

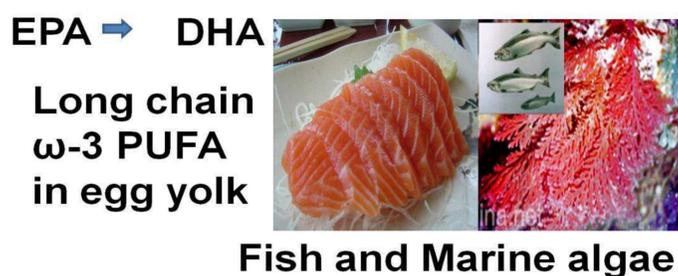
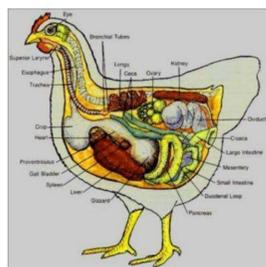
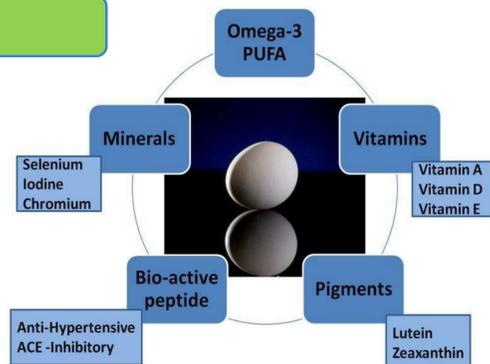


# Uniformity and Stability of Omega-3 PUFA Enriched Table Eggs

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## Background

- The diet containing fat soluble enrichment ingredients (Omega-3 polyunsaturated fatty acids ( $\omega$ -3 PUFA), Lutein and Vitamin E ) can be fed in hen diets to enrich eggs for consumer use.
- The use of 10 to 15 % flax in feed is most economical way to enrich the egg with  $\omega$ -3 PUFA .
- The use of extruded flax or ground flax with carbohydrase enzymes are efficient way to enrich egg with  $\omega$ -3 PUFA .
- The  $\omega$ -3 PUFA in eggs has proven health benefits to the human in preventing chronic heart disease.
- The flax is primarily a source of medium chain  $\omega$ -3 PUFA, LNA , however, birds can convert LNA into EPA and DHA.



- Lutein in egg yolk is most bioavailable for humans and prevents age related macular degeneration in eyes.



Normal

As Age Advances

## Objectives

- To optimize the level and duration of feeding  $\omega$ -3 PUFA enriched diet to prevent overloading of  $\omega$ -3 absorption capability of bird.
- Uniform and stable enrichment level in each egg at low cost of production.

## What we observed ?

- The target threshold of 300 mg of total  $\omega$ -3 PUFA/egg (Market labeling requirement) can be achieved in just 5 d using a 15% of an extruded flax product.
- The feeding of extruded flax as in Linpro (equivalent to 7.5% flax) had resulted in higher  $\omega$ -3 PUFA enrichment compared to feeding 10 % of ground flax in hen ration.
- There is no negative interaction of feeding 10% of flaxseed with lutein (500 ppm) in hen ration for the enriching eggs.
- The Long chain  $\omega$ -3 PUFAs (multiple double bond) in egg yolk are highly susceptible to oxidative damage during the storage of egg for 30 d at 4 °C with most prominent reduction in C 20:5  $\omega$ -3 (**EPA**).
- Inclusion of lutein to the flax diet had protective effect on the Long Chain  $\omega$ -3 PUFAs during storage.
- The hens grouped on the base of energetic efficiency had differences at the gut level, with the Efficient hens had 25% longer villi, resulting in greater absorptive surface area/villi than in Non-efficient.
- The co-efficient of variability for total  $\omega$ -3 PUFA in egg yolk from efficient hens was lower than that of non-efficient birds (11.1 vs. 21.4), indicating a more uniform level of enrichment.

## What does this mean ?

- Strategies to improve incorporation of enrichment ingredients into the yolk include modifying the mode of delivery of ingredient, or modifying the ingredients themselves.
- Feeding the enrichment ingredients beneficial for birds, targeting the human health and with increased stability will help to economize the enrichment process.
- Utilizing more energetically efficient birds for the purpose of value-added egg enrichment might help in reducing the variability in end product.
- Feeding the birds at right age with optimum dietary level and time period will help to reduce the individual bird to bird variability to transfer the enrichment.

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