The effect of consuming farmed salmon compared to salmon oil capsules on long chain omega 3 fatty acid and selenium status in humans

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Melanie Pauga

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ABSTRACT

Salmon is a good source of long chain (LC) omega 3 fatty acids and selenium; these are well recognised for their health benefits. Recommendations for LC omega 3 fatty acid intakes presume equivalence between fish and fish oil. The aim of this research was to compare the effects of consuming salmon with salmon oil capsules on LC omega 3 fatty acid and selenium status.

Forty four healthy subjects were randomly assigned to consume either two servings of 120 g farmed New Zealand King (FNZK) salmon/week or 2, 4 or 6 capsules of salmon oil/day for 8 weeks. Fasting blood samples, anthropometric measures, food consumption habits information and blood pressure (BP) measurements were obtained at the study commencement and ending.

Each subject's intake of LC omega 3 fatty acids and selenium was determined by analysing the fatty acid and selenium content of duplicate portions of cooked salmon and capsules. The amount of salmon consumed was then calculated by subtracting unconsumed amounts of salmon and then calculating the intake of LC omega 3 fatty acids as grams of LC omega 3 fatty acids consumed per day. Percentage of compliance to capsule intake, based on counts of unconsumed capsules, was calculated to determine the amount of LC omega 3 fatty acids consumed per day from capsules. Change in red blood cells (RBC) LC omega 3 fatty acid levels from equivalent amounts of LC omega 3 fatty acids consumed from capsules and salmon were compared using linear regression analysis predictive models fitted to the capsule data. Omega 3 index was calculated.

LC omega 3 fatty acid intakes from salmon and 2, 4 and 6 capsules were 0.82, 0.24, 0.47 and 0.68 g/day, respectively. Equal amounts of LC omega 3 fatty acids consumed from salmon and capsules resulted in similar increases in RBC LC omega 3 fatty acids and omega 3 index (RBC eicosapentaenoic acid (EPA): 0.80 [0.58 – 1.02] vs. 1.00 [0.71 – 1.27] %; RBC docosahexaenoic acid (DHA): 0.93 [0.58 – 1.29] vs. 0.99 [0.68 – 1.31] %; omega 3 index: 1.92 [1.46 – 2.38] vs. 2.25 [1.65 – 2.83] %). The capsules did not contain selenium, but the salmon provided 6.84 μg selenium/day. Plasma selenium concentrations increased significantly in the salmon group compared to the capsule

group (0.16 ±0.13 vs. 0.02 ±0.13 μmol/l). Whole blood glutathione peroxidase (GPx) did not change with either treatment.

Salmon and capsules were equally effective in increasing RBC LC omega 3 fatty acid levels and omega 3 index. Consuming salmon also increased plasma selenium concentrations. Thus, omega 3 fatty acid status can be improved by either method according to consumer preference; however salmon has the added benefit of increasing plasma selenium status.

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Δ	end value – baseline value
AA	arachidonic acid
AI	adequate intake
ALA	α-linolenic acid
B	baseline value
BMI	body mass index
BP	blood pressure
CHD	coronary heart disease
CVD	cardiovascular disease
DART	diet and reinfarction trial
DART 2	diet and angina randomised trial
DHA	docosahexaenoic acid
DPA	docosapentaenoic acid
E	end value
EAR	estimated average requirement
EPA	eicosapentaenoic acid
FAME	fatty acids methyl esters
FFQ	food frequency questionnaire
FNZK salmon	farmed New Zealand King salmon
FSANZ	food standard Australia New Zealand
GC	gas chromatography
GISSI	gruppo Italiano per la sperimentazione della streptochinasi nell'Infarto miocardico
GPx	glutathione peroxidase
HDL-C	high density lipoprotein cholesterol
JELIS	Japan eicosapentaenoic acid lipid intervention study
LA	linoleic acid
LC	long chain
LDL-C	low density lipoprotein cholesterol
MI	myocardial infarction
MUFA	monounsaturated fatty acids
PUFA	polyunsaturated fatty acids
RBC	red blood cell
RCT	randomised controlled trial
RDI	recommended daily intake
SDT	suggested dietary target
SFA	saturated fatty acids
TC	total cholesterol
TC:HDL-C	total cholesterol to high density lipoprotein cholesterol ratio
TG	triacylglycerols
UL	upper level of intake
VLDL-C	very low density lipoprotein cholesterol
waist:hip	waist circumference to hip circumference ratio