

California Poultry Letter

December 1996

Egg Quality at Major Retail Grocery Stores

During June through August, 1996, 107 major chain stores were visited in 5 states (California, Illinois, Pennsylvania, and North Carolina) by Extension Specialists. At each store, 3 one-dozen cartons were sampled from every large dozen egg brand present in the display case at the time of the store visit. Individual eggs were candled for visible quality defects (cracks, blood and meat spots, etc.), weighed, and then broken out for thick albumin height measurements. Individual egg Haugh Units were then calculated and averaged for each dozen eggs in the sample.

The accumulated time between packaging and our purchase of the eggs was determined from the date stamped on the carton. In many cases, the egg processor's policy regarding "sell-by" or "expiration" period was used to determine the age of the egg at the time of purchase. A total of 252 3-dozen large egg samples were collected in the study.

Both northern and southern California retail stores were included in the study (table 1).

These stores were located in Fresno, Modesto, Davis, San Jose, and Santa Rosa in northern California, and Los Angeles, San Diego and Riverside in southern California.

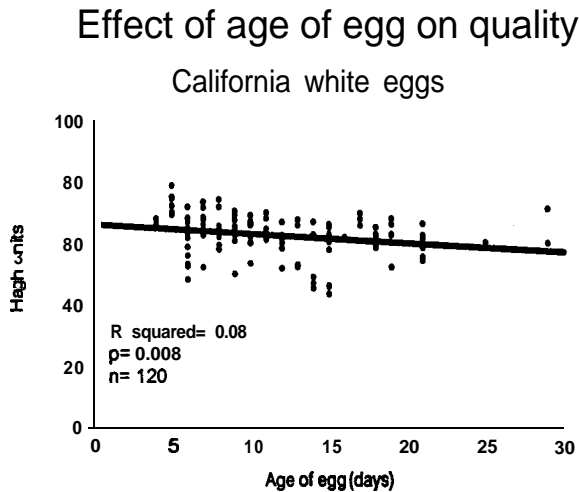
Table 1. California Stores Sampled

Northern California	No. of Stores	Southern California	No. of Stores
Albertson's	2	Gelson	1
Safeway	4	Hughes	1
Von's	1	Lucky's	2
SaveMart	2	Ralph's	2
Raley's	1	Von's	2
New Deal	1	Boneys	1
Food for Less	1	Stater Brothers	1
Nob Hill	1		
G & G	1		
Petrini's	1		
Lucky's	2		

The Relationship between age of the egg and interior egg quality (Haugh Units)

Figure 1 shows the relationship between age of the egg and Haugh units observed for white eggs in California.

Figure 1.

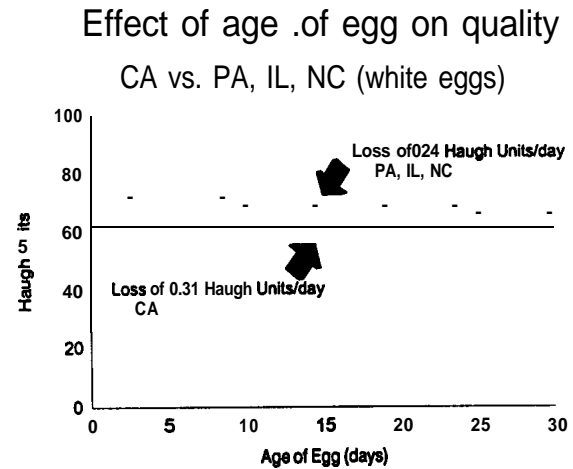


Older eggs tended to have lower Haugh units, which declined at the rate of 0.312 units per day post packaging. The average age of California eggs was 11.7 days. Eggs that have been stored for that period of time would be expected to lose 3.6 Haugh units. Age accounted for only six percent of the variability in Haugh units, which suggests that there are several other factors that effect interior egg quality.

Figure 2 compares the age-quality relationships between California and the

other three states (Pennsylvania, Illinois and North Carolina).

Figure 2.

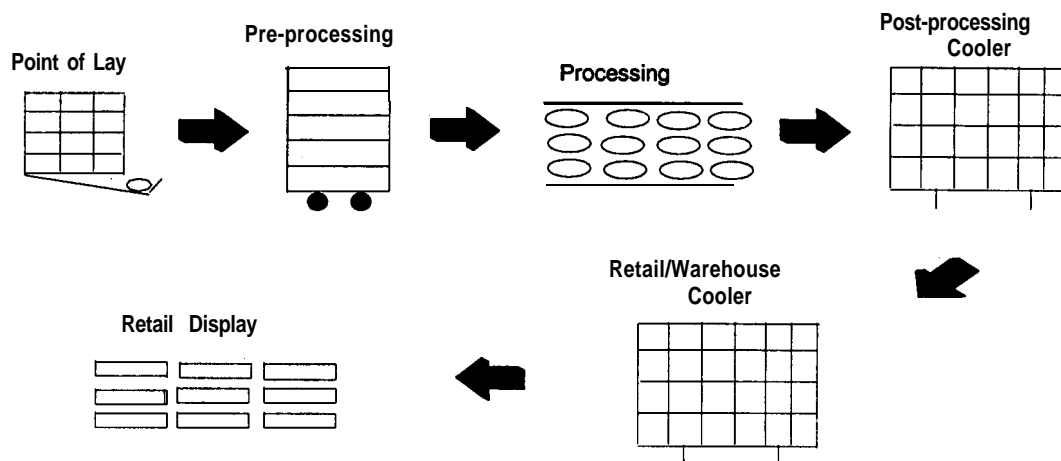


Differences between California and the other states were seen both in the rate of Haugh unit decline with time and the starting interior quality at packaging (zero days). California eggs had lower Haugh units at packaging and lost interior quality more rapidly than did the other states.

As mentioned earlier, there are several other factors in addition to age that are likely to contribute to changes in interior egg quality and that could account for the differences observed between California and the other states. At any given point along the egg’s journey from the lay house to the point of purchase there are factors that influence the starting egg quality as well as loss of quality with time (figure 3).

Figure 3.

The Egg's Journey



Factors that could influence egg quality at point of lay are genetics of the flock, age of the hens, environmental conditions in the lay houses (temperature and humidity) and the length of time the eggs remain in the house prior to collection. Differences between California and the other states regarding the amount of molting have resulted in California having an older average flock age. In addition, regional differences in strain preference could also contribute to a lower starting point for Haugh units.

Conditions under which the eggs are stored prior to processing can cause differences in interior quality. The most important of these are time, humidity and temperature. Warm temperatures and low humidity favor interior quality loss. Farms with in-line collection systems usually process eggs within 12 hours of the time they are laid, while farms without these systems require storage sometimes for up to two days.

Two factors affecting egg quality during processing are egg temperature and oiling. Studies have shown that hot wash and rinse

water can increase the external egg temperature to nearly the temperature of the water. This in turn creates a heat sink in the center of the egg which is cooler than the shell. Heat energy is therefore transferred to the interior of the egg until the shell and egg contents equilibrate. Eggs that have had their temperature monitored during post processing in the cooler actually heat up several hours before they cool. Oiling of eggs helps prevent the loss of carbon dioxide. The loss of carbon dioxide creates an environment favorable to the break-down of thick albumin thus causing loss of **Haugh** units. Both carbon dioxide loss and break-down of albumin occurs more rapid at higher temperatures. While increases in egg temperature during washing could theoretically effect the starting egg quality at time of packaging, oiling practices probably only effect the rate of decline in quality **after** packaging.

Interior quality loss that is associated with the age of the egg **after** packaging is primarily influenced by storage conditions at the processing plant cooler, warehouse or store holding facility and the retail display

case itself. Storage conditions of greatest concern are time, humidity and temperature.

The time that it takes to cool eggs after packaging in the processing plant's cooler is a critical factor in retaining egg quality. Several factors can influence this including: the heat sink created by washing, packaging materials, cooling capacity of the refrigeration unit and the desired **final** temperature. Cooling capacity and the degree to which the cool air has access to the eggs is critical. The materials used for packaging all act as insulators. This does not present a problem after the eggs are cooled, but does significantly slow down the rate of cooling. Eggs that are palletized in corrugated cardboard cases cool much more slowly than do eggs in wire baskets. In many cases, eggs never reach their target cold temperature in the processing plant cooler because they do not remain there long enough.

Storage time and conditions after the eggs leave the processing plant can vary substantially. Some store orders are assembled at the processing plant and then are trucked directly to the retail store, others are assembled at the processing plant and then trucked to a central distribution warehouse where they are transferred to a different truck for delivery, and still others are assembled for retail at a warehouse from bulk orders at the processing plant. The time it takes to reach the retail store can be quite different between these systems. In addition to time, other factors including: the **refrigeration** capacity of the delivery trucks, the number of stops the trucks make, and the temperature and humidity conditions of the warehouse or retail holding facility.

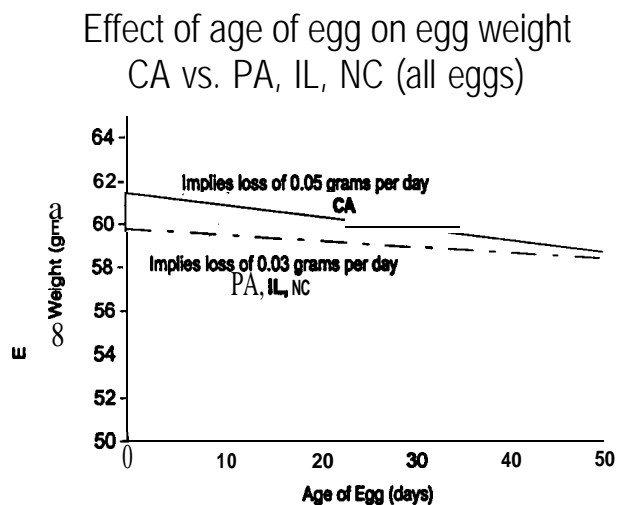
The final stop prior to sale is the display case itself. In California all but one retail

store had refrigerated display cases; however most did not have a thermometer in the case itself. Product rotation and turn-over are probably the most important factors at this level. Most stores attempt to rotate their oldest product to the **front** of the case; however the use of "sell-by", "expiration" and "packing" dates on the carton make it easy for the consumers to pick the **freshest** eggs from the display, thus countering the benefits of rotation. Pricing may also influence the turn-over rate of eggs. We observed that "specialty" eggs (fertile, **free-range**, low cholesterol etc.) had significantly higher prices and were also significantly older.

The relationship between the age of the egg and egg weight

A significant correlation was observed between age of eggs and egg weight for all states in the study (figure 4).

Figure 4.

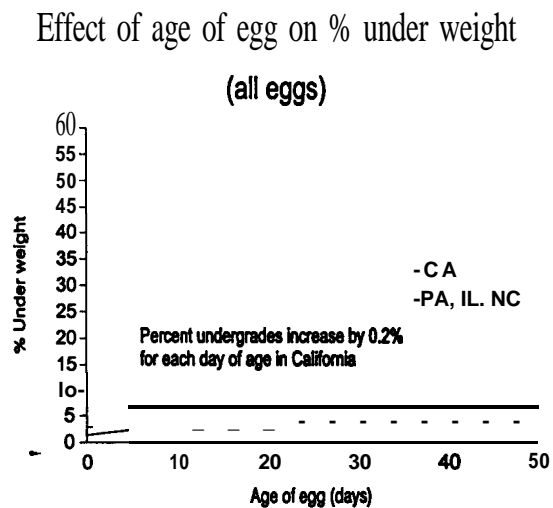


Older eggs weighed less, implying that the eggs shrink in weight as the eggs age. The rate of egg weight loss was 0.05 grams per day after packaging for California, while the

other states averaged only 0.03 grams per day. California's large eggs weighed an average of 61.4 grams at point of packaging compared with 59.8 grams for the other states. The fact that California eggs weighed more than those from the other states is probably due to California's older flock age. Differences in rates of egg weight loss could be due to a combination of environmental conditions during storage working together with differences in egg shell quality which is also age related, oiling practices, and differences in the use of foam packaging between the states.

Egg weight loss can lead to eggs weighing less than the minimum 53.4 gram standard for large eggs if the egg scales during processing are set close to the tolerance. Figure 5 shows a significant egg age effect on the number of eggs falling below the minimum standard for large eggs in California, but not for the other states.

Figure 5.



The 0.2 percent increase in under weight eggs per day of storage in California suggests that processing plants here are packing eggs more closely to tolerance than the other states.

Conclusions

Significant relationships were observed between age of the egg post packaging and loss of quality and egg weight. Age, however, accounted for only 6 percent of the variability in **quality**, suggesting that many other factors effect quality as well. Flock age and strain differences between the states likely accounts for some of the differences observed. Other factors such as storage environments, oiling practices and packaging materials may also play a role. Increases in the percentage of under-weight eggs in California is probably reflective of grading close to egg weight tolerances.

D. R Kuney
Area Poultry Farm Advisor
Southern California Region

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J. Price Schroeder
2/25/17 - 9/16/96

J. Price Schroeder, 79, of Palm Springs, California died September 16, 1996 following surgery. Price was well known to the turkey industry in California, having worked as Area Turkey Farm Advisor for 22 years. After retirement Price and his second wife **Bernice** moved to Palm Springs where he was active in several local organizations. Price is survived by four daughters and his wife, **Bernice**. Price will be missed by his many friends in the University and poultry industry. Donations in his name may be made to the **PePa** Scholarship and Research Foundation, 1521 "I" Street, Sacramento, CA 958 14.

Ralph A. Ernst
Extension Poultry Specialist
U.C. Davis

JOINT FSIS/FDA CONFERENCE ON EGG REFRIGERATION - TIME AND TEMPERATURE

This panel was convened by FSIS and FDA to review information and expert testimony about shell egg and processed egg refrigeration. These agencies have stated their intent to develop and publish an egg refrigeration regulation. The CEC Board felt that California should have input into any such discussion and arranged for (and financed) Peter Olsen, Amie Riebli and I to address the panel. Copies of the written testimony presented by each of us is available from the CEC office. Testimony was coordinated to some extent by UEP who also presented testimony.

Collectively we attempted to document the differences between shell eggs and other products such as milk, liquid eggs, etc. Intact shell eggs resist bacterial penetration and growth as a result of their many unique physical and chemical properties. Important physical properties are the shell, shell membranes, thick albumen and yolk membrane. All egg producers know that the thick albumen breaks down with storage time and that this is accelerated by high temperatures. Therefore, refrigeration contributes to egg safety in two ways. Lower **temperatures** retard bacterial growth but they also slow the breakdown of the thick albumen. Thick albumen retards penetration of bacteria **from** the shell membrane into the yolk where it would grow at a faster rate. There are also chemical substances in the albumen which inhibit bacterial growth. Some of these render

elements such as iron (conalbumin) and biotin (avidin) unavailable to the bacteria. Lysozyme is another important component of albumen which can disrupt the cell walls of bacteria.

We pointed out that any change in refrigeration regulations which would delay timely egg movement to consumers, would also have a negative impact on interior quality and microbial safety of eggs.

I presented results of a recently completed study of egg sweating **funded** by CEC. In this study shell eggs were intentionally contaminated on the outside of the shell with about 6 million *Salmonella enteritidis* (SE) per egg. This study showed that sweating did not increase the movement of SE into sound or cracked eggs. Cracked eggs were more --frequently found contaminated **with SE** and numbers of bacteria were much higher than found in sound eggs. This emphasizes the importance of removing as many cracked eggs as possible from consumer packs.

Finally I emphasized the successful efforts in California by industry and government, to develop a farm-to-table animal food safety program which we call the California Egg Quality Assurance Program. I suggested that this program offers the best hope of reducing pathogens in shell eggs when combined with good processing, handling, and refrigeration, and timely marketing.

*Ralph Ernst, Poultry Specialist
Department of Avian Sciences
University of California, Davis*

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1997 CALENDAR

January 12-15, National Turkey Federation Convention, San Francisco, California. (202) 898-0100.

January 22-24, International Poultry Exposition, Atlanta, Georgia. U.S. Poultry and Egg Association (404) 493-940 1.

February 11-12, Northwest Poultry Workshop, Sweetbrier Inn, Tualatin, Oregon 97062. Phone **800/551-9167** for room reservations. For additional information contact Connie Burmester, P.O. Box 3003, Portland, OR 97208; Telephone 503/777-1320; Fax **503/777-2373**.

March 1, American College of Poultry Veterinarians-Sponsored Hatchery Workshop, Sacramento, California. Continuing education workshop on the effect of the hatchery on hatchability and **chick/poult** quality. Registration is \$100 and seating will be limited to 100 participants. Dr. Jose Linares (206) 8851414.

March 1-4, 46th Western Poultry Disease Conference, Sacramento, CA. Registration forms available in early 1997 from Lina Caparas, Conference and Event Services, UC Davis (916) 757-3331.

April 8-11, Pacific Egg and Poultry Association Annual Convention, Palm Springs, California. (916) 441-0801.

June 25-27, Oregon/Washington Poultry Industries Joint Annual Convention, Inn of the Seventh Mountain, 18575 SW Century Drive, Bend, Oregon 97702. Phone 1-800-452-68 10 for room reservations. For additional information contact Connie Burmester, P.O. Box 3003, Portland, OR 97208; Telephone **503/777-1320**; Fax **503/777-2373**.

CALIFORNIAN'S HONORED BY AAAP

At the summer meeting of the American Association of Avian Pathologists, Dr. Richard Yamamoto and Dr. Bryan Mayeda were elected to life membership in the association. Dr. Yamamoto is retired **from** the Veterinary School faculty at UC Davis. He was widely known for his pioneering research on avian mycoplasma and Infectious coryza. Dr. Mayeda served on the California Department of Food and Agriculture Diagnostic Laboratory staff for many years. When he retired he was head of the Diagnostic Laboratory at Petaluma California. He was known for his tireless pursuit of poultry disease problems and his willingness to help any producer with a problem. Our congratulations to these two deserving recipients.

UC DAVIS DEPARTMENT OF AVIAN SCIENCES WEBPAGE

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