

Research shows eggs from pastured chickens may be more nutritious

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(PhysOrg.com) -- A study conducted by researchers in Penn State's College of Agricultural Sciences has shown that eggs produced by chickens allowed to forage in pastures are higher in some beneficial nutrients.

In the research, titled "Vitamins A, E and fatty acid composition of the eggs of caged hens and pastured hens," which was published online this year in the January issue of *Renewable Agriculture and Food Systems*, researchers examined how moving pastured hens to forage legumes or mixed grasses influenced hen egg omega-3 fatty acids and concentrations of vitamins A and E.

The study also compared the eggs of the pastured hens to those of hens fed a commercial diet. The differences were striking, according to lead investigator Heather Karsten, associate professor of [crop production ecology](#).

"Compared to eggs of the commercial hens, eggs from pastured hens eggs had twice as much vitamin E and long-chain omega-3 fats, more than double the total omega-3 fatty acids, and less than half the ratio of omega-6 to omega-3 fatty acids," she said. "Vitamin A concentration was 38 percent higher in the pastured hens' eggs than in the commercial hens' eggs, but total vitamin A per egg did not differ."

The Penn State researchers used a "cross-over design" in the study to compare the influence of different pasture plant species. Seventy-five sister hens were assigned to one of three pasture treatment groups -- alfalfa, red and white clover or mixed cool-season grasses.

Groups of hens were rotated to all three pasture treatments, each for two weeks, and their diets were supplemented with commercial hen mash chicken feed. Pasture botanical composition, forage mass, leaf-to-total ratio and plant fatty-acid composition were compared among pasture treatments. Eggs of the pastured hens were compared to eggs of 50 sister hens that were fed only commercial hen mash in cages for the entire six weeks.

"The chicken has a short [digestive tract](#) and can rapidly assimilate dietary nutrients," said Paul Patterson, professor of poultry science, who was a co-investigator in the project. "Fat-soluble vitamins in the diet are readily transferred to the liver and then the egg yolk. Egg-nutrient levels are responsive to dietary change.

"Other research has demonstrated that all the fat-soluble vitamins, including A and E, and the unsaturated fats, linoleic and linolenic acids,

are egg responsive, and that hen diet has a marked influence on the egg concentration."

Forage parameters in the study varied somewhat, Karsten conceded, but did not explain plant linolenic acid variation. Seventeen of the 18 quantified egg fatty acids and vitamin A concentrations did not differ among the three pasture treatment groups. Eggs of the hens that foraged grasses had 23 percent more vitamin E than eggs of hens that foraged clover. "Results suggest that grass pastures may enhance vitamin E in eggs of pastured hens more than clover," she said.

The researchers noted that the hens did not forage to the degree necessary to meet their requirements for energy and protein, when compared to the commercial birds. At the end of the experiment, pastured hens weighed 14 percent less and averaged 15 percent lower egg production than commercial birds.

"Pastured hens were lacking dietary protein and energy to match the intake of the commercial hens," Patterson explained. "We have since estimated that, at the level of voluntary forage consumption of hens in this study, pastured hens would require additional mash feed to sustain body weight and egg production equal to that of the commercial [hens](#)" "Supplementing the birds with additional mash, however, would likely result in reduced omega-3 fatty acid and vitamin A and E concentrations in their eggs," he added. "Further research is needed to identify how to optimize pastured poultry feed supplementation for optimum egg production, hen welfare and egg nutritional quality."

Producing poultry on pasture or cover crops is becoming a popular way for livestock and crop farmers to diversify their operations in the United States, especially in the Northeast. Poultry are often rotated onto pastures after cattle or sheep, where they forage on regrowth and scavenge for invertebrates in manure deposits, often helping to distribute

manure nutrients.

Recent research indicates that livestock products from animals that forage grasslands have a higher concentration of omega-3 fatty acids and fat-soluble vitamins than livestock products from animals that are fed grain and stored-feed diets, Karsten pointed out. But studies of pastured poultry are limited.

The experiment was conducted at Penn State's Dairy Cattle Research and Education Center. Prior to the experiment, the field was rotationally grazed with dairy heifers and dry cows, with excess forage harvested. Pastures were mowed occasionally to maintain them in similar vegetative stages of development.

Provided by Pennsylvania State University

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