Dietary alpha-linolenic acid enhances omega-3 long chain polyunsaturated fatty acid levels in chicken tissues

L.R. Kartikasari, R.J. Hughes, M.S. Geier, M. Makrides, R.A. Gibson

*FOODplus Research Centre, School of Agriculture, Food and Wine, University of Adelaide, Adelaide, SA, Australia
South Australian Research and Development Institute (SARDI), Pig and Poultry Production Institute, Roseworthy Campus, SA, Australia
School of Animal and Veterinary Sciences, University of Adelaide, Roseworthy, SA, Australia
School of Paediatrics and Reproductive Health, University of Adelaide, Adelaide, SA, Australia
Child Nutrition Research Centre, Women's and Children’s Health Research Institute, Women's and Children's Hospital, North Adelaide, SA, Australia
Department of Animal Product Technology, Faculty of Agriculture, Sebelas Maret University, Central Java, Indonesia

Abstract

The effects of enriching broiler chicken diets with a vegetable source of n-3 fat in the form of alpha-linolenic acid (ALA, 18:3n-3) on the accumulation of n-3 long chain polyunsaturated fatty acids (LCPUFA) in chicken meat were investigated. Sixty unsexed one-day-old broiler chickens (Cobb 500) were randomly allocated to one of six diets (n=10 birds/diet) for 4 weeks. The ALA levels varied from 1 to 8% energy (%en) while the level of the n-6 fatty acid linoleic acid (LA, 18:2n-6) was held to less than 5%en in all diets. At harvest (day 28) the levels of n-3 LCPUFA including eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA) and docosahexaenoic acid (DHA) in breast and thigh meat increased in a curvilinear manner as dietary ALA increased, reaching 4- to 9-fold above the levels seen in control birds. In contrast, arachidonic acid (AA) was reduced in response to increasing dietary ALA.

Abbreviations

AA, arachidonic acid; ALA, alpha-linolenic acid; DHA, docosahexaenoic acid; DPA, docosapentaenoic acid; EPA, eicosapentaenoic acid; FAME, fatty acid methyl ester; MUFA, monounsaturated fatty acid; LA, linoleic acid; LCPUFA, long chain polyunsaturated fatty acid; %en, percent of energy; PL, phospholipids; TL, total lipid; SFA, saturated fatty acid.

Keywords

Omega-3 enrichment; Docosahexaenoic acid; Eicosapentaenoic acid; Chicken meat; Alpha-linolenic acid