

NATIONAL 4-H POULTRY JUDGING MANUAL
Revised February 21, 2021

MARKET EGGS - INTERIOR QUALITY BY CANDLING

The interior grades of eggs are set by the United States Department of Agriculture and include Grades AA, A, B, and Loss. Dirty and cracked eggs are removed as loss eggs. The specific standards for the USDA egg grades are shown in Table 1.

Table 1. Summary of USDA standards for interior egg quality by candling for 4-H poultry judging.

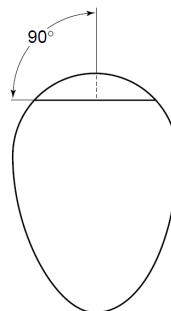
QUALITY FACTOR	GRADES			
	AA	A	B	LOSS
AIR CELL	1/8 inch or less in depth	3/16 inch or less but more than 1/8 inch in depth	More than 3/16 inch in depth	N/A
ALBUMEN/WHITE	Clear Firm	Clear May be reasonably firm	Clear May be weak and watery	N/A
YOLK	Outline slightly defined	Outline may be fairly well defined	Outline clearly visible	N/A
BLOOD OR MEAT SPOT	None	None	Blood or meat spots totalling no more than 1/8 inch in diameter	Blood or meat spots totalling more than 1/8 inch in diameter

To evaluate the interior quality of eggs without breaking them open, the eggs are candled. Candling takes place in a darkened room and involves shining a light through the egg. To candle an egg, hold the small end of the egg between your thumb and first two fingers. Place the large end up to the candling light in a slanting position (see Figure 1). You can see the air cell and the yolk shadow within the albumen. For any 4-H poultry judging contest, the air cell will always be at the large end of the egg. While holding the egg between your thumb and first two fingers, turn your wrist quickly (Figure 1). This will cause the contents of the egg to twirl. The movement of the contents can tell you a great deal about the yolk and albumen.

When rotating the egg held up to the light, you may see the shadow of the yolk. The yolk of a fresh, high-quality egg will be surrounded by a rather dense layer of albumen. As a result, the yolk moves only slightly away from the center of the egg when it is twirled while being candled. Because of this, the yolk outline is indistinct or partially visible. As the egg ages or deteriorates in quality, the albumen becomes thinner and the yolk tends to move more freely and approaches the shell more closely. The yolk then becomes more visible when candled. The condition of the albumen, therefore, is determined largely by the movement of the egg yolk when the egg is candled. When twirling the egg, if the yolk retains its position in the center, the white is usually firm and thick.



Figure 1. Holding an egg for candling as shown from the front (left photo) and the side (right photo)



Point from which to measure air cell depth

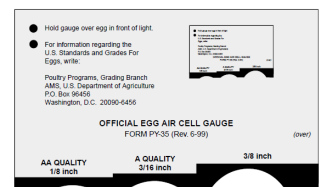


Figure 2. Use of the USDA air cell gauge to determine egg grade.

While observing the movement of the egg contents while twirling the egg, any blood or meat spots present will be visible. If there are small blood or meat spots that together total less than $\frac{1}{8}$ inch in diameter, the egg is a grade B. If there are large blood or meat spots (greater than $\frac{1}{8}$ inch in diameter) present, the egg is considered a loss egg. Contestants should not confuse meat spots with chalaza. The chalazae are strands of mucin fibers that help hold the yolk in the egg's center and may be prominent in some eggs. The chalaza is distinguished from a blood or meat spot by a bright area of refracted light that accompanies the chalaza's darker shadow.

If there are no blood or meat spots, the grade of the egg is based primarily on the air cell depth. The depth of the air cell

is the distance from its top to its bottom when the egg is held with the air cell up to the light. In a fresh egg, the air cell is very small. As the egg ages, evaporation takes place and the air cell increases in size.

There is an official USDA egg air cell gauge card that is used to grade egg (see Figures 2 and 3). If the air cell depth is $\frac{1}{8}$ inch deep or less, it is a Grade AA egg. If the air cell depth is greater than $\frac{1}{8}$ inch deep but less than $\frac{3}{16}$ inch deep, it is a Grade A egg. If the air cell is more than $\frac{3}{16}$ inch deep, it is a Grade B egg. **During a contest air cell gauges may not be used**, so contestants must learn to determine air cell depth without the use of a gauge.

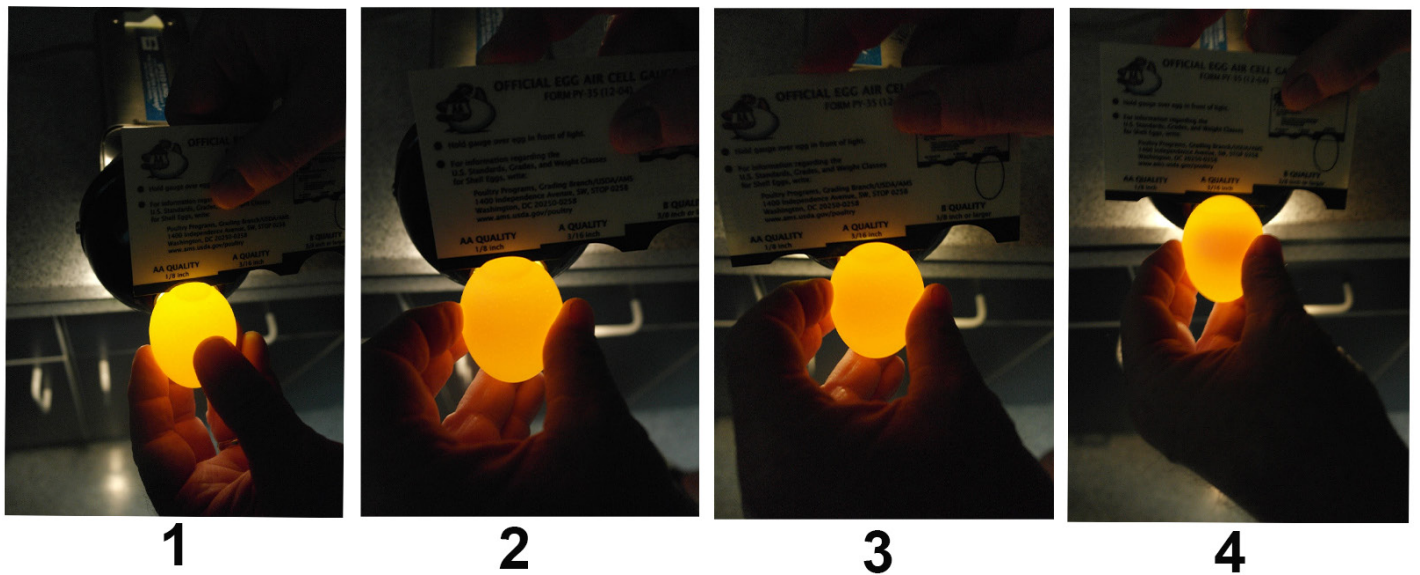


Figure 3. The use of the USDA air cell gauge to determine air cell depth in eggs. 1) Grade AA egg with an air cell depth less than $\frac{1}{8}$ inch allowed; 2) Grade A egg with air cell depth more than the $\frac{1}{8}$ inch allowed for Grade AA; 3) The same Grade A egg with an air cell gauge showing less than $\frac{3}{16}$ inch allowed for Grade A; and 4) Grade B egg with an air cell depth of more than $\frac{3}{16}$ inch allowed for a Grade A egg.