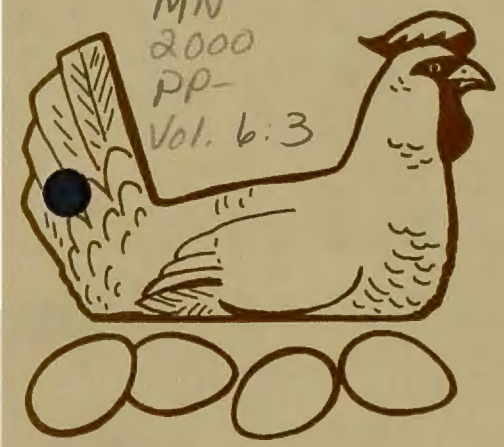

Poultry Patter

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THE FORMATION OF AN EGG

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The importance of eggs as a food source has led to breeding and feeding practices which have increased the average annual production per hen from the natural level of one or two dozen to well over 200 eggs per year. The best modern hen still takes about 24 hours to produce an egg: the same time it took the wild jungle fowl from which it descended. A look at the way an egg is formed may give us some hints as to why this is so, and perhaps even suggest some directions we might look for increasing egg production by decreasing egg production time.

The egg, as we know it, is actually the female germ cell, plus a large quantity of nutrients, all wrapped up in a protective package. It has sufficient nutrients and water to keep the growing embryo supplied for the 3 weeks it takes to develop into a young chick. The egg also provides a protective environment for the embryo during its growth and development.

Yolk Formation

Eggs have their beginnings in the chick embryo when the germ cells migrate to the area that will develop into the ovary. When the chick hatches and starts to grow, these germ cells begin to accumulate yolk material and become surrounded by a yolk sac or follicle formed from the layers of cells from the ovary.

For the first several months of the chicken's life, the growth of these developing yolks or ova is very slow. But as the bird becomes sexually mature the ova undergo more rapid growth, bringing them from about 1/25 inch to $\frac{1}{4}$ inch in diameter within a month or so. At this stage they are still very pale in color. The next stage is a spurt of growth during which the yolk grows from about $\frac{1}{4}$ inch to $1\frac{1}{4}$ inch in diameter in only 6 to 7 days. This is the period when the yellow yolk is produced and stored.

The germ cell stays at the surface of the yolk, leaving a channel of light-colored yolk material called the latebra leading to the center of the yolk. Modern feeding practices tend to produce a yolk of uniform color. During the rapid growth period, concentric layers of light and dark yolk may be formed from the periodic deposit of differing amounts of pigmented material. Although the yolk formation rate is rather constant, yolk may be lighter colored during certain periods because little dietary pigment is available.

When the ova are mature, a surge of pituitary hormone causes the yolk sac to split and to ovulate or release the yolk into the body cavity. Here it is picked up by the funnel of the oviduct and starts its passage to the outside.

Addition of the Albumen

When it is ovulated the yolk is covered only by the thin vitelline membrane (yolk membrane). As it moves through the upper part of the oviduct, known as the magnum, the albumen of the egg white is secreted by the walls of the oviduct and deposited around the yolk.

The first white secreted around the yolk is rather stringy, and, as the yolk revolves on its way down the oviduct, these strings are pulled out and twisted together to form the chalazae. These are the milky colored, cord-like strands one sees in the white of the egg running from either end to the yolk, seeming to suspend it in the center of the white. It takes the yolk about 3 hours to pass down 15 inches or so of the magnum. When it reaches the end of this section, essentially all the nutrients for the finished egg have been deposited. Some water and salts are added as the egg continues its journey.

Membrane and Shell Formation

After its passage through the magnum, the egg enters a narrow section of the oviduct called the isthmus. Here the two shell membranes are formed around the egg white. Travel through these 4 inches or so takes about an hour and a half. The egg next enters the thick-walled part of the oviduct, known as the shell gland or uterus, where it spends about 20 of the 24 hours needed

for its production. Here the shell is formed and the pigment of colored shells added to the outer shell layers. Finally, approximately 24 hours after it was ovulated, the egg passes from the uterus to the vagina into the cloaca and is laid.

A Barrier to Increased Production

Apparently the time it takes for the shell to be formed (20 of the 24 hours) is the bottleneck in the failure of modern hens to produce more than one egg a day. If we really want to increase egg production, then it would seem we might have to change our ideas of what an ideal egg is and begin to think of thin-shelled or shell-less eggs as possible keys to success. This would call for major changes in collecting and handling, but it might be a way to increase egg production markedly.

Double-Yolked Eggs

It is common to find eggs containing two yolks. Double-yolked eggs are generally larger, longer, and narrower than single-yolked eggs. The increase in albumen weight is not equal to that in total yolk weight.

A number of conditions can occur to produce these abnormal eggs. Two ova may be ovulated at the same time, either by simultaneous development or by premature ovulation of one of the ova. A yolk may be ovulated into the body cavity, but not picked up by the funnel of the oviduct until the time of ovulation of the next yolk. Abnormal muscle activity in the oviduct may cause a yolk to move at a slower than normal rate; antiperistaltic action may occur reversing the travel of the yolk so two yolks are enclosed in the same membrane. Most double-yolked eggs result from the condition first described.

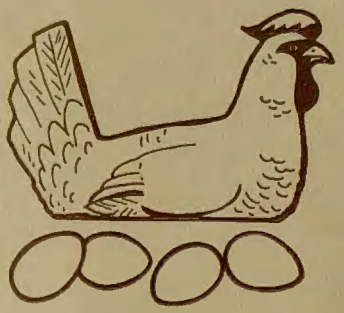
The appearance of the double-yolked egg will depend on where the yolks are brought together in the oviduct. If they are in contact in the funnel, they will be surrounded by a common inner thick layer of albumen. If they meet in the albumen-secreting section of the magnum, each yolk will have its own inner thick albumen layer. Most double-yolked eggs are this type. Two yolks can be brought together just before the shell membranes are added in the isthmus--then each egg will have its own outer thick layer of albumen.

Other Abnormalities

Other egg abnormalities are even more rare. Eggs containing three yolks are found occasionally. Double eggs can also occur. A more or less complete egg or even complete eggs have been reported within an egg.

Dwarf eggs are produced with the yolk usually missing or incomplete. If the yolk is absent, a foreign body may be present serving as a nucleus around which the albumen is secreted. Constricted or bound eggs can also result. These are often abnormal in internal appearance and have unusual shell formation.

A good healthy hen will produce nearly 100 percent normal eggs. Some conditions in part hereditary can be influenced by the breeding program. The poultryman should have a knowledge of the egg formation process to better understand the limitations of the hen and provide her with the best possible environment for satisfactory production.



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