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Abstracts

Vitamins

Depletion of serum alternative complement pathway activity in gilthead seabream (*Sparus auratus*) caused by α-tocopherol and *n* − 3 HUFA dietary deficiencies

D. Montero[a], L. Tort[b], M.S. Izquierdo[c], L. Robaina[c], J.M. Vergara[c]

[a]*Instituto Canario de Ciencias Marinas, Gobierno de Canarias, P.O. Box 56, 35200 Telde, Las Palmas, Canary Islands, Spain*

[b]*Dpto. de Biologia Celular y Fisologia, Facultad de Ciencias, Univ. Autonoma de Barcelona, 08193 Bellaterra, Barcelona, Spain*

[c]*Dpto. de Biologia, Univ. de Las Palmas de Gran Canaria, 35017 Las Palmas de Gran Canaria, Canary Islands, Spain*

Serum alternative complement pathway (ACP) is an important part of the non-specific immune system in fish. Several factors, including nutrition and stress, are known to affect complement activity. Although vitamin E deficiencies have been reported by some authors to cause complement depletion, little is known on the effect of essential fatty acids on the complement activity. The ACP activity in gilthead seabream fed different dietary levels of α-tocopherol and *n* − 3 HUFA was studied under different stress conditions. A significant reduction in ACP activity was found when diets with marginal deficiencies in α-tocopherol and *n* − 3 HUFA were assayed, regardless the type of stress applied. Plasma cortisol and total plasma protein levels were also studied and results discussed in connection with ACP depletion. Both α-tocopherol and *n* − 3 HUFA deficiencies significantly decreased juvenile gilthead seabream immunocompetence.

Combined effect of dietary α-tocopherol and *n* − 3 HUFA on egg quality of gilthead seabream (*Sparus auratus*) broodstock

H. Fernandez-Palacios[a], M.S. Izquierdo[b], M. Gonzalez[b], L. Robaina[b], A. Valencia[a]

[a]*Instituto Canario de Ciencias Marinas, Gobierno de Canarias, P.O. Box 56, 35200 Telde, Las Palmas de Gran Canaria, Spain*

[b]*Dpto. de Biologia, Univ. de Las Palmas de Gran Canaria, Tafira Baja, 35017 Las Palmas de Gran Canaria, Spain*

Dietary α-tocopherol and essential fatty acids are some of the nutrients that greatly affect gonadal development and fecundity in fish. In gilthead seabream, a non-synchro-

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nous ovarian fish, the biochemical composition of female organs and subsequently their gametes quality are affected by spawning nutritional regimes. Although the importance of essential fatty acids in broodstock diets for gilthead seabream has been extensively studied, the effects of other nutrients on gamete quality have not been investigated in detail. Fifteen gilthead seabream broodstock groups were fed for 2 months with one of five experimental diets containing four α-tocopherol levels (ranging from 20 to 2000 mg/kg), combined with two *n*-3 HUFA levels (1.6 and 2.5 g/100 g). Eggs produced naturally by each female were collected daily. Egg viability and percentage of abnormal eggs improved with increasing dietary α-tocopherol levels. α-Tocopherol content in fish eggs also increased proportionally with increasing dietary level.

Effects of cholecalciferol and triiodothyronine on bioavailability of dietary phosphorus in rainbow trout, *Oncorhynchus mykiss*

D.I. Skonberg[a], R.W. Hardy[b], F.M. Dong[a]

[a]*School of Fisheries, University of Washington, 3707 Brooklyn Ave. NE, Seattle, WA 98105, USA*

[b]*National Marine Fisheries Service, 2725 Montale Blvd. E, Seattle, WA 98112, USA*

The overall objectives of our research on phosphorus metabolism in rainbow trout are: (1) to determine methods to increase bioavailability of dietary phosphorus, and (2) to formulate minimally polluting fish feeds. The goal of this study was to examine the effects of supplemental dietary vitamin D_3 (cholecalciferol) and thyroid hormone (triiodothyronine; T_3) on the bioavailability of dietary phosphorus by rainbow trout. Results from recent studies by other investigators indicate that vitamin D_3 and its metabolites may help to maintain phosphorus homeostasis in fish. Recent reports also suggest that thyroid hormones promote phosphorus absorption in animals by enhancing synthesis of phosphorus transport proteins. Fingerling rainbow trout (3.4 g) were fed one of 8 semi-purified wheat gluten based diets or a fish meal control diet for 14 weeks. The test diets were formulated to compare the effects of total phosphorus concentration (0.15 or 0.5%), supplemental dietary D_3 level (0, 2000 or 200,000 IU/kg) and dietary T_3 (0 or 100 ppm) on % ash, phosphorus, and calcium and magnesium in whole body, skin, vertebrae and plasma, and alkaline phosphatase in plasma and intestine. Dietary phosphorus concentration had a significant effect on fish weights and on mineral concentrations in whole body, skin, and vertebrae. Weight, mineral concentrations, and plasma alkaline phosphatase activities were not significantly affected by dietary D_3 levels. The addition of T_3 to the diet resulted in decreased magnesium concentrations and increased phosphorus and calcium concentrations in whole body, vertebrae and skin.

L-Gulono-γ-lactone oxidase is not down-regulated in lake sturgeon (*Acipenser fulvescens*) by dietary ascorbic acid

R. Moreau, K. Dabrowski

School of Natural Resources, The Ohio State University, Columbus, OH 43210, USA

Sturgeon have the ability to synthesize L-ascorbic acid (AA) de novo due to the presence of L-gulono-γ-lactone (GLO) in renal cell microsomes. The effect of increasing