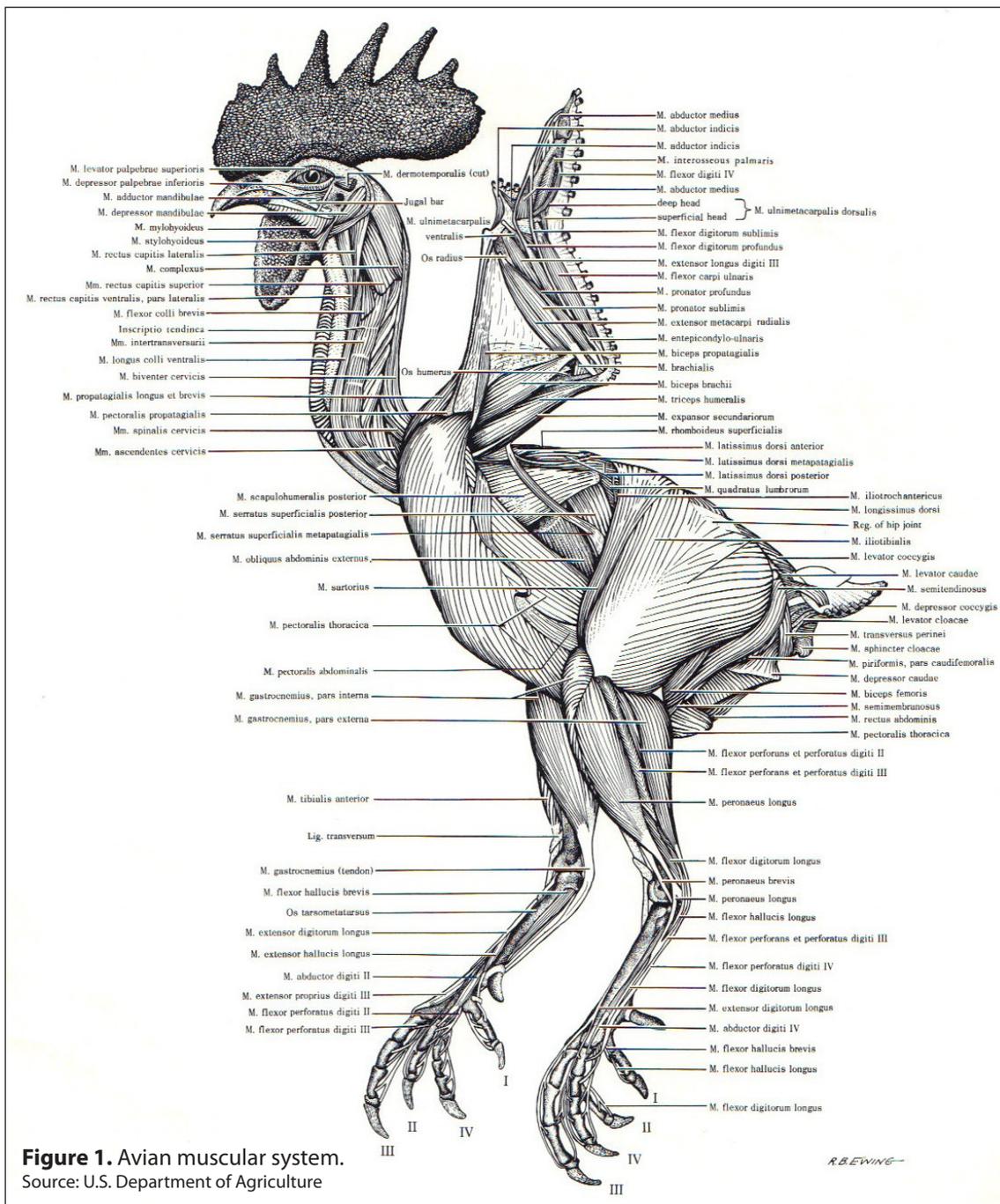


Figure 1. Avian muscular system.
Source: U.S. Department of Agriculture

acidic). The rate of the pH decline and the final point that it reaches are important factors affecting meat quality and color. The pH typically needs to decline from the normal of 7 to 5.8. If the pH does not drop low enough, primarily due to excess activity prior to

slaughter, the meat will be dark, firm, and dry. On the other hand, if the pH drops too quickly immediately after slaughter, the condition of Pale Soft and Exudative (PSE) meat will result.

As is commonly observed after death, rigor mortis soon sets in

resulting in a stiffness of the body. At this state the muscle is temporarily tough. After a period of time the muscle becomes more flexible again. It is for this reason that poultry are typically aged rather than eaten immediately after being processed.