Concurrent Session 8: Lipids in human health

Genotypic variation in muscle fatty acid composition of pure and cross-bred yearling sheep

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Background – Ruminant depot fat has a high saturated fatty acids (SFA) to polyunsaturated FA (PUFA) ratio due to ruminal hydrogenation of dietary FA. However, the lipid contained in trimmed lamb (intramuscular fat) contains a higher proportion of PUFA and omega-3 (ω-3) FA than depot lipid and may provide important sources of these FA.
Objectives – To determine the variation in muscle FA between genotypes in 14 month old yearling sheep.
Design – One side of 147 carcasses from five genotypes (pure Merino=Merino; Border Leicester x Merino= BLM; Poll Dorset selected for growth x Merino=PDgM; Poll Dorset selected for muscling x Merino= PDmM; PDg x BLM= 2X) of sheep maintained under the same grazing conditions were used. Carcass lean and fatness, entire loin muscle weight and muscle FA composition were determined.
Outcomes – Carcass fatness (%) increased in an ascending order from Merino to Poll Dorset to Border Leicester genetics. Muscle lipid, SFA, PUFA:SFA ratio and omega-3 FA did not differ between genotypes.

Variable	Merino	BLM	PDgM	PDmM	2X	SED	P-value
Carcass lean (%)	73.1	66.7	69.3	70.5	66.9	1.32	0.001
Carcass lipid (%)	22.9	29.7	26.9	26.0	29.6	1.36	0.001
Loin muscle weight (g)	685	752	853	803	878	43.7	0.01
Loin muscle lipid (g/100 g muscle)	5.12	5.56	5.24	5.64	5.71	1.2	0.71
Muscle ω-3 FA (mg/100g muscle)	195	207	196	181	193	35.5	0.65
Muscle SFA (mg/100g muscle)	2217	2350	2257	2461	2501	497	0.67
Ratio of muscle PUFA:SFA	0.25	0.24	0.23	0.22	0.20	0.03	0.73

Conclusion – These data indicate that consumption of one serve of yearling sheep meat (150 g) would contribute 120 mg of long chain ω-3 FA to their diet, which is 24% of the suggested daily allowance recommended by the National Health and Medical Research Council 2005.

Dose dependent changes in plasma triglycerides with DHA supplementation

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Background – Increased consumption of the long chain omega-3 (n-3) fatty acids eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA) is associated with a reduction in cardiovascular (CV) and inflammatory risk factors but it is unclear what level of intake is required to achieve benefits**.**
Objective – The aim of this study was to establish a relationship between changes in red blood cell (RBC) membrane DHA levels and changes in CV and inflammatory risk factors.
Design – Seventy subjects (42 males and 28 females, mean age 51.8 yr) with habitually low dietary n-3 intake, elevated triglycerides (> 1.6 mmol) and BMI > 25 kg/m^2 were enrolled in a randomized, double-blind, placebo-controlled intervention trial. Subjects were assigned to consume 6 x 1g oil capsules per day for 12 weeks. Varying combinations of DHA-rich tuna oil (26% DHA, 6% EPA) or sunflower oil (placebo) capsules provided intakes of 0, 2, 4 or 6g of either oil/day. RBC membrane fatty acid composition and markers of CV risk and inflammation were measured.
Outcomes – DHA incorporation into RBC membranes increased over 12 weeks and was proportional to the level of DHA consumed ($P<0.05$). After 6 weeks of supplementation, there was a dose-response relationship between the intake of DHA and reduction in plasma triglycerides ($R=0.315$, $P<0.05$), with no effect on plasma cholesterol.
Conclusions – Plasma triglycerides are reduced in a dose-dependent manner in response to supplementation with DHA-rich fish oil. The relationship between the intake of DHA, its incorporation into RBC membranes and changes in markers of cardiovascular risk may provide a potential index of the health benefits of DHA rich foods.