- ALA has beneficial health effects
    - cardiovascular health
    - decreases series 1 and 2 eicosanoid production
    - reduces blood triglyceride levels
    - reduces LDL (bad) cholesterol
    - reduces blood pressure
    - protects kidney, liver, adrenal gland and skin health
- ALA is converted to DHA if DHA levels are very low
- DHA is conserved by the body (retina)
- ALA is converted to EPA

Cardiovascular Health

Heart rate (beats per minute) slowed and ejection rate (ml/beat) increased for male rats consuming a diet supplemented with flaxseed oil (10 % oil, 53.5 % ALA, n6:n3 ratio 0.33) (Demaison et al. 1991). Serum c-reactive protein levels were reduced for dyslipidemic patients consuming dietary supplements of flaxseed oil (15 ml/day, 8.1 g ALA/day, n6:n3 ratio 1.3) (Paschos et al. 2005, Rallidis et al. 2003). Thrombosis incidence and platelet adhesiveness was normalized for rats consuming a diet supplemented with saturated fat, cholesterol and flaxseed oil (80 mg oil/day) (Nordöy et al. 1965b). Incidence of thrombosis and hypercholesterolemia was reduced, coagulation factors V and VII were normalized for rats consuming a diet supplemented with saturated fat and flaxseed oil (80 mg oil/day, 47.2 % ALA, n6:n3 ratio 0.38) (Nordöy et al. 1965).

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Reduced Cholesterol

Serum total and LDL cholesterol levels were reduced whereas serum HDL cholesterol levels were not affected for hypertensive or hyperlipemic volunteers consuming a diet supplemented with flaxseed oil (60 ml oil/day, 64 % ALA, n6:n3 ratio 0.23) (Singer et al. 1986a, Singer et al. 1990b). Serum total cholesterol was decreased for patients with types IIb, IV or V primary hyperlipoproteinemia consuming dietary supplements of flaxseed oil (60 ml/day, 38 g ALA per day, n6:n3 ratio 0.23) (Singer et al. 1990). LDL oxidizability, which may contribute to atherosclerosis, was reduced and HDL cholesterol levels were not affected and for normolipidemic male subjects consuming a diet supplemented with flaxseed oil (30 ml oil/day, 20 g ALA/day n6:n3 ratio of diet $\leq$ 1) (Wilkinson et al. 2000). Plasma and liver cholesterol levels were reduced for rats consuming a diet supplemented with flaxseed oil (20.3 % ALA, n6:n3 ratio 0.33) (Ramaprasad et al. 2006, Ramaprasad et al. 2004). Plasma cholesterol levels decreased for rats consuming dietary supplementation with flaxseed oil (12 % oil, 51.7% ALA, n6:n3 ratio 0.37) (Herman et al. 1989). Plasma cholesterol levels were decreased for rats consuming a diet supplemented with flaxseed oil (8.8 % oil, 54 % ALA, n6:n3 ratio 0.3) (Yamashita et al. 2003). Serum cholesterol, triacylglycerol, nonesterified fatty acid concentrations were decreased for rats consuming dietary supplementation with flaxseed oil (48.8 % ALA, n6:n3 ratio 0.33) (Jeffery et al. 1996). Serum cholesterol level was lowered whereas liver cholesterol level was unaffected for rats consuming a diet supplemented with flaxseed oil (10 % oil, 58.4 % ALA, n6:n3 ratio 0.28) (Lee et al. 1988). Incidence of hypercholesterolemia was reduced for rats consuming a diet supplemented with and flaxseed oil (80 mg oil/day, 47.2 % ALA, n6:n3 ratio 0.38) and

additional saturated fat (Nordöy et al. 1965). Plasma total cholesterol levels, LDL, VLDL, TC:HDL and LDL:HDL ratio were reduced for male rats consuming a high fat diet supplemented with flaxseed oil (1 g oil/ kg body weight, 55 % ALA, n6:n3 ratio 0.31) (Vijaimohan et al. 2006).

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Reduced Triglyceride Level

Serum total triglyceride level decreased for healthy volunteers consuming dietary supplementation with flaxseed oil (30 ml/day, 15.9 ml ALA, n6:n3 ratio 0.25) (Schwab et al. 2006). Serum triglycerides were reduced for normal volunteers consuming a diet supplemented with flaxseed oil (60 ml oil/day, 64 % ALA, n6:n3 ratio 0.23) (Singer et al. 1986a). Plasma triglyceride levels were reduced for normal, healthy volunteers expressing an atherogenic lipoprotein phenotype consuming dietary supplements of flaxseed oil (30 g/day, 15 g ALA per day, n-6:n3 ratio <1) (Wilkinson et al. 2005). Serum triglyceride levels were reduced for male volunteers with mild hypertension consuming a diet supplemented with flaxseed oil (60 ml/day, 64 % ALA (Singer et al. 1990b). Serum triglycerides were reduced for hypertensive and hyperlipemic volunteers consuming a diet supplemented with flaxseed oil (60 ml oil/day, 64 % ALA, n6:n3 ratio 0.23) (Singer et al.1986a). Serum triglyceride levels were reduced for patients with types IIa, IIb, IV or V primary hyperlipoproteinemia consuming dietary supplements of flaxseed oil (60 ml/day, 38 g ALA per day, n-6:n-3 ratio 0.23) (Singer et al. 1990). Plasma triglyceride levels decreased for rats consuming dietary supplementation with flaxseed oil (12 % oil, 51.7% ALA, n6:n3 ratio 0.37) (Herman et al. 1989). Plasma triglyceride and phospholipid levels were reduced and liver phospholipid levels were unchanged for male rats consuming a diet supplemented with flaxseed oil (20 % oil, 55.5 % ALA, n6:n3 ratio 0.28) (Takeuchi et al. 2001). Serum triacylglycerol levels were reduced for rats consuming dietary supplementation with flaxseed oil (40 % energy, 10 % energy as ALA, n6:n3 ratio 0.3) (Farwer et al. 1994). Serum triglyceride level was reduced whereas liver triglyceride level was unaffected for rats consuming a diet

supplemented with flaxseed oil (10 % oil, 58.4 % ALA, n6:n3 ratio 0.28) (Lee et al.1988). Plasma triacylglycerol and free fatty acid levels were reduced for male rats consuming a high fat diet supplemented with flaxseed oil (1 g oil/ kg body weight, 55 % ALA, n6:n3 ratio 0.31) (Vijaimohan et al. 2006).

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Reduced Blood Pressure

Dietary supplementation with flaxseed oil (15 ml/day, 8 g ALA/day n6:n3 ratio 1.3) decreased systolic, diastolic and mean arterial pressure for dyslipidaemic patients (Paschos et al. 2007). Arterial compliance was increased and mean arterial pressure was decreased for overweight volunteers consuming dietary supplementation with flaxseed oil based margarine (~ 54.5 g oil per day, 36.7 % ALA, 20 g ALA per day, n6:n3 ratio 0.27) (Nestel et al. 1997). Systolic blood pressure in response to stress was decreased, diastolic blood pressure was unaffected for male volunteers with mild hypertension consuming a

diet supplemented with flaxseed oil (60 ml/day, 64 % ALA) (Singer et al. 1990b). Systolic blood pressure was decreased for hypertensive rats consuming dietary supplementation with flaxseed oil (53.3 % ALA, n6:n3 ratio 0.39) (Brändle et al.1997). Blood pressure was decreased for hypertensive rats consuming dietary supplementation with flaxseed oil (61.7 % ALA) (Dierberger et al.1991). Systolic blood pressure was reduced for one kidney one clip rats consuming a diet supplemented with flaxseed oil (40 % of calories, 50.5 % ALA, n6:n3 ratio 0.36) as compared to standard diet (Codde et al. 1984). Blood pressure was reduced for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (62.5 % ALA, n6:n3 ratio 0.32) (Hoffman et al. 1983). Blood pressure was reduced for female spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (14 % oil, 62.5 % ALA, n6:n3 ratio 0.21) (Hoffmann et al.1985). Systolic blood pressure was reduced and blood pressure reduction increased for subsequent generations for male offspring of generations of spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (14 % oil, 14.5 J % ALA, n6:n3 ratio 0.34)(Hoffmann et al. 1986b). Blood pressure was reduced for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (30 J % oil, 14.5 J % ALA, n6:n3 ratio 0.34) (Singer et al. 1984b). Systolic blood pressure was reduced for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (15 % oil, 64 % ALA, n6:n3 ratio 0.23) (Moritz et al.1985). Blood pressure was reduced for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (1, 2.5 and 5 %) (Ohkubo et al. 1991 abstract only). Blood pressure was decreased for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (1 ml/day, 49.3 % ALA, n6:n3 ratio 0.33) (Sekine et al. 2007). Blood pressure tended to be

lower for rats consuming dietary supplementation with flaxseed oil (40 % energy, 50 % ALA) (Croft et al.1984).

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Reduced Production of Series 1 and 2 eicosanoids

Aortic 6-keto-$PGF_{1\alpha}$ and renomedullary $PGF_{2\alpha}$ production was reduced for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (30 J % oil, 14.5 J % ALA, n6:n3 ratio 0.34) (Singer et al.1984b). Kidney homogenate 6-keto-$PGF_{1\alpha}$ and PGE_2 levels were reduced for rats consuming dietary supplementation with flaxseed oil (40 % energy, 50 % ALA) (Croft et al. 1984). Whole body 6-keto-$PGF_{1\alpha}$ levels, kidney homogenate 6-keto-$PGF_{1\alpha}$ and PGE_2 levels were reduced and urinary excretion of 6-keto $PGF_{1\alpha}$ was increased for rats consuming a diet supplemented with flaxseed oil (5, 20 and 40 % energy, 50 % ALA, n6:n3 ratio 0.36) as compared to a diet supplemented with coconut oil (Croft et al. 1984b). Liver prostaglandin synthesis was decreased, thymus and spleen prostaglandin synthesis was not affected for rats consuming a diet supplemented with flaxseed oil (10 % oil, 61.8 % ALA, n6:n3 ratio 0.28) (Marshall et al.1982). Control and phytohemaglutinin stimulated peripheral blood mononuclear cell and splenocyte PGE_2 synthesis was reduced for rats consuming a diet supplemented with flaxseed oil (10 % oil, 61.8 % ALA, n6:n3 ratio 0.28) (Marshall et al. 1985). Peritoneal macrophage production of arachadonic metabolites TXA_2 and PGI_2 induced by endotoxin were reduced for horses consuming a diet supplemented with flaxseed oil (8 % by weight, 60 % ALA, n6:n3 ratio 0.28) (Morris et al. 1989). PGE

synthesis was reduced for mice injected with tumor cells and consuming dietary supplementation of flaxseed oil (10 % flaxseed oil, 55.9 % ALA, n6:n3 ratio 0.32) (Fritsche et al. 1990). PGE_2 levels were reduced for male polycystic kidney diseased rats consuming a diet supplemented with flaxseed oil (5 % oil, 52.3 % ALA, n6:n3 ratio 0.30) (Weiler et al. 2002). PGE_2 production was reduced for male and female offspring of polycystic kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (7% oil, ALA 52.3 %, n6:n3 ratio 0.30)(Ogborn et al. 2006). Kidney medulla PGE and $PGF_{2\alpha}$ production and aorta $PGF_{2\alpha}$ and PGI_2-like production were reduced for female spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (14 % oil, 62.5 % ALA, n6:n3 ratio 0.21) (Hoffmann et al. 1985). Renomedullary $PGF_{2\alpha}$ production was reduced for spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (62.5% ALA, n6:n3 ratio 0.21) (Hoffmann et al. 1986).

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Protective Effects on Kidney, Liver, Adrenal Glands and Skin

Weight gain was normalized, creatinine and urine protein/creatinine ratio were not affected and cystic change, macrophage infiltration were reduced for male offspring of polycystic kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (7% oil, ALA 52.3 %, n6:n3 ratio 0.30) (Ogborn et al. 2006). Urine protein/creatinine ratio, cyst area, fibrosis, ox-LDL, macrophages, epithelial proliferation were reduced for female offspring of polycystic kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (7% oil, ALA 52.3 %, n6:n3 ratio 0.30) (Ogborn et al. 2006). Kidney sclerosis was reduced for male rats with two kidneys consuming a diet supplemented with flaxseed oil (Gröne et al. 1989). Litter size and body weight of pups at weaning were not affected, renal histology and function was improved, cyst growth, PCNA positive cells, ox-LDL, proteinuria, creatinine clearance, glomerular hypertrophy and interstitial fibrosis was decreased for offspring of polycystic

kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (7% oil)(Sankaran et al. 2006). Skin lesions, fatty liver and abnormal adrenal glands were healed for essential fatty acid deprived capuchin monkeys after consuming a diet supplemented with flaxseed oil (55.7 % ALA, n6:n3 ratio 0.27)(Fiennes 1973, Sinclair 1974).

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EYE, RETINA, DHA LEVELS

A diet deficient in linolenic acid is associated with decreased levels of DHA in rod outer segment fatty acids (Organisciak et al. 1986). Patients with retinitis pigmentosa had lower plasma ALA levels (Gong et al. 1992). Higher intake of ALA as assessed by food frequency questionnaires tended to be associated with lower incidence of age related maculopathy for older volunteers (Chua et al. 2006). The age dependent decrease in rod outer segment DHA levels were prevented by supplementation with flaxseed oil (1 ml oil

per week) for rats (Organisciak et al. 1986). DHA levels were highest for rats consuming a diet supplemented with flaxseed oil (10 % weight oil/weight diet, 53 % ALA, n6:n3 ratio 0.38) (Stinson et al. 1991). Electroretinogram responses were improved (higher a-wave responses, quicker b-wave response for puppies consuming either dietary supplementation with flaxseed oil or breastmilk from mothers whose diets were supplemented with flaxseed oil (68.2 % ALA, n6:n3 ratio) (Heinemann et al. 2005). DHA levels were increased in plasma lipid, retinal pigment epithelium and rod outer segment fatty acids for rats consuming a diet supplemented with flaxseed oil (52.2% ALA, n6:n3 ratio 0.31) (Wang et al. 1992). Rod outer segment DHA levels were increased and ALA was a preferred precursor versus LA for rod outer segments for rats reared in bright light and consuming a diet supplemented with flaxseed oil (10 % oil, 53 % ALA, n6:n3 ratio 0.38) (Wiegand et al. 1995). Dietary ALA intake increases brain DHA levels (Barceló-Coblijn et al. 2005).

DHA is highly conserved with in the retina (Stinson 1991, Wiegand 1991). DHA and EPA are present even after 15 years of becoming vegan (either DHA, EPA are conserved or DHA and EPA synthesized from ALA) (Rossell et al. 2005).

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ALA is desaturated and elongated to EPA and DHA.

The conversion of ALA to DHA may be optimized by lowering the LA to ALA ratio (Blank 2002).

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Table 1 indicates the effect of dietary flaxseed oil supplementation on EPA, arachidonic acid (AA), DHA and ALA levels. Each number is a reference to a research study. References and descriptions for the table are listed below.

Table 1. Fatty acid (EPA, Arachidonic Acid (AA), DHA and ALA) level after dietary flaxseed oil supplementation.

Fatty acid	Increased	Decreased
EPA (20:5n-3)	1, 2, 3,4,5a,5b,6,7,8,9 ,10a,12b,13a,b, 14b[i,ii],14c[i,ii,	84a

	iii,iv],15,17a,b,j,p, 20a,b, 21a,b,c,d, 22a,23a,24a,b,c,d,25,26a,27a,b,c,d,e,28,29a,30c,e,f, 33a,f,h,i,34a,35a,b,36a,37a,38a,b,39a,40a,41a,c, 42a,b,43a,b,c,45a,46a,b,48a,49a,51a,52a,56a,57a,b,e,f,59a,b,60a,b,62a,b,c,d,63a,b,c,64a,b,c,d,e,f,g, 65a,69a,70a,71a,74a,75a,76a,b,d,e,77a,b,c,d,e,78a,79a,b,80a,b,81a,c,d,82a,b,c,d,e,f,g,h,83b,c,e,g,84b,85a,86a,87a,89a,b,c,94a, 95a,96a,97a,b,d	
AA(20:4n-6)	17b,50c,57f,	1, 2,6,10a,11,12a,14a[ii], 14b[ii,iii],14c[i,ii,iii],16,17a,19, 20a,b, 21a,c,d, 22a,23a,b,25,30a,b,c,f,33a,d,e,f,i,34a,35a,b,37a, 39a,40a,41a,b, 42a,43b,46a,b,47b,48a,49a,50f,52a,53a,54a,55a,b,c,56a,57a,b,c, 59a,b,60a,b,c,61a,63a,b,c,64a,b,c,d,e,65a,68b,69a,70a,73b,74a,75a,76a,b,c,78a,b,c,79b,82a,b,c,d,e,

		f,g,h,83b,c,e,g,h,84a,b,85a,86a,89a,b,c,91a,92a,b,c,d,93a,94a,95a,97a,b,c,d
DHA(22:6n-3)	4,6,13a,14a[i,ii],14c[iii],19,21a,b,24a,b,c,d,29a,30b,c,f,31,32,33b,c,d,e,f,g,h,i,38a,39a,40a,42a,45a,46a,b,50c,f,52a,53a,54a,55b,c,56a,57a,b,c,58a,b,59a,b,60a,b,63b,64c,d,e,68b,c,69a,70a,73a,b,74a,75a,76a,b,d,e,77a,b,c,d,e,f,88a,89a,c,94a,96a,97a,b,d	11,12a,23a,35a,51a,80a,82a,b,c,d,e,f,g,h,83c,g,h,84a,b,85a,86a,87a
ALA(18:3n-3)	1, 2(in triacylglycerols, cholesterol esters), 3(serum, PBMNC), 4,5b,6,7,8,9,10a,10b, 11,12a,b,13a,b,14b[i,ii,iv],14c[i,ii], 17b,c,d,e,f,18a[i,ii,iv,vi,viii ix],18b[i,vi,viii,ix], 20a,b,21a,b,c,d, 23a,b,24a,b,25,26a,b,27a,b,c,d,e,f,28,29a,31,33a,d,34a,35a,b,40a,41a,42b,c,d,43a,b,c,44a,45a,46a,b,48a,49a,50a,b,c,d,e,f,51a,53a,54a,55a,b,c,56a,57b,c,d,e,f,58a,b	57b*

	,59a,b,60a,b,61a ,b,62a,b,c,d,63a, c,64a,b,d,e,66a, b,67b,69a,70a,7 1a,72a,73a,b74a ,75a,76a,b,c,d,e, 77a,b,c,d,e,f,78a ,b,c,79a,b,80a,8 2a,b,c,d,e,f,g,h,8 3a,b,c,d,e,f,g,h,8 4a,b,85a,86a,87 a,89a,b,c,90a,92 a,b,c,d, 93a,94b,95a,96a ,97a,b,c,d	

References for Table 1.

1. Healthy volunteers consuming dietary encapsulated flaxseed oil supplements (5.9 g/day ALA, 10.7 g/day flaxseed oil, n6:n3 ratio 0.27 on average) (Freese et al. 1997). Context: platelet lipids

   Freese R & Mutanen M. (1997) Am. J. Clin. Nutr. 66: 591-598.

2. Healthy volunteers consuming a diet supplemented with flaxseed oil (60 ml/day, 52.9% ALA, 31.74 ml ALA/day, n6:n3 ratio 0.39) (Budowski et al. 1984). Context: plasma lipids (a) triacylglycerol (b) cholesterol esters (c) phospholipids

   Budowski P, Trostler N, Lupo M, Vaisman N & Eldor A. (1984) Nutr. Res. 4: 343-346.

3. Healthy volunteers consuming a diet supplemented with flaxseed oil (31.7 g/day, 21.28 % ALA, 6.7 g ALA/day, n6:n3 ratio 0.72) (Kelley et al. 1993). Context: (a) serum lipids (b) peripheral blood mononuclear cells

   Kelley DS, Nelson GJ, Love JE, Branch LB, Taylor PC, Schmidt PC, Mackey BE & Iacono JM. (1993) Lipids 28: 533-537.

4. Normotensive, mildly hypercholesterolemic volunteers consuming a diet supplemented with flaxseed oil (9.2 g ALA per serving, n6:n3 ratio 0.48) (Kestin et al. 1990). Context: plasma

   Kestin M, Clifton P, Belling GB & Nestel PJ. (1990) Am. J. Clin. Nutr. 51: 1028-1034.

5. Healthy, vegetarian volunteers consuming a diet supplemented with flaxseed oil (15.4 g ALA per day, n6:n3 ratio 1.0) (Li et al. 1999). Context: (a) platelet phospholipids (b) plasma phospholipid

   Li D, Sinclair A, Wilson A, Nakkote S, Kelly F, Abedin L, Mann N & Turner A. (1999) Am. J. Clin. Nutr. 69: 872-882.

6. Healthy volunteers consuming a diet supplemented with flaxseed oil (30 ml oil/day, 18.75 ml ALA/day, n6:n3 ratio 0.2) (Mest et al. 1983). Context: serum total phospholipids

   Mest HJ, Beitz J, Heinroth I, Block HU, Förster W. (1983) The influence of linseed oil diet on fatty acid pattern in phospholipids and thromboxane formation in platelets in man. Klin. Wochenschr. 61: 187-191.

7. Healthy volunteers consuming a diet supplemented with flaxseed oil (9.38 g ALA/day, n6:n3 ratio 0.33) (Sanders et al. 1983). Context: platelet phosphoglycerides

   Sanders TAB & Roshanai F. (1983) Clin. Sci. 64: 91-99.

8. Normal, healthy volunteers expressing an atherogenic lipoprotein phenotype consuming a diet supplemented with flaxseed oil (30 g oil/day, 15 g ALA/day, n6:n3 ratio <1) (Wilkinson et al. 2005). Context: erythrocyte phospholipids

   Wilkinson, P., Leach, C., Ah-Sing, E., Hussain, N., Miller, G., Millward, D. and Griffin, B. (2005) Atheroscler. 181: 115-124.

9. Overweight volunteers consuming a diet supplemented with flaxseed oil and flaxseed oil margarine (20 g ALA/day) (Nestel et al. 1997). Context: plasma

   Nestel PJ, Pomeroy SE, Sasahara T, Yamashita T, Liang YL, Dart AM, Jennings GL, Abbey M & Cameron JD. (1997) Arterioscler. Thromb. Vasc. Biol. 17: 1163-1670.

10. Healthy volunteers consuming a diet supplemented with encapsulated flaxseed oil (3.51 g ALA/day, n6:n3 ratio: 0.256) (Cao et al. 2006). Context: (a) erythrocyte membranes (b) plasma phospholipids

    Cao J, Schwichtenberg KA, Hanson NQ & Tsai MY. (2006) Clin. Chem. 52(12): 2265-2272.

11. Rats consuming a diet supplemented with flaxseed oil (62% ALA, 1,2.5,5 % flaxseed oil wt/wt of diet, n6:n3 ratio 0.24) (Rupp et al. 1996). Context: thoracic aorta

    Rupp H, Turcani M, Ohkubo T, Maisch B & Brilla CG. (1996) Mol. Cell Biochem. 162(1): 59-64.

12. Healthy volunteers consuming a diet supplemented with flaxseed oil (30 ml oil/day, 15.9 ml ALA, n6:n3 ratio 0.25) (Schwab et al. 2006). Context: (a) serum cholesteryl esters (b) serum triglycerides

    Schwab US, Callaway C, Erkkila AT, Gynther J, Uusitupa MI & Jarvinen T. (2006) Eur. J. Nutr. 45(8): 470-477.

13. Rats consuming a diet supplemented with flaxseed oil (20.3 % ALA, n6:n3 ratio 0.33) (Ramaprasad et al. 2005). Context: (a) liver (b) platelets

    Ramaprasad TR, Baskaran V, Krishnakantha TP & Lokesh BR. (2005) Mol. Cell Biochem. 277: 19-26.

14. Rats consuming a diet supplemented with flaxseed oil (56.71 % ALA, n6:n3 ratio 0.39) (Barceló-Coblijn et al. 2005). Context: (a) brain (b) heart (c) liver [i] ethanolamine glycerophospholipid [ii] choline glycerophospholipid [iii] phosphatidylserine [iv] phosphatidylinositol

    Barceló-Coblijn G, Collison LW, Jolly CA & Murphy EJ. (2005) Lipids 40: 787-798.

15. Healthy volunteers consuming a diet supplemented with encapsulated flaxseed oil (3.5 g ALA/day, n6:n3 ratio 0.36 of oil, n6:n3 of total diet 3.04) (Wallace et al. 2003). Context: plasma phospholipids

    Wallace FA, Miles EA & Calder PC. (2003) Br. J. Nutr. 89: 679-689.

16. Healthy volunteers consuming a diet supplemented with encapsulated flaxseed oil (9 g/day, 4.0 g ALA/day, n6:n3 ratio: 0.37) (Healy et al. 2000). Context: neutrophil

    Healy DA, Wallace FA, Miles EA, Calder PC & Newsholme P. (2000) Lipids 35: 763-768.

17. Healthy volunteers consuming a diet supplemented with flaxseed oil (oil: 35 mg/kg body weight per day, 57.5 % ALA, n6:n3 ratio: 0.25 (for 70 kg subject this would be 4.3 g oil / day, 2.47 g ALA/day) (Layne et al. 1996). Context: (a) HDL triacylglycerol high P/S ratio diets (b) HDL triacylglycerol low P/S ratio diets (c) VLDL triacylglcerol high P/S (d) VLDL triacylglycerol low P/S (e) LDL triacylglycerol high P/S (f) LDL triacylglycerol low P/S (g) HDL cholesteryl ester high P/S ratio (h) HDL cholesteryl ester low P/S ratio (i) VLDL cholesteryl ester high P/S ratio (j) VLDL cholesteryl ester low P/S ratio (k) LDL cholesteryl ester high P/S ratio (l) LDL cholesteryl ester low P/S ratio (m) HDL plasma phospholipids high P/S (n) HDL plasma phospholipids low P/S (o) VLDL plasma phospholipids high P/S (p) VLDL plasma phospholipids low P/S (q) LDL plasma phospholipids high P/S (r) LDL plasma phospholipids low P/S

Layne KS, Goh YK, Jumpsen JA, Ryan EA, Chow P & Clandinin MT. (1996) J. Nutr. 126: 2130-2140.

18. Patients with non-insulin-dependent diabetes mellitus consuming a diet supplemented with flaxseed oil (35 mg ALA/kg body weight/day) (Goh et al. 1997). Context: (a)[i] Plasma triacylglycerol low P/S ratio VLDL (a)[ii] LDL (a)[iii] HDL (a)[iv] Plasma phospholipids fraction low P/S ratio VLDL (a)[v], LDL (a)[vi] HDL (a)[vii] Plasma cholesteryl ester low P/S ratio VLDL (a)[viii] LDL (a)[ix] HDL (b)[i] Plasma triacylglycerol high P/S ratio VLDL (b)[ii] LDL (b)[iii] HDL (b)[iv] Plasma phospholipids fraction high P/S ratio VLDL (b)[v] LDL (b)[vi] HDL (b)[vii] Plasma cholesteryl ester high P/S ratio VLDL (b)[viii]LDL (b)[ix] HDL

Goh YK, Jumpsen JA, Ryan EA & Clandinin MT. (1997) Diabetologia 40: 45-52.

19. Rats consuming a diet supplemented with flaxseed oil (53.3 % ALA, n6:n3 ratio 0.39) (Al Makdessi et al. 1994). Context: heart sarcolemma phospholipids

Al Makdessi S, Sweidan H, Jacob R. (1994) J. Mol. Cell. Cardiol. 26(1): 23-29.

20. Mice consuming a diet supplemented with flaxseed oil (49.7 % ALA, n6:n3 ratio 0.5) (Fritsche et al. 1989). Context: (a) splenocyte choline phosphoglyceride (b) splenocyte ethanolamine phosphoglyceride

Fritsche KL & Johnston PV. (1989) Lipids 24(4): 305-311.

21. Chicks consuming a diet supplemented with flaxseed oil (37.8 % ALA, n6:n3 ratio 0.75) (Fritsche et al. 1991). Context: (a) serum (b) splenocyte (c) bursa (d) thymus

Fritsche KL, Cassity NA & Huang SC. (1991) Poult. Sci. 70(5): 1213-1222.

22. Mice consuming a diet supplemented with flaxseed oil (80g/kg, 43.5 % ALA, n6:n3 ratio 0.32) (Hillyer et al. 2006). Context: (a) serum

Hillyer LM, Sandiford AM, Gray CE & Woodward B. (2006 Br. J. Nutr. 95(2): 230-233.

23. Rats consuming a diet supplemented with flaxseed oil (48.8 % ALA, n6:n3 ratio 0.33) (Jeffery et al. 1996). Context: (a) serum (b) lymphocyte

Jeffrey NM, Sanderson P, Sherrington EJ, Newsholme EA & Calder PC. (1996) Lipids 31(7): 737-745.

24. Chickens consuming a diet supplemented with flaxseed oil (34.6 % ALA, n6:n3 ratio of diet 0.85) (Anderson et al. 1989). Context: (a) egg yolks (b) serum of chicks hatched from eggs (c) brain tissue of chicks hatched from eggs (d) retinal fatty acids of chicks hatched from eggs

Anderson GJ, Connor WE, Corliss JD & Lin DS. (1989) J. Lipid Res. 30(3): 433-441.

25. Dogs consuming a diet supplemented with flaxseed oil (20 g/day, 53 % ALA, n6:n3 ratio 0.33) (Anderson et al. 1994) Context: plasma lipids including phospholipids, triglycerides, free fatty acids, cholesterol esters

Anderson RE, Maude MB, Acland G & Aguirre GD. (1994) Exp. Eye. Res. 58(2): 129-137.

26. Mildly hypercholesterolemic men consuming a diet supplemented with flaxseed oil (9 g ALA/day, n6:n3 ratio 0.5) (Abbey et al. 1990). Context: (a) plasma fatty acids (b) HDL cholesteryl ester

Abbey M, Clifton P, Kestin M, Belling B & Nestel P. (1990) Aterioscler. Thromb. Vasc. Biol. 10: 85-94.

27. Healthy female volunteers consuming a diet supplemented with ALA (Adam et al. 1986). Context: (a) LDL phosphatidyl choline (b) HDL phosphatidyl choline (c) plasma cholesteryl esters (d) LDL cholesteryl esters (e) HDL cholesteryl esters (f) platelet total lipids (g) HDL phosphatidylethanolamine

Adam O, Wolfram G & Zöllner N. (1986) J. Lipid Res. 27: 421-426.

28. Healthy male volunteers consuming a diet supplemented with flaxseed oil (40 g oil/day, approximately 57 % ALA, n6:n3 ratio 0.28) (Allman et al. 1995). Context: platelet fatty acids

Allman MA, Pena MM, Peng D. (1995) Eur. J. Clin. Nutr. 49: 169-178.

29. Healthy female volunteers consuming a diet supplemented with flaxseed oil (20 g oil/day, ALA 58.2 %, n6:n3 ratio 0.26) (Cunnane et al. 1993). Context: (a) plasma triglycerides (b) plasma phospholipids

Cunnane SC, Ganguli S, Menard C, Liede AC, Hamadeh MJ, Chen ZY, Wolever TMS & Jenkins DJA. (1993) Br. J. Nutr. 69: 443-453.

30. Rats consuming a diet supplemented with flaxseed oil (diet: 13.8 %ALA, n6:n3 ratio 1.2) (Alsted 1992). Context: (a) brain phosphatidylinositole (b) brain phosphatidylserine (c) brain phosphatidylethanolamine (d) brain poly-phosphatidylinositol-4-phosphate PIP (e) brain phosphatidylinositol-4,5-bisphosphate PIP2 (f) heart phosphatidylethanolamine

Alsted AL. (1992) Biochim. Biophys. Acta 1125(3): 237-244.

31. Mice consuming a diet supplemented with flaxseed oil (oil not described) (Berger et al. 1992). Context: cardiolipins

Berger A, German JB, Chiangg BL, Ansari AA & Keen CL. (1993) J. Nutr. 123(2): 225-233.

32. N-3 deficient rats consuming a diet supplemented with flaxseed oil (1 ml/week, 53 % ALA, n6:n3 ratio not described) (Bicknell et al. 2002). Context: rod outer segment

Bicknell IR, Darrow R, Barsalou L, Fliesler SJ & Organisciak DT. (2002) Mol. Vision 8: 333-340.

33. Rats consuming a diet supplemented with flaxseed oil (10 % weight oil/weight diet, 58.6 % ALA, n6:n3 ratio 0.3) (Brown et al. 1984). Context: (a) breast milk (b) brain phosphatidylcholine (c) brain phosphatidylinositol/phosphatidylserine (d) brain diacyl phosphatidylethanolamine (e) brain plamalogen phosphatidylethanolamine (f) second generation brain phosphatidylcholine (g) second generation brain phosphatidylinositol/phosphatidyl serine (h) second generation brain diacyl phosphatidylethanolamine (i) second generation brain plamalogen phosphatidylenthanolamine

Brown ML, Marshall LA & Johnston PV. (1984) J. Neurochem. 43(5): 1392-1400.

34. Rats consuming a diet supplemented with flaxseed oil (7% oil) (Century et al. 1968). Context: (a) liver phospholipids

Century B & Horwitt MK. (1968) J. Nutr. 4: 509-516.

35. Pigs consuming a diet supplemented with flaxseed oil (5% oil/weight diet, 50.4 % ALA, n6:n3 ratio 0.36) (Chartrand et al. 2003). Context: (a) maternal blood plasma (b) endometrial tissues

Chartrand R, Matte JJ, Lessard M, Chouinard PY, Giguère A & Laforest JP. (2003) J. Anim. Sci. 81: 726-734.

36. Rats consuming a diet supplemented with flaxseed oil (20 % oil (99% flaxseed oil) 61.5% ALA, n3:n6 ratio 0.189) (Christiansen et al. 1991). Context: (a) liver phospholipids

Christiansen EN, Lund JS, Rortveit T, Rustan AC. (1991) Biochim. Biophys. Acta. 1082(1): 57-62.

37. Rats consuming a diet supplemented with flaxseed oil (10 % oil w/w diet, ALA 47 %, n6:n3 ratio 0.36) (Cleland et al. 1990). Context: (a) peritoneal exudates cell phospholipids, significance not noted

Cleland LG, James MJ, Gibson RA, Hawkes JS, Betts WH. (1990) Biochim. Biophys. Acta. 1043(3): 253-258.

38. Rats consuming a diet supplemented with flaxseed oil (5% oil, 56.5 % ALA, n6:n3 ratio 0.28) (Cleland et al. 2005). Context: (a) heart phospholipids (b) plasma

Cleland LG, Gibson RA, Pedler J & James MJ. (2005) Lipids 40(10): 995-998.

39. Mice consuming a diet supplemented with flaxseed oil (10 % oil, 56 % ALA, n6:n3 ratio 0.27) (Cohen et al. 2005). Context: (a) serum

Cohen SL & Ward WE. (2005) J. Toxicol. Environ. Health A. 68(12): 1861-1870.

40. IL-10 knockout mice consuming a diet supplemented with flaxseed oil (10 % oil, 56 % ALA) (Cohen et al. 2005b). Context: (a) serum

Cohen SL, Moore AM & Ward WE. (2005b) J. Nutr. Biochem. 16(6): 368-374.

41. Rats consuming a diet supplemented with flaxseed oil (5, 20 and 40 % energy, 50 % ALA, n6:n3 ratio 0.36) (Croft et al. 1984b). Context: (a) plasma phospholipids (b) kidney phospholipids (c) liver phosphatidylethanolamine

Croft KD, Beilin LJ, Vandongen R, Mathews E. (1984b) Biochim. Biophys. Acta. 795(2): 196-207.

42. Rabbits consuming a diet supplemented with flaxseed oil (60 g/kg, 33.43 % ALA, n6:n3 ratio:0.53) (Vas Dias et al. 1982). Context: (a) platelet lipids (b) liver (c) adipose tissue (d) aortic lipids

Vas Dias FW, Gibney MJ & Taylor TG. (1982) Atheroscler. 43: 245-257.

43. Lactating women consuming a diet supplemented with flaxseed oil (20 g oil/day, 53.6 % ALA, n6:n3 ratio 0.28) (Francois et al. 2003). Context: (a)

breast-milk fatty acid (b) maternal plasma fatty acid (c) maternal erythrocyte fatty acid

Francois CA, Connor SL, Bolewicz LC & Connor WE. (2003) Am. J. Clin. Nutr. 77: 226-233.

44. Lactating rats consuming a diet supplemented with flaxseed oil (10.2 % lipid in diet, 62.5 % ALA n6:n3 ratio not described) (Grigor et al. 1980). Context: (a) breastmilk fatty acid

Grigor MR & Warren SM. (1980) Biochem J. 188: 61-65.

45. For chronically ill volunteers consuming a diet supplemented with flaxseed oil (5.2 g oil/day, 58 % ALA, n6:n3 ratio 0.29) (Harper et al. 2006). Context: (a) plasma fatty acid

Harper CR, Edwards MJ, DeFilipis AP & Jacobson TA. (2006) J. Nutr. 136: 83-87.

46. Puppies consuming either a diet supplemented with flaxseed oil or breastmilk from mothers whose diets were supplemented with flaxseed oil (68.2 % ALA, n6:n3 ratio of diet 0.51) (Heinemann et al. 2005). Context: (a) suckling pups plasma phospholipids (b) weaned pups plasma phospholipids

Heinemann KM, Waldron MK, Bigley KE, Lees GE & Bauer JE. (2005) J. Nutr. 135: 1960-1966.

47. Horses consuming a diet supplemented with flaxseed oil (8% oil, ALA content not described, n6:n3 ratio not described) (Henry et al. 1990). Context: (a) monocyte phosphatidylcholine (b) monocyte phosphatidylethanolamine (c) monocyte phosphatidylserine

Henry MM, Moore JN, Feldman EB, Fischer JK & Russell B. (1990) Circ. Shock 32(3): 173-188.

48. Spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (62.5% ALA, n6:n3 ratio 0.21) (Hoffmann et al. 1986). Context: (a) kidney phospholipids

Hoffmann P, Block HU, Beitz J, Taube C, Forster W, Wortha P, Singer P, Naumann E & Heine H. (1986) Lipids 21(12): 733-737.

49. Female spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (14 % oil, 62.5 % ALA, n6:n3 ratio 0.21) (Hoffmann et al. 1985). Context: (a) kidney medulla phospholipids

Hoffmann P, Taube C, Heinroth-Hoffmann I, Fahr A, Beitz J, Forster W, Poleshuk WS & Markov CM. (1985) Arch. Int. Pharmacodyn. Ther. 276(2): 222-235.

50. Guinea pigs consuming a diet supplemented with flaxseed oil (5 % oil, 46.9 % ALA, n6:n3 ratio 0.45) (Huang et al. 1985). Context: (a) plasma cholesteryl esters (b) plasma triglycerides (c) plasma total phospholipids (d) liver cholesteryl esters (e) liver triglycerides (f) liver total phospholipids

Huang YS, Horrobin DF, Manku MS & Mitchell J. (1985) Proc. Soc. Exp. Biol. Med. 178 (1): 46-49.

51. Renal ablated rats consuming a diet supplemented with flaxseed oil (15 % oil, ALA not described, n6:n3 ratio not described) (Ingram et al. 1995). Context: (a) renal tissue phospholipids

Ingram AJ, Parbtani A, Clark WF, Spanner E, Huff MW, Philbrick DJ & Holub BJ. (1995) Am. J. Kidney Dis. 25(2): 320-329.

52. Children diagnosed with attention deficit hyperactivity disorder and consuming a diet supplemented with flaxseed oil (200 mg ALA/day, n6:n3 ratio not described) (Joshi et al. 2006). Context: (a) red blood cell phospholipids

Joshi K, Lad S, Kale M, Patwardhan B, Mahadik SP, Patni B, Chaudhary A, Bhave S & Pandit A. (2006) Prostaglandins, Leukot. Essential Fatty Acids 74: 17-21.

53. Pups of rats consuming a diet supplemented with flaxseed oil while pregnant (7 % oil, 33% ALA, n6:n3 ratio 0.42) (Korotkova et al. 2004). Context: (a) pup serum phospholipids

Korotkova M, Ohlsson C, Hanson LA & Strandvik B. (2004) Br. J. Nutr. 92: 643-648.

54. Pups of rats consuming a diet supplemented with flaxseed oil while pregnant (7% oil, 33 % ALA, n6:n3 ratio 0.42) (Korotkova et al. 2005). Context: (a) pup serum phospholipids

    Korotkova M, Gabrielsson B, Holmäng A, Larsson B, Hanson LA & Strandvik B. (2005) Am. J. Physiol. Regulatory Integrative Comp. Physiol. 288: 575-579.

55. Rats consuming a diet supplemented with flaxseed oil while pregnant (7% oil, 33 % ALA, n6:n3 ratio 0.42) (Korotkova et al. 2002). Context: (a) breastmilk (b) pup white adipose tissue total lipids (c) pup white adipose tissue phospholipids

    Korotkova M, Gabrielsson B, Lönn M, Hanson L & Strandvik B. (2002) J. Lipid Res. 43: 1743-1749.

56. Pups of rats consuming a diet supplemented with flaxseed oil (7 % oil, 33 % ALA, n6:n3 ratio 0.42) (Korotkova et al. 2004b). Context: (a) pup serum phospholipids

    Korotkova M, Telemo E, Yamashiro Y, Hanson LÅ, Strandvik B. (2004b) Clin. Exp. Immunol. 137: 237-244.

57. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 58.4 % ALA, n6:n3 ratio 0.28) (Lee et al. 1988). Context: (a) liver phosphatidylcholine (b) serum phosphatidylcholine (c) aorta phosphatidylcholine (d) liver triglyceride (e) serum triglyceride (f) adipose tissue triglyceride

    Lee JH, Sugano M & Ide T. (1988) J. Nutr. Sci. Vitaminol (Tokyo) 34(1): 117-129.

58. Rats consuming a diet supplemented with flaxseed oil (0.48 % oil, 3.12 % omega-3 pufa, n6:n3 ratio not described) (Li et al. 2003). Context: (a) femoral cortical bone (b) femoral bone marrow

    Li Y, Greiner RS, Salem N Jr & Watkins BA. (2003) Lipids 38(6): 683-686.

59. Rats exposed to carbon tetrachloride and consuming a diet supplemented with flaxseed oil (20 % oil, 50.7 % ALA, n6:n3 ratio 0.29) (MacDonald-Wicks et al. 2002). Context: (a) plasma (b) red blood cell membranes

    MacDonald-Wicks LK & Garg ML. (2002) J. Nutr. Biochem. 13(2): 87-95.

60. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 61.8% ALA, n6:n3 ratio 0.28) (Magrum et al. 1983). Context: (a) peritoneal macrophage ethanolamine phosphoglyceride (b) peritoneal macrophage choline phosphoglyceride (c) peritoneal macrophage serine phosphoglyceride

    Magrum LJ & Johnston PV. (1983) Lipids 18(8): 514-521.

61. Rats consuming a diet supplemented with flaxseed oil (3 % oil, 53 % ALA, n6:n3 ratio 0.26) (Mahoney et al.1983). Context: (a) renal fatty acid (b) aortic fatty acid

    Mahoney D, Croft K & Beilin LJ. (1983) Prostaglandins 26(3): 479-491.

62. Volunteers consuming a diet supplemented with flaxseed oil (amount of oil not described, 55.6 % ALA, n6:n3 ratio 0.33) (Mantzioris et al. 1994). Context: (a) plasma phospholipids (b) plasma cholesteryl esters (c) plasma triglycerides (d) neutrophil phospholipids

    Mantzioris E, James MJ, Gibson RA & Cleland LG. (1994) Am. J. Clin. Nutr. 59: 1304-1309.

63. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 54.10 ALA, n6:n3 ratio 0.29) (Maranesi et al. 1988). Context: (a) plasma phospholipids (b) platelet phospholipids (c) aorta phospholipids

    Maranesi M, Barzanti V, Tarozzi G & Turchetto E. (1988) Biochem Int. 16(2): 349-357.

64. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 61.8% ALA, n6:n3 ratio 0.28) (Marshall et al. 1983b). Context: (a) splenocyte ethanolamine phosphoglyceride (b) splenocyte choline phosphoglyceride (c) thymocyte ethanolamine phosphoglyceride (d) mast cell ethanolamine phosphoglyceride (e) mast cell choline phosphoglyceride (f) peripheral lymphocyte ethanolamine phosphoglyceride (g) peripheral lymphocyte choline phosphoglyceride

Marshall LA & Johnston PV. (1983b) Lipids 18: 737-742.

65. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 61.8 % ALA, n6:n3 ratio 0.28) (Marshall et al. 1982). Context: (a) liver ethanolamine phosphoglyceride

Marshall LA & Johnston PV. (1982) Lipids 17(12): 905-913.

66. For patients accepted for elective cardiac surgery involving cardiopulmonary bypass and consuming a diet supplemented with flaxseed oil (10 ml/d, 58.7 % ALA, n6:n3 ratio 0.27) (Metcalf et al. 2007). Context: (a) atrial phospholipids (b) erythrocyte phospholipids

Metcalf RG, James MJ, Gibson RA, Edwards JRM, Stubberfield J, Stuklis R, Roberts-Thomson K,Young GD & Cleland LG. (2007) Am. J. Clin. Nutr. 85: 1222-1228.

67. Dogs consuming a diet supplemented with flaxseed oil (200 mg/kg/d oil, 570 mg ALA, n6:n3 ratio 0.30) (Mueller et al. 2005). Context: (a) skin (b) plasma

Mueller RS, Fettman MJ, Richardson K, Hansen RA, Miller A, Magowitz J & Ogilvie GK. (2005) Am. J. Vet. Res. 66(5): 868-873.

68. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 54.17 ALA, n6:n3 ratio 0.23) (Tarozzi et al. 1984). Context: (a) whole brain (b) optic nerve (c) visual cortex

Tarozzi G, Barzanti V, Biagi PL, Cocchi M, Lodi R, Maranesi M, Pignatti C & Turchetto E. (1984) Acta Vitaminol. Enzymol. 6(3): 157-163.

69. Volunteers consuming a diet supplemented with flaxseed oil (30 ml oil/day, 62.5 % ALA, n6:n3 ratio 0.21) (Beitz et al. 1981). Context: (a) serum total phospholipids

Beitz J, Mest HJ & Forster W. (1981) Acta Biol. Med. Germ. 40: K31-K35.

70. Rats with established kidney disease consuming a diet supplemented with flaxseed oil (7% oil) (Sankaran et al. 2007). Context: (a) kidney fatty acid

Sankaran D, Bankovic-Calic N, Cahill L, Yu-Chen Peng C, Ogborn MR, Aukema HM. (2007) Nephron Exp Nephrol. 106(4): e122-128.

71. Pigs consuming a diet supplemented with flaxseed oil (5% oil, 56.9 % ALA, n6:n3 ratio 0.27) (Nguyen et al. 2004). Context: (a) adipose tissue

    Nguyen LQ, Everts H & Beynen AC. (2004) J. Anim. Physiol. Anim. Nutr. (Berl). 88: 204-210.

72. Patients with rheumatoid arthritis consuming a diet supplemented with flaxseed oil powder (30 g oil powder, 32 % ALA, n6:n3 ratio not described) (Nordström et al. 1995). Context: (a) serum

    Nordström DCE, Honkanen VEA, Nasu Y, Antila E, Friman C & Konttinen YT. (1995) Rheumatol. Int. 14: 231-234.

73. Polycystic kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (5% oil, ALA 52.3 %, n6:n3 ratio 0.30) (Ogborn et al. 2002). Context: (a) kidney (b) liver

    Ogborn MR, Nitschmann E, Bankovic-Calic N, Weiler HA & Aukema H.(2002) Lipids 37: 1059-1065.

74. Male offspring of polycystic kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (7% oil, ALA 52.3 %, n6:n3 ratio 0.30) (Ogborn et al. 2006). Context: (a) kidney

    Ogborn MR, Nitschmann E, Bankovic-Calic N, Weiler HA & Aukema H. (2006) Lipids 41: 1141-1149.

75. Female offspring of polycystic kidney disease Han:SPRD-cy rats consuming a diet supplemented with flaxseed oil (7% oil, ALA 52.3 %, n6:n3 ratio 0.30) (Ogborn et al. 2006). Context: (a) kidney

    Ogborn MR, Nitschmann E, Bankovic-Calic N, Weiler HA & Aukema H. (2006) Lipids 41: 1141-1149.

76. Rats consuming a diet supplemented with flaxseed oil (20.3 %ALA, n6:n3 ratio 0.33) (Ramaprasad et al. 2004). Context: (a) serum (b) liver (c) adipose tissue (d) heart (e) brain

Ramaprasad TR, Baskaran V, Sambaiah K & Lokesh BR. (2004) Lipids 39:627-632.

77. Female rats consuming a diet supplemented with flaxseed oil (10 % oil, 53 % ALA, n6:n3 ratio 0.38) (Wiegand et al.1991). Context: (a) plasma total phospholipids (b) plasma triglycerides (c) plasma cholesterol ester (d) rod outer segment phosphatidylcholine (e) rod outer segment phosphatidylethanolamine (f) rod outer segment phosphatidylserine Note: AA levels are increased relative to coconut oil but decreased relative to safflower oil supplementation. LA levels are increased relative to coconut oil but decreased or unchanged relative to safflower oil supplementation.

Wiegand RD, Koutz CA, Stinson AM & Anderson RE. (1991) J. Neurochem. 57(5): 1690-1699.

78. Rats consuming a diet supplemented with flaxseed oil (15 % oil, 53 % ALA, n6:n3 ratio 0.28) (Dwivedi et al.2005). Context: (a) serum fatty acids (b) colon microsomal fraction (c) tumor microsomal fraction

Dwivedi C, Natarajan K & Matthees DP. (2005) Nutr. Cancer 51(1): 52-58.

79. Male volunteers with mild hypertension consuming a diet supplemented with flaxseed oil (60 ml/day, 64 % ALA) (Singer et al.1990b). Context: (a) serum triglycerides (b) serum cholesterol esters

Singer P, Jaeger W, Berger I, Barleben H, Wirth M, Richter-Heinrich E, Voigt S & Godicke W. (1990b) J. Hum. Hypertens. 4(3): 227-233.

80. Rats consuming a diet supplemented with flaxseed oil (20 % oil (99% flaxseed oil, 1 % sunflower oil), 62% ALA, n6:n3 ratio 0.19) (Rustan et al.1992). Context: (a) liver triacylglycerol (b) liver phospholipids

Rustan AC, Christiansen EN & Drevon CA. (1992) Biochem J. 283: 333-339.

81. Vegan and omnivore volunteers consuming a diet supplemented with flaxseed oil (20 ml oil/day, 53.93 % ALA, n6:n3 ratio 0.34) (Sanders et al. 1981). Context: (a) vegan plasma choline phosphoglycerides (b) vegan platelet phosphoglycerides (c) omnivore plasma choline phosphoglycerides (d) omnivore platelet phosphoglycerides

Sanders TAB & Younger KM. (1981) J. Nutr. 45: 613-616.

82. Spontaneously hypertensive (SHR) and normotensive rats consuming a diet supplemented with flaxseed oil (15 % oil, 64 % ALA, n6:n3 ratio 0.23) (Singer et al. 1987). Context: (a) SHR liver triglycerides (b) SHR liver free fatty acids (c) SHR liver phosphatidylethanolamine (d) SHR liver phosphatidylcholine (e) normotensive liver triglycerides (f) normotensive liver free fatty acid (g) normotensive phosphatidylethanolamine (h) normotensive phosphatidylcholine

    Singer P, Berger I, Gerhard U, Wirth M, Mortiz V & Forster D. (1987) Prostaglandins Leukot. Med. 28(2): 183-193.

83. Volunteers consuming a diet supplemented with flaxseed oil (60 ml oil/day, 64 % ALA, n6:n3 ratio 0.23) (Singer et al.1986). Context: (a) normal volunteers serum triglycerides (b) normal volunteers serum cholesterol esters (c) normal volunteers serum phospholipids (d) hypertensive volunteers serum triglycerides (e) hypertensive volunteers serum cholesterol esters (f) hyperlipemic volunteers serum triglycerides (g) hyperlipemic volunteers serum cholesterol esters (h) hyperlipemic volunteers serum phospholipids

    Singer P, Berger I, Wirth M, Godicke W, Jaeger W, Voigt S. (1986) Prosaglandins Leukot. Med. 24: 173-193.

84. Rats consuming a diet supplemented with flaxseed oil (150 g oil/kg, 64 % ALA, n6:n3 ratio 0.23) (Singer et al. 1990c). Context: (a) spontaneously hypertensive rat renal medulla triglyceride (b) spontaneously hypertensive rat renal medulla free fatty acid

    Singer P, Wirth M, Kretschmer H, Berger I & Heine H.(1990c) Prostaglandins Leukot. Essent. Fatty Acids 39(4): 329-335.

85. UVB irradiated mice consuming a diet supplemented with flaxseed oil (10% oil, 48.4 % ALA, n6:n3 ratio 0.46) (Takemura et al. 2002). Context: (a) dorsal skin total lipids

    Takemura N, Takahashi K, Tanaka H, Ihara Y, Ikemoto A, Fujii Y & Okuyama H. (2002) Photochem. Photobiol. 76(6): 657-663.

86. Pigs consuming a diet supplemented with flaxseed oil (10.5 % oil, 44 % ALA, n6:n3 ratio 0.41) (Turek et al.1996). Context: (a) alveolar macrophage

Turek JJ, Schoenlein IA, Watkins BA, Van Alstine WG, Clark LK & Knox K. (1996) J. Nutr. 126(6): 1541-1548.

87. Normolipidemic male subjects consuming a diet supplemented with flaxseed oil (30 ml oil/day, 20 g ALA/day n6:n3 ratio of diet ≤ 1) (Wilkinson et al. 2000). Context: (a) erythrocytes

Wilkinson PA, Ah-Sing E, Emery C, Fereday A, Millward DJ, Richards S, Sheppard J & Griffin BA. (2000) Proc. Nutr. Soc. 59: 16A.

88. Rats reared in bright light and consuming a diet supplemented with flaxseed oil (10 % oil, 53 % ALA, n6:n3 ratio 0.38) (Wiegand et al.1995). Context: (a) rod outer segment

Wiegand RD, Koutz CA, Chen H & Anderson RE. (1995) Exp. Eye Res. 60(3): 291-306.

89. Rats consuming a diet supplemented with flaxseed oil (6.4 % oil, 34 % ALA in diet, 55 % ALA in oil, n6:n3 ratio 0.34 in diet) (Winters et al.1994). Context: (a) plasma phospholipids (b) erythrocyte phospholipids (c) liver microsomal phospholipids

Winters BL, Yeh SM & Yeh YY. (1994) J. Nutr. 124(9): 1654-1659.

90. Adults with ADHD consuming a diet supplemented with flaxseed oil (60 g oil/day, 59.6 % ALA, n6:n3 ratio not described) (Young et al.2005). Context: (a) serum phospholipids

Young GS, Conquer JA & Thomas R. (2005) Reprod. Nutr. Dev. 45(5): 549-558.

91. Mice consuming a diet supplemented with flaxseed oil (10 % oil, 57 % ALA, 0.28) (Zhang et al. 1996). Context: (a) lung

Zhang H & German JB. (1996) Lipids 31(1): 19-25.

92. One kidney one clip rats consuming a diet supplemented with flaxseed oil (40 % of calories, 50.5 % ALA, n6:n3 ratio 0.36) (Codde et al. 1984). Context: (a) kidney total lipids (b) kidney phospholipids (c) aortic phospholipids (d) plasma phospholipids

Codde JP, Beilin LJ & Croft KD. (1984) J Hypertension 2(1): 65-71.

93. Rats consuming a diet supplemented with flaxseed oil (20 % energy, 44 % ALA, n6:n3 ratio 0.5) as compared to safflower oil or hydrogenated coconut oil/safflower oil mixture (Codde et al.1984b). Context: (a) renal phospholipids

Codde JP, Croft KD, Barden A, Matthews E, Vandongen R, Beilin LJ. (1984b) J Hypertension 2(3): 265-270.

94. White rabbits consuming a diet supplemented with flaxseed oil (Bolton-Smith et al. 1984). Tissue (a) platelet total fatty acids (b) aortic total fatty acids

Bolton-Smith C, Gibney MJ, Vas Dias FW & Hillier K. (1984) Br. J. Clin. Pract. Suppl. 31: 37-41.

95. Spontaneously hypertensive rats consuming a diet supplemented with flaxseed oil (1 ml/day, 49.3 % ALA, n6:n3 ratio 0.33) (Sekine et al. 2007). Context: (a) liver total lipids

Sekine S, Sasanuki S, Aoyama T & Takeuchi H.(2007) J. Oleo Sci. 56(7): 341-345.

96. Overweight but otherwise healthy volunteers consuming a diet supplemented with flaxseed oil capsules (ALA 5 % of energy intake, 57 % ALA, n6:n3 ratio 0.32) (Nelson et al. 2007). Context: (a) erythrocyte cell membrane fatty acid

Nelson TL, Stevens JR, Hickey MS. (2007) Metab. 56(9): 1209-1215.

97. Rats consuming a diet supplemented with flaxseed oil (10 % oil, 53.5 % ALA, n6:n3 ratio 0.33) (Liautaud et al. 1991). Context: (a) phospholipid fraction of rat hearts (b) phospholipids fraction of cultured rat cardiomyocytes (c) non-phophorous lipid fraction of rat heart (d) non-phosphorous lipid fraction of cultured rat cardiomyocytes

Liautaud S, Grynberg A, Mourot J & Athias P. (1991) Cardiosci. 2(1): 55-61.