

Yolk Cholesterol in Eggs from Various Avian Species

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IN THIS study 36 eggs from Pekin ducks, 28 eggs from White Holland turkeys, 37 eggs from Fayoumi hens and 33 eggs from Japanese quails were collected for estimating egg weight, yolk weight and yolk cholesterol content.

Cholesterol content of egg yolk (mg/g of yolk) was found to be 19.27 in ducks, 15.67 in turkeys, 14.18 in Fayoumi and 11.96 in quails. Concerning the previous traits, breed had a significant effect.

The cholesterol in the whole yolk was positively correlated with cholesterol per gram of yolk. Negative correlations, but insignificant, were found between cholesterol in gram of yolk and egg weight and yolk weight.

Limited information is available on the effects of breed or strain on cholesterol content of eggs. Significant yolk cholesterol differences among strains and among hens within strains were obtained by Edwards *et al.* (1960). Harris and Wilcox (1958) reported that the cholesterol content of egg yolk could be relatively constant among eggs of different species of birds. They indicated also that the duck's egg was markedly richer in yolk cholesterol than the hen's egg. Recent studies showed a high cholesterol concentration in duck, turkey and quail eggs than in chicken eggs. Turk and Barnett (1971) reported values of 9.33, 8.84 and 5.53 mg cholesterol of gram eggs respectively. Bair and Mariow (1977) reported also values of 16.2, 16.0, 14.3, 14.0, 12.8, 14.7, 15.8, 17.5 and 22.0 mg cholesterol/gram yolk of eggs for duck, turkey, Japanese quail, domestic fowl, Guinea fowl, pheasant, African goose, white goose and dove respectively.

Miller and Denton (1962) found a value ranged between 15.5-17.5 mg cholesterol per gram egg yolk depending upon the breed of bird and season of year. However, Harris and Wilcox (1958) reported insignificant cholesterol value differences of the eggs

during the various periods of the year. They found also significant positive correlations (from 0.3 to 0.5) from the cholesterol values of eggs laid by the same hen whether the eggs were taken over a large time interval (5 months) or from two eggs laid during the same period.

A negative correlation between the concentration of yolk cholesterol and yolk weight was observed by Harris and Wilcox (1963) and Kicka *et al.* (1979). They found also a positive correlation between yolk cholesterol level and both egg weight and cholesterol per yolk. However, Gissel *et al.* (1977) found that cholesterol content was not correlated with egg weight.

The purpose of the present study was to determine the yolk cholesterol in duck, turkey, fowl and Japanese quail eggs.

Material and Methods

This investigation was carried out on 36 Pekin ducks, 28 White Holland turkeys, 37 Fayoumi hens and 33 Japanese quails (*Coturnix Coturnix Japonica*). During the period of experiment they were fed the same laying mash which content 40% maize, 15% wheat bran, 20% decorticated cotton seed meal, 10% protylan, 8% blood meal, 7% yeast, 0.5% salt (sodium chloride), 1.5% limestone and 1% vitamin A and D₃ (Vitamin A 5000 IU/g and D₃ 500 IU/g. Crude protein was 19.0% and starch value 77.9.

One egg from each bird was taken at random from the eggs layed during a week. During 24 hr from laying, the egg was weighted, broken and the shell discarded. The egg yolk was carefully separated from the albumen and mixed with a glass stirring rod. Duplicated one-gram sample material were collected and the rapid technique of extraction of egg yolk cholesterol modified by Washburn and Nix (1974) was started. In this procedure 15 ml of 2:1 chloroform-methanol was added to 1 g egg yolk, the sample shaken by hand, 5 ml of H₂O added and hand shaken again. After centrifugation, the aqueous-methanol layer removed and the chloroform layers was filtered. Total cholesterol content of the samples was determined according to the method described by Courchaine *et al.* (1959). The absorbance of the purple colour was measured at 550 mm against a blank reagent using a Unicam sp/800 spectro-

photometer. A standard curve was conducted using pure dry cholesterol and the result were calculated as mg cholesterol per gram yolk.

The data were analysed according to Duncan (1955). Phenotypic correlations were calculated between cholesterol per gram of yolk and egg weight, yolk weight and yolk cholesterol.

Results and Discussion

The means of the studied traits (egg weight, yolk weight, mg cholesterol/g of yolk and yolk cholesterol) and its significant are shown in Table 1. There were significant differences in all traits between the four studied avian species. The highest cholesterol value was 19.27 mg/g yolk for the duck followed by the turkey (15.67) and the Fayoumi (14.18) but the lowest value of 11.96 obtained for the quail. These values were nearly in agreement with other published data. Bair and Mariow (1977) reported mg cholesterol/g yolk of 16.2, 16.0, 14.3 and 14.0 for eggs from duck, turkey, Japanese quail and domestic fowl respectively. Harris and Wilcox (1958) indicated that the duck eggs were markedly richer in yolk cholesterol than the hen eggs. The same results were obtained when comparing between yolk cholesterol of the different breeds studied (Table 1).

TABLE 1. Means* of some egg traits in different breeds.

Breed	egg wt.	Yolk wt.	mg cholesterol/gm of yolk	mg cholesterol/yolk
Pekin duck	65.32 ^a	22.29 ^a	19.27 ^a	432.40 ^a
White Holland turkey	76.13 ^b	24.71 ^b	15.67 ^b	387.40 ^b
Fayaumi fowl	48.31 ^c	16.11 ^c	14.18 ^b	230.32 ^c
Japanese quail	9.66 ^d	3.17 ^d	11.96 ^c	37.80 ^d

* Means within a column followed by different letters differ significantly ($p < 0.01$) from each other.

The phenotypic correlations for mg cholesterol/g yolk with other traits are presented in Table 2. There was a high and positive phenotypic correlation between mg cholesterol per gram of

yolk and yolk cholesterol for the different breeds. Meanwhile, a negative and insignificant phenotypic correlations were present between the level of cholesterol in yolk and yolk weight and egg weight. The same results were obtained by Harris and Wilcox (1963) and Kicka *et al.* (1979).

TABLE 2. Phenotypic correlations between mg cholesterol per gram of yolk and egg weight, yolk weight, yolk cholesterol for the different breeds.

Breed	Egg wt.	Yolk wt.	mg cholesterol/yolk
Pekin duck	-0.24	-0.17	+0.84 ^{**}
White Holland turkey	-0.09	-0.05	+0.81 ^{**}
Fayoumi fowl	-0.18	-0.27	+0.55 ^{**}
Coturnix quail	-0.01	-0.13	+0.55 ^{**}

** $p < 0.01$.

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نسبة الكولستيرول في بيض بعض الانواع من الطيور

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في هذه الدراسة اخذت ٣٦ بيضة من البط البكينى ، ٢٨ بيضة من الرومى الهولندى الابيض ، ٣٧ بيضة من الدجاج الفيومى ، ٣٣ بيضة من السمان اليابانى وذلك لقياس وزن البيضة ، وزن الصفار ، نسبة الكولستيرول في الصفار ، وكمية الكولستيرول في الصفار وكانت النتائج كما يلي :

متوسط نسبة الكولستيرول لكل جرام من الصفار كان ١٩.٢٧ ملليجرام في البط ، ١٥.٦٧ في الرومى ، ١٤.١٨ في الفيومى ، ١١.٩٦ في السمان .

والفروق بين هذه المتوسطات كانت معنوية على مستوى ١٪ .

كذلك نسبة الكولستيرول في الصفار ووزن الكولستيرول في الصفار. اما الارتباط بين نسبة الكولستيرول في الصفار ووزن البيضة او وزن الصفار فكان سالباً وغير معنوى .