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the egg

and you



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The Egg and YOU . . .

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WOULD you eat the eggs you send to market? If all producers would, then you know your business will remain healthy. To remain healthy, the poultry business depends a great deal upon the quality of eggs it sells. Profits in the poultry business also depend upon the number of eggs each person in the country uses. Rate of use—or consumption—will be high when consumers can buy eggs of the quality they want at a fair price.

Actually, egg quality is determined before the hen even lays the egg. There is no known way of improving quality after the egg is laid. Even if an egg has perfect quality, it starts to deteriorate or spoil right after it is laid.

Most producers selling eggs on a quality basis soon realize how perishable their product is. These people find that they must understand factors affecting rate of spoilage. Otherwise, they will not be able to care for the eggs properly from the time they are laid until they are sold.

Kind Do Consumers Want?

Smart egg buying comes from a knowledge and understanding of egg size and quality. Size is determined by the weight of a dozen eggs. Hens lay more eggs in one season than in another and they also lay smaller eggs at the beginning of their production period. Careless buyers use the same size eggs all year. Wise buyers know there is a difference. During the fall months, they find it more economical to buy small or medium size eggs. In spring and summer, large and extra large eggs are more economical.

Quality of the egg within the shell will show up best by candling. Persons who grade eggs do this by holding the egg in front of a bright light in a room partly darkened.



In order that consumers can secure the kind of eggs they demand, the Department of Agriculture has set up standards for different quality grades of eggs. Those graded AA and A are top quality eggs. They are desirable for poaching, frying, or boiling. Grade B and grade C eggs are edible, but they are less palatable. Consumers find them suitable for baking or cooking.

United States Standards for Quality of Individual Shell Eggs

Consumer (Retail)	Shell	Air Cell	White	Yolk
AA	Clean Unbroken Practically normal	$\frac{1}{8}$ inch or less in depth; practically regular	Clear Firm	Well centered; outline slightly defined; free from defects
A	Clean Unbroken Practically normal	$\frac{1}{4}$ inch or less practically regular	Clear May be reasonably firm	May be fairly well centered; outline may be fairly well defined; practically free from defects
B	Clean Unbroken May be slightly abnormal	$\frac{3}{8}$ inch or less in depth; may show movement not over $\frac{3}{8}$ inch; if not over $\frac{1}{4}$ inch may be free	Clear May be slightly weak	May be off center; outline may be well defined; may be slightly enlarged and flattened; definite but not serious defects
C	Clean Unbroken May be abnormal	May be over $\frac{3}{8}$ inch in depth; may be free or bubbly	Clear May be weak and watery; small blood clots or spots may be present	May be off center; outline may be plainly visible; may be enlarged and flattened; may show clearly visible germ development but no blood; may show other serious defects



What Decides Market Egg Value?

Supply, demand, and the price of competitive foods help determine the general value of market eggs. Producers who sell eggs on a graded basis, however, receive different prices for the eggs they have which are of different quality and size.

Careful handling, in order that eggs keep their top quality, also means greater costs in marketing. Eggs must sell for enough to more than justify the added costs of maintaining quality.

Value of market eggs also depends upon size and quality. Prestige and demand that the marketing agency has developed for its produce may affect value, too. Normally, price differences between high and low quality eggs are greatest during the late summer months. Then, temperatures are high and humidity is low. These conditions cause rapid spoiling of eggs unless they receive protection.

Are Eggs Top Quality When Laid?

Generally, most hens lay top quality eggs. However, eggs inherit certain characteristics. Others are affected by the diet of the layers. These factors cause a wide difference in the number of top grade eggs laid by different flocks.

Good management and breeding practices can help layers produce more top quality eggs. Flocks which receive a complete ration stand a better chance of producing quality eggs for market. Likewise, a producer will receive a better price for his eggs if flock has been bred to lay large eggs, of proper shape and color, and good shell texture and interior quality.

Indiscriminate breeding and incomplete rations promote poor egg quality.

What Affects Egg Deterioration?

Time, temperature, and humidity have much to do with keeping egg quality. In order to keep the

greatest amount of egg quality, careful producers remove the animal heat from eggs as soon as possible. Then, they hold or keep the eggs at a low temperature—40 to 65 degrees F. They keep the humidity high—at least 80 percent—until the eggs are sold.

The shorter the length of time from producer to consumer, the less chance for the eggs to deteriorate. Producers who sell eggs at least once a week avoid much of the waste. High temperatures cause the thick white of an egg to break down into watery white. This causes the yolk to cast a dark, distinct shadow when candled.

Low humidity also causes the thick white to deteriorate and the egg contents to evaporate more rapidly. Candling shows evaporation as a large air cell.

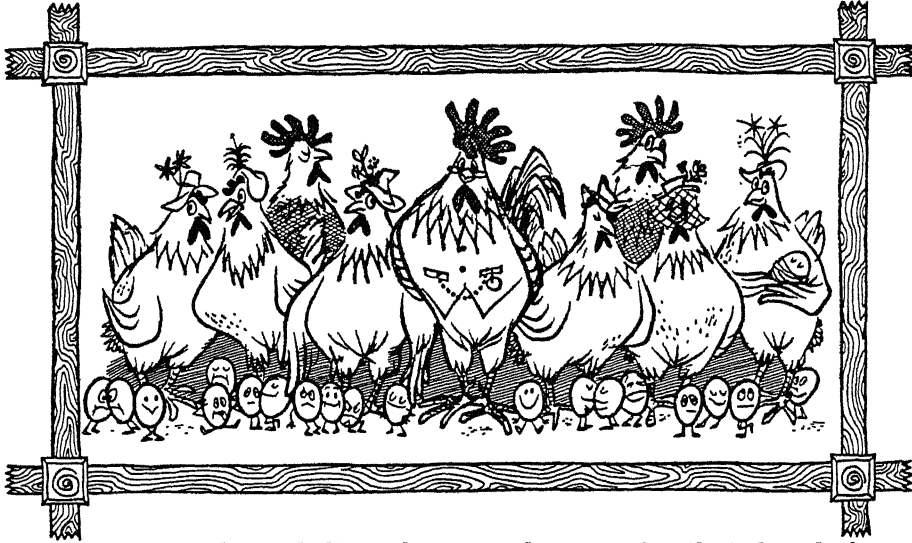
Do All Eggs Deteriorate As Fast?

All eggs do not deteriorate at the same rate if they are held under the same conditions of temperature and humidity. Differences in shell texture and physical and chemical makeup cause variations. Because of this, eggs must be recandled if several days have elapsed between original grading and the time they are offered for sale.

Does Shell Color Effect Quality?

Some markets prefer and will pay premium prices for white shell eggs. Others do the same thing for brown shell eggs. Different colored eggs, produced on the same ration, show no difference in food value.





Some egg merchants believe that brown eggs have thicker shells. They feel that this allows them to store brown shell eggs longer. This belief has not been checked by research workers.

What Determines Egg Size?

Egg size is inherited. Chances are eggs of a large layer will be large. Breeding stock with body size equal to or slightly above standard weight offers a desired goal when selecting breeding flocks.

USDA research workers have found that selection of breeding males for egg size can be based on weights of eggs laid by their sisters and daughters. This gives a steady improvement in egg weight of the female offspring. In an experiment using this method of selection, average egg weight increased from 21.9 ounces per dozen to 24.6 ounces per dozen . . . all in a period of 4 years. During the same period, workers devel-

oped a strain that layed fewer small eggs when they first began to produce eggs.

Temperatures above 80 degrees F. tend to decrease the size of eggs laid by all layers. Extremely hot weather causes hens to lay smaller eggs. Size of eggs hens lay returns to normal size slowly after a hot spell.

Most rations have little effect on egg size . . . evidence points out that milk may tend to improve egg size, but the increase is not of great importance.

Can Shell Color Be Controlled?

Producers definitely have a problem of shell color. As already pointed out, most markets prefer either white shell eggs or dark brown shell eggs. Also, some markets dislike tinted eggs although there are all variations of shades between brown and white.

Only by rigid selection of hatching eggs and scientific breeding involving progeny testing can shell color be controlled.

Producers can argue that generally there is no nutritional difference between eggs of different colors. But, when consumers will pay a higher price for any given color, producers cannot ignore the question. Again—the problem cannot be solved after layers start producing. It is a problem which must be controlled at the time of mating and selecting hatching eggs.

Can Abnormal Eggs Be Reduced?

Layers will produce a few double-yolked eggs, dwarf eggs, or oddly-shaped eggs under any system of breeding, feeding, and management. If most of the eggs from a flock are of the same general shape, it is safe to assume that this is an inherited shape. If eggs are of an undesirable shape, the only way a producer can make changes is to select proper hatching eggs and use males which have ancestors free of the undesired trait.

Why Produce Infertile Eggs?

An egg that is fertile contains everything it needs to produce a chick. However, in order to do so, the egg must be subjected to the right temperature, humidity, and management.

Even though a chick cannot be hatched from a fertile egg held at a temperature of 70 to 90 degrees F., the germ or embryo will develop enough to make the egg inedible in a few days. Infertile eggs, however, will remain edible for a far longer period of time even though subjected to the same conditions.

Obviously, it is necessary to have males in breeding flocks to

keep the industry going. As soon as hatching eggs are no longer needed, careful producers remove the males. Males in flocks producing market eggs cause millions of dollars of loss to the industry every summer.

Are Dirty Eggs Important?

Eggs graded by specifications of the U. S. Consumer Grades must have clean, sound shells. Those with dirty or soiled shells belong in grade C, even though they meet AA quality standards in all other respects. This requirement causes producers of soiled eggs to receive a lower price.

Since practically all eggs are clean when the hens lay them, the problem becomes one of management.

How Can Dirty Eggs be Prevented?

In order to market clean eggs, without added time and expense of cleaning, producers must keep eggs away from dirt from the time the eggs are laid until they are sold.



To prevent dirty eggs, producers need to:

- Keep layers confined to the laying house.
- Keep clean or dry litter on floor.
- Screen perches to prevent layers from getting in droppings.
- Provide at least one nest for each five layers.
- Keep nests and nesting material clean.
- Gather eggs at least twice daily.
- Clean hands before gathering eggs.
- Use clean baskets for gathering eggs.
- Keep hands clean when packing eggs.
- Pack eggs in clean fillers and flats.

Usually, it is profitable to clean soiled eggs on the farm, but the time used adds to the costs of production.

Abrasive brushes or steel wool will remove slightly soiled places on eggs with little loss of time. Warm water cleans dirtier eggs more economically, however.

Eggs which have been cleaned by washing, scraping, or sanding deteriorate more rapidly. A higher percentage will spoil in storage, too, than clean eggs which needed no hand cleaning. Cleaning destroys the outer finish—called the cuticle—of an egg. This increases the opportunities for bacteria and molds to enter the shell pores and cause spoilage.

Are Cracked Eggs Serious?

An experiment at the Ohio Agricultural Experiment Station in

1949 showed that 8 percent of the eggs produced are cracked between the time they are laid until they reach a city wholesaler. In Ohio, this represents a loss of several million dollars each year.

How Can Breakage be Reduced?

Factors which have to do with good shell texture all affect egg breakage. Shell texture is an inherited characteristic. Certain families or strains of chickens tend to lay eggs of much better shell texture than others. Breeders control this genetic factor by carefully selecting hatching eggs. They also use males from ancestors known to have laid eggs with good shell texture.

Diet of layers affects shell texture, too. Since egg shell is almost pure calcium carbonate, it becomes necessary for producers to supply their layers with this material in some form. Most producers keep clean, coarsely ground oyster shell before the layers at all times. Others include some form of calcium carbonate in the laying mash.



Chickens tend to use less oyster shell if fine material collects in the trough so they cannot easily pick out the coarse shell. Many poultrymen make it a regular practice to clean the fine material out of troughs every day. Other poultrymen feed 1 to 2 percent of the finely ground oyster shell in the laying mash. They do this in addition to having coarse oyster shell available all the time.

Manganese sulfate is another part of the diet necessary to insure good egg shell texture. Layers need this only in small quantities, however. Four ounces per ton of feed is sufficient.

Even though producers may feed enough oyster shell and manganese sulfate, it is impossible for the chickens to make use of the materials unless the chickens receive direct sunshine or some form of vitamin D supplement to the ration. Vitamin D helps chickens to use the minerals properly.

Temperatures above 80 degrees F. cause layers to produce eggs with thin shells. Texture also tends to deteriorate toward the end of the laying period. Together, these two factors cause poor shell texture during late summer months. If producers keep layers in cool, insulated, well-ventilated houses, they will help control this problem.

What Determines Yolk Color?

Amount of yellow pigment—called xanthophyll—determines the color of the yolk. Most of this pigment is found in green feeds. Some is present in yellow corn. If layers are not on range, and if the total ration does not contain more

than 5 percent alfalfa, yolk color will not be objectionable.

Consumers probably dislike variations in yolk color more than the actual shade of color. When a consumer has two eggs to eat, one of which has a dark yolk and the other a light yolk, he is likely to feel there is something wrong with one of the eggs.

Best way of controlling yolk color uniformity is by feeding a complete ration that does not contain an excess of green food. Another way is by keeping layers confined to their house so they do not have access to other sources of green food.

Egg graders or marketing agencies often complain about eggs having dark yolks. They refer to the dark appearance of the yolk, which they see when they candle the eggs. Actually, this has no relation to the actual color of the yolk. Egg graders see the yolk shadow when they candle eggs.

What Causes a "Watery White"?

Consumers detect an egg with a "watery white" by the way it flattens out and covers the entire pan when it is broken. Egg graders detect a "watery white" by the ease with which they can see the yolk shadow and by the way in which the yolk moves when they turn the egg before the candling light. These conditions are an indication of a low quality egg.

As eggs deteriorate, the thick white or albumen breaks down. In the last stage before eggs become inedible, the thick white practically disappears.



Several things influence thickness of the white. Some strains or families of chickens lay eggs with much better albumen quality than other strains. Research workers nowadays are giving much thought and time to this matter. They try particularly to impress upon breeders the importance of the "I.Q." or "interior quality" of eggs produced by different strains.

Many good breeders already are checking the eggs of their pedigreed hens for interior quality. Hatchery-men, too, are beginning to ask for this characteristic in the breeding males they buy from breeders for their own flock improvement program.

Age of eggs and temperature and humidity of the storage room all have a direct bearing upon the rate at which the thick white breaks down into thin albumen or "watery white." Good management practices are important in keeping this breakdown at a slow rate.

- Gather eggs three times a day. Get them away from the heat of the hens on the nests.
- Gather eggs in wire baskets. This lets air circulate freely be-

tween the eggs to cool them quickly.

- Take eggs to a cool, moist room or egg cooler right away. Keep the temperature between 40 and 65 degrees F., and maintain 80 percent relative humidity.
- Allow eggs to cool at least 12 hours before casing.
- Keep empty egg cases in the cool, moist room at least 24 hours before packing with eggs.
- Market eggs at least once a week.

Some poultrymen report an increase in the number of "watery whites" right after they give birds unlimited access to succulent, green range. Experimental evidence has failed to verify this, however.

Does "Watery White" Show?

Condition of albumen directly affects the way the egg yolk looks before a candling light. No matter what the color of the egg yolk may be, a thick white will allow only enough light to pass through it to show the yolk as a light shadow. Again, color of yolk has no effect on the way the yolk looks when a grader candles an egg having a thin white. In such a case, light passes through the "watery white" to show a dark yolk shadow.

Because of this, when a marketing man talks about eggs with dark yolks, he does not refer to the yolk color. Rather he refers to the density of the yolk shadow. Eggs which show a dark yolk shadow must be placed in grades B or C according to U. S. Consumer Grades.

What are "Heat Spots" on Yolks?

This is a term used by marketing men to tell of the appearance of small, partly discolored areas which develop on the yolk surface as the egg deteriorates. These so-called "heat spots" tend to give the yolk shadow a reddish look before a candling light. Badly deteriorated eggs have this condition more than others.

What Causes Off-Color Yolks?

It is not uncommon for an egg to have an olive colored yolk. This is caused by plants of the mustard family, such as Shepherd's Purse and Pennycress, to which layers sometimes have access.

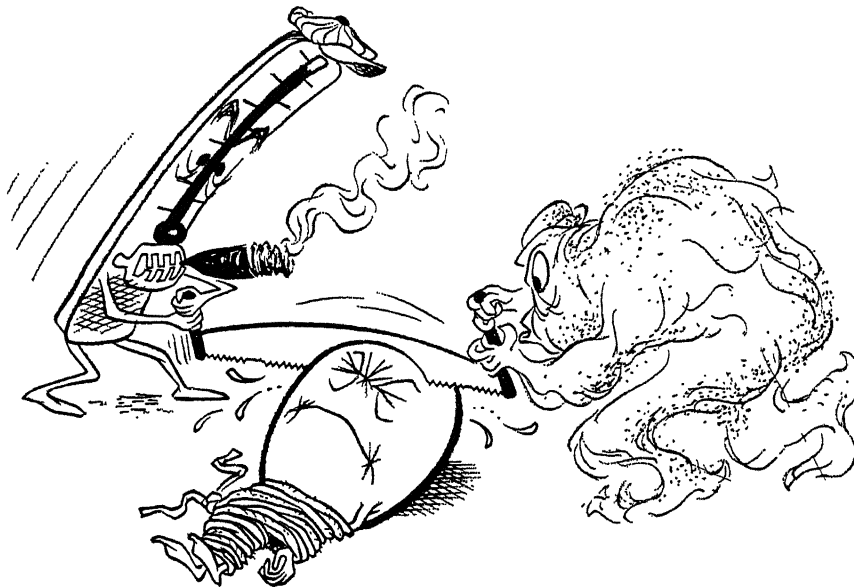
If producers feed their poultry a ration which has more than 5 percent cottonseed meal, eggs will have off-colored yolks. Many egg

yolks will be mottled yellow, olive, salmon green, or nearly black after they have been in storage for a month or longer. Off-color yolks can be controlled by keeping layers in confinement and feeding a good ration.

Why Do Eggs Have Large Air Cells?

In the formation and development of an egg, it is covered with two membranes before the shell is formed. These membranes are known as the inner shell membrane and the outer shell membrane. When the egg is laid, the contents completely fill the shell. As it cools, the contents of the egg contract, or shrink. The two shell membranes separate at the large end of the egg forming a small air cell.

The shell itself has many small pores through which the developing chick — embryo — can secure



oxygen. These same pores permit the contents of the egg to evaporate if the egg is kept at a high temperature and in a room with low humidity.

Market men prevent evaporation in storage by dipping eggs in an odorless, and tasteless mineral oil. This seals the pores in the shell. The treatment is known as "processing" or "shell treating." Some marketing agencies also "shell treat" eggs going into use right away, especially if a few days must elapse between grading and packing dates and the date they go on sale in retail markets.

Some eggs which have not been "shell treated" have large air cells. This indicates that the eggs either have been held for some time or that they have been held under poor conditions for a shorter length of time.

The same factors which influence the size of the air cell also influence the thickness of the albumen. A combination of these two conditions in the egg help graders to tell the quality of an egg.

What Causes Blood Spots?

If consumers find an egg containing blood spots or meat spots, they are likely to think it is an incubated egg. After doing this, consumers may change their source of supply.

Blood spots in most eggs show up before a candling light. This is particularly true if the candler turns the egg over when he holds it before the light so he can see both sides of the egg.

Blood spots are caused by the bursting of a small vessel in the

ovary or oviduct at the time the yolk is released.

Certain strains or families of chickens lay a much higher percentage of eggs with blood spots than other strains. Evidence is lacking, however, that fright has any effect on the number of eggs produced with blood spots, as is commonly believed. Some of the small blood spots apparently are absorbed gradually by the egg. They do not show up if the eggs are a few days old before they are candled.

What Causes Off-Flavor Eggs?

These may be caused by something which the chickens have eaten. Sometimes off-flavor eggs simply are the result of an absorption of odors from the place where the eggs are stored. It is not uncommon for eggs to taste like kerosene, onions, or decaying vegetable materials such as apples. Eggs in close contact with any of those things are more likely to absorb the odors.

How About Handling and Packing?

Sudden and frequent jarring of eggs lowers the quality by increasing the percentage of eggs with tremulous air cells. The effect is more serious if the eggs are improperly packed. Good producers *always pack eggs with the small end down*. Sometimes eggs are so large or long that they extend above the top of a regular filler. These can be packed in duck egg fillers or simply used at home.

Two standard cup flats, back to back in the bottom of the case, will give extra cushion effect.



What are Requirements of a Good Farm Egg Holding Room?

- Temperature controlled between 40 and 65 degrees F.
- Relative humidity of at least 75 to 80 percent.
- Freedom from molds and odors.
- Readily accessibility to laying house and egg truck.

Many larger producers have found it profitable to install mechanically refrigerated egg coolers. Others have installed evaporative coolers which aid in keeping a high relative humidity as well as a lower temperature.

Most basements will provide proper egg holding conditions for the average farm flock. Basements,

however, should be almost entirely underground and have a small amount of exposed wall protected from the sun by shrubbery. Proper management is essential, too.

During the summer, basement windows must be kept closed and covered during the day. This will help to prevent heating by the sun. Windows can be opened during the night for ventilation and closed again early in the morning.

Moist basement floors will keep humidity at the proper point during both summer and winter. If it is objectionable to throw water on the floor, large flat pans properly filled will help maintain humidity. Pans can be covered with a half inch of sand that is almost covered with water or wet burlap bags. Some people will want to hang wet burlap bags on the wall. Others

will want to place them on the floor. Either method is satisfactory.

It is better to have a warm basement with high humidity than a cool, dry basement for storing eggs.

What Happened to Egg Use?

Consumption—or use—of eggs in the United States, during the 10 years before World War II, averaged 298 eggs per person per year.

During the war, egg consumption increased about 85 eggs per person per year. This was caused

partly a shortage of red meats. People thought less eggs would be used after red meats again became available, but this did not happen. Economists believe per capita consumption reached the highest mark in history in 1951. This was about 406 eggs per person for the year.

Perhaps eggs have continued to be used at a high rate since the war because meat prices have stayed high. The fact remains, however, better eggs are more readily available. No doubt this has been partly responsible for the increase in egg consumption.

