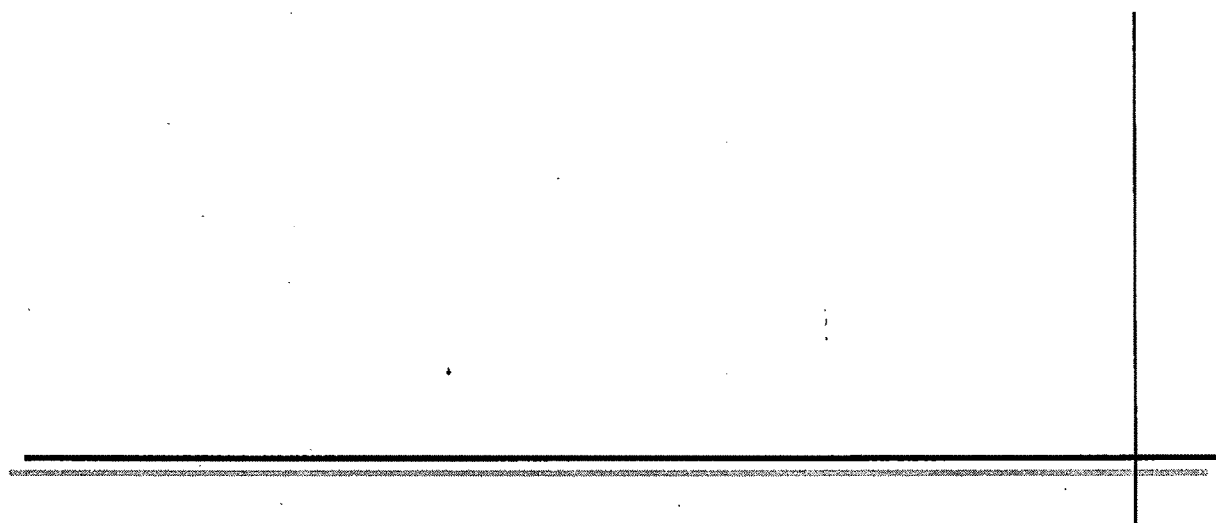


References



References

- Ageitos JM, Vallejo JA, Veiga-Crespo P & Villa TG (2011) Oily yeasts as oleaginous cell factories. *Appl Microbiol Biotechnol* **90**: 1219-1227.
- Ahmad I, Shim WY & Kim JH (2013) Enhancement of xylitol production in glycerol kinase disrupted *Candida tropicalis* by co-expression of three genes involved in glycerol metabolic pathway. *Bioprocess Biosyst Eng* **36**: 1279-1284.
- Akhavan AA, Mirhendi H, Khamesipour A, *et al.* (2010) Leishmania species: detection and identification by nested PCR assay from skin samples of rodent reservoirs. *Exp Parasitol* **126**: 552-556.
- Aldai N, Dugan ME, Kramer JK, Martinez A, Lopez-Campos O, Mantecon AR & Osoro K (2011) Length of concentrate finishing affects the fatty acid composition of grass-fed and genetically lean beef: an emphasis on trans-18:1 and conjugated linoleic acid profiles. *Animal* **5**: 1643-1652.
- Alonso DL & Maroto FG (2000) Plants as 'chemical factories' for the production of polyunsaturated fatty acids. *Biotechnol Adv* **18**: 481-497.
- Anonymous, (2009) Nutrient requirements and recommended dietary allowances for Indians, A Report of the Expert Group of the Indian Council of Medical Research (ICMR). National Institute of Nutrition, Jamai-Osmania PO, Hyderabad, pp 114-142.
- Antruejo A, Azcona JO, Garcia PT, *et al.* (2011) Omega-3 enriched egg production: the effect of α -linolenic acid omega-3 fatty acid sources on laying hen performance and yolk lipid content and fatty acid composition. *British Poultry Science* **52**: 750-760.
- Apiradee H, Kalyanee P, Pongsathon P, *et al.* (2004) The expression of three desaturase genes of *Spirulina platensis* in *Escherichia coli* DH5 α . Heterologous expression of *Spirulina*-desaturase genes. *Mol Biol Rep* **31**: 177-189.
- Arendrup MC (2013) *Candida* and candidaemia. Susceptibility and epidemiology. *Dan Med J* **60**: B4698.
- Armenta R & Valentine M (2013) Single-Cell Oils as a Source of Omega-3 Fatty Acids: An Overview of Recent Advances. *Journal of the American Oil Chemists' Society* **90**: 167-182.
- Arterburn LM, Hall EB & Oken H (2006) Distribution, interconversion, and dose response of n-3 fatty acids in humans. *Am J Clin Nutr* **83**: 1467S-1476S.
- Baradkar VP, Mathur M & Kumar S (2010) Hichrom candida agar for identification of *Candida* species. *Indian J Pathol Microbiol* **53**: 93-95.

- Barclay W, Weaver C, Metz J & Hansen J (2010) Development of a docosahexaenoic acid production technology using *Schizochytrium*: historical perspective and update. *Single Cell Oils*, (Cohen Z & Ratledge C, eds.), pp. 75-96. AOCS Press, Champaign, IL.
- Baumgart DC & Carding SR (2007) Inflammatory bowel disease: cause and immunobiology. *Lancet* **369**: 1627-1640.
- Beaudoin F & Napier JA (2002) Targeting and membrane-insertion of a sunflower oleosin in vitro and in *Saccharomyces cerevisiae*: the central hydrophobic domain contains more than one signal sequence, and directs oleosin insertion into the endoplasmic reticulum membrane using a signal anchor sequence mechanism. *Planta* **215**: 293-303.
- Beaudoin F, Wilkinson BM, Stirling CJ & Napier JA (2000) In vivo targeting of a sunflower oil body protein in yeast secretory (sec) mutants. *Plant J* **23**: 159-170.
- Bell MV & Tocher DR (2009) Biosynthesis of Polyunsaturated Fatty Acids in Aquatic Ecosystems: General Pathways and New Directions. *Lipids in Aquatic Ecosystems*, (Arts MT, Brett MT & Kainz M, eds.), pp. 211-236. Springer, Heidelberg.
- Beopoulos A & Nicaud JM (2012) Yeast: A new oil producer? *Oleagineux, Corps Gras, Lipides* **19**: 22-28.
- Beopoulos A, Nicaud JM & Gaillardin C (2011) An overview of lipid metabolism in yeasts and its impact on biotechnological processes. *Appl Microbiol Biotechnol* **90**: 1193-1206.
- Berquin IM, Min Y, Wu R, *et al.* (2007) Modulation of prostate cancer genetic risk by omega-3 and omega-6 fatty acids. *J Clin Invest* **117**: 1866-1875.
- Betoret E, Betoret N, Vidal D & Fito P (2011) Functional foods development: Trends and technologies. *Trends in Food Science & Technology* **22**: 498-508.
- Bilyeu KD, Palavalli L, Sleper DA & Beuselinck PR (2003) Three Microsomal Omega-3 Fatty-acid Desaturase Genes Contribute to Soybean Linolenic Acid Levels Contribution of the Missouri Agric. Exp. Stn. *Crop Sci.* **43**: 1833-1838.
- Bjerregaard P, Mulvad G & Pedersen HS (1997) Cardiovascular risk factors in Inuit of Greenland. *Int J Epidemiol* **26**: 1182-1190.
- Blanchard H, Legrand P & Pedrono F (2011) Fatty Acid Desaturase 3 (Fads3) is a singular member of the Fads cluster. *Biochimie* **93**: 87-90.
- Blandino A, Al-Aseeri ME, Pandiella SS, Cantero D & Webb C (2003) Cereal-based fermented foods and beverages. *Food Research International* **36**: 527-543.
- Bloomer RJ, Larson DE, Fisher-Wellman KH, Galpin AJ & Schilling BK (2009) Effect of eicosapentaenoic and docosahexaenoic acid on resting and exercise-induced

inflammatory and oxidative stress biomarkers: a randomized, placebo controlled, cross-over study. *Lipids Health Dis* **8**: 36.

Bloomfield DK & Bloch K (1960) The formation of delta-9 unsaturated fatty acids. *J Biol Chem* **235**: 337-345.

Bokor S, Dumont J, Spinneker A, *et al.* (2010) Single nucleotide polymorphisms in the FADS gene cluster are associated with delta-5 and delta-6 desaturase activities estimated by serum fatty acid ratios. *J Lipid Res* **51**: 2325-2333.

Botham PA & Ratledge C (1979) A biochemical explanation for lipid accumulation in *Candida* 107 and other oleaginous micro-organisms. *J Gen Microbiol* **114**: 361-375.

Bousquet M, Calon F & Cicchetti F (2011) Impact of omega-3 fatty acids in Parkinson's disease. *Ageing Res Rev* **10**: 453-463.

Bouwens M, van de Rest O, Dellschaft N, *et al.* (2009) Fish-oil supplementation induces antiinflammatory gene expression profiles in human blood mononuclear cells. *Am J Clin Nutr* **90**: 415-424.

Bradford MM (1976) A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Anal Biochem* **72**: 248-254.

Brondz I & Olsen I (1990) Multivariate analyses of cellular carbohydrates and fatty acids of *Candida albicans*, *Torulopsis glabrata*, and *Saccharomyces cerevisiae*. *J Clin Microbiol* **28**: 1854-1857.

Bucek A, Pichova I, Matouskova P & Hruskova O (2009) Characterization of delta12 and omega3 fatty acid desaturase from *Candida albicans*. IOCB, Protein Biochemistry, Prague.

Cahoon EB, Mills LA & Shanklin J (1996) Modification of the fatty acid composition of *Escherichia coli* by coexpression of a plant acyl-acyl carrier protein desaturase and ferredoxin. *J Bacteriol* **178**: 936-939.

Cai J, Roberts IN & Collins MD (1996) Phylogenetic relationships among members of the ascomycetous yeast genera *Brettanomyces*, *Debaryomyces*, *Dekkera*, and *Kluyveromyces* deduced by small-subunit rRNA gene sequences. *Int J Syst Bacteriol* **46**: 542-549.

Calder PC (2006) n-3 polyunsaturated fatty acids, inflammation, and inflammatory diseases. *Am J Clin Nutr* **83**: 1505S-1519S.

Cao Y, Xian M, Yang J, Xu X, Liu W & Li L (2010) Heterologous expression of stearyl-acyl carrier protein desaturase (S-ACP-DES) from *Arabidopsis thaliana* in *Escherichia coli*. *Protein Expr Purif* **69**: 209-214.

- Casaregola S, Weiss S & Morel G (2011) New perspectives in hemiascomycetous yeast taxonomy. *C R Biol* **334**: 590-598.
- Castro LFC, Monroig O, Leaver MJ, Wilson J, Cunha I & Tocher DR (2012) Functional Desaturase Fads1 ($\Delta 5$) and Fads2 ($\Delta 6$) Orthologues Evolved before the Origin of Jawed Vertebrates. *PLoS ONE* **7**: e31950.
- Chavan P, Mane S, Kulkarni G, *et al.* (2009) Natural yeast flora of different varieties of grapes used for wine making in India. *Food Microbiol* **26**: 801-808.
- Chellappa R, Kandasamy P, Oh CS, Jiang Y, Vemula M & Martin CE (2001) The membrane proteins, Spt23p and Mga2p, play distinct roles in the activation of *Saccharomyces cerevisiae* OLE1 gene expression. Fatty acid-mediated regulation of Mga2p activity is independent of its proteolytic processing into a soluble transcription activator. *J Biol Chem* **276**: 43548-43556.
- Chen H, Gu Z, Zhang H, Wang M, Chen W, Lowther WT & Chen YQ (2013) Expression and purification of integral membrane fatty acid desaturases. *PLoS One* **8**: e58139.
- Cho HP, Nakamura M & Clarke SD (1999a) Cloning, expression, and fatty acid regulation of the human delta-5 desaturase. *J Biol Chem* **274**: 37335-37339.
- Cho HP, Nakamura MT & Clarke SD (1999b) Cloning, expression, and nutritional regulation of the mammalian Delta-6 desaturase. *J Biol Chem* **274**: 471-477.
- Choi JY, Stuke J, Hwang SY & Martin CE (1996) Regulatory elements that control transcription activation and unsaturated fatty acid-mediated repression of the *Saccharomyces cerevisiae* OLE1 gene. *J Biol Chem* **271**: 3581-3589.
- Crawford MA, Bazinet RP & Sinclair AJ (2009) Fat intake and CNS functioning: ageing and disease. *Ann Nutr Metab* **55**: 202-228.
- Cserzo M, Wallin E, Simon I, von Heijne G & Elofsson A (1997) Prediction of transmembrane alpha-helices in prokaryotic membrane proteins: the dense alignment surface method. *Protein Eng* **10**: 673-676.
- Damude HG & Kinney AJ (2008) Engineering oilseeds to produce nutritional fatty acids. *Physiol Plant* **132**: 1-10.
- Damude HG, Zhang H, Farrall L, Ripp KG, Tomb JF, Hollerbach D & Yadav NS (2006) Identification of bifunctional delta12/omega3 fatty acid desaturases for improving the ratio of omega3 to omega6 fatty acids in microbes and plants. *Proc Natl Acad Sci U S A* **103**: 9446-9451.
- de Carvalho C & Caramujo M (2012) Lipids of Prokaryotic Origin at the Base of Marine Food Webs. *Marine Drugs* **10**: 2698-2714.

DeGraffenried LA, Friedrichs WE, Fulcher L, Fernandes G, Silva JM, Peralba JM & Hidalgo M (2003) Eicosapentaenoic acid restores tamoxifen sensitivity in breast cancer cells with high Akt activity. *Ann Oncol* **14**: 1051-1056.

Demain AL & Vaishnav P (2009) Production of recombinant proteins by microbes and higher organisms. *Biotechnol Adv* **27**: 297-306.

Dey P & Maiti MK (2013) Molecular characterization of a novel isolate of *Candida tropicalis* for enhanced lipid production. *J Appl Microbiol* **114**: 1357-1368.

Diezmann S, Cox CJ, Schonian G, Vilgalys RJ & Mitchell TG (2004) Phylogeny and evolution of medical species of *Candida* and related taxa: a multigenic analysis. *J Clin Microbiol* **42**: 5624-5635.

Dorea JG (2008) Persistent, bioaccumulative and toxic substances in fish: human health considerations. *Sci Total Environ* **400**: 93-114.

Dumon-Seignovert L, Cariot G & Vuillard L (2004) The toxicity of recombinant proteins in *Escherichia coli*: a comparison of overexpression in BL21(DE3), C41(DE3), and C43(DE3). *Protein Expr Purif* **37**: 203-206.

Dyerberg J, Bang HO & Hjerne N (1975) Fatty acid composition of the plasma lipids in Greenland Eskimos. *Am J Clin Nutr* **28**: 958-966.

Freund-Levi Y, Hjorth E, Lindberg C, *et al.* (2009) Effects of omega-3 fatty acids on inflammatory markers in cerebrospinal fluid and plasma in Alzheimer's disease: the OmegaAD study. *Dement Geriatr Cogn Disord* **27**: 481-490.

Friedrichs W, Ruparel SB, Marciniak RA & deGraffenried L (2011) Omega-3 fatty acid inhibition of prostate cancer progression to hormone independence is associated with suppression of mTOR signaling and androgen receptor expression. *Nutr Cancer* **63**: 771-777.

Galli C & Calder PC (2009) Effects of fat and fatty acid intake on inflammatory and immune responses: a critical review. *Ann Nutr Metab* **55**: 123-139.

Gangopadhyay S, Nandi S & Ghosh S (2006) Biooxidation of fatty acid distillates to dibasic acids by a mutant of *Candida tropicalis*. *J Oleo Sci* **56**: 13-17.

Ghafoorunissa, Ibrahim A & Natarajan S (2005) Substituting dietary linoleic acid with alpha-linolenic acid improves insulin sensitivity in sucrose fed rats. *Biochim Biophys Acta* **1733**: 67-75.

Gietz RD & Schiestl RH (2007) High-efficiency yeast transformation using the LiAc/SS carrier DNA/PEG method. *Nat Protoc* **2**: 31-34.

Gladyshev MI, Sushchik NN & Makhutova ON (2013) Production of EPA and DHA in aquatic ecosystems and their transfer to the land. *Prostaglandins Other Lipid Mediat* **107**: 117-126.

- Gorg A, Weiss W & Dunn MJ (2004) Current two-dimensional electrophoresis technology for proteomics. *Proteomics* **4**: 3665-3685.
- Gostincar C, Turk M & Gunde-Cimerman N (2010) The evolution of fatty acid desaturases and cytochrome b5 in eukaryotes. *J Membr Biol* **233**: 63-72.
- Gould JF, Smithers LG & Makrides M (2013) The effect of maternal omega-3 (n-3) LCPUFA supplementation during pregnancy on early childhood cognitive and visual development: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr* **97**: 531-544.
- Green MS, Hossler PA & Castor CW (1986) Connective tissue activation. XXX: Isoelectric point microheterogeneity of CTAP-III, a human platelet-derived growth factor. *Proc Soc Exp Biol Med* **181**: 555-559.
- Guallar E, Sanz-Gallardo MI, van't Veer P, *et al.* (2002) Mercury, fish oils, and the risk of myocardial infarction. *N Engl J Med* **347**: 1747-1754.
- Gunstone FD (2002) *Vegetable oils in food technology*. CRC press, Boca Raton.
- Gunstone FD, Harwood JL & Dijkstra AJ (2007) *The Lipid Handbook, Third Edition* CRC press, Boca Raton.
- Gygi SP, Corthals GL, Zhang Y, Rochon Y & Aebersold R (2000) Evaluation of two-dimensional gel electrophoresis-based proteome analysis technology. *Proc Natl Acad Sci U S A* **97**: 9390-9395.
- Hageman JH, Hooyenga P, Diersen-Schade DA, Scalabrin DM, Wichers HJ & Birch EE (2012) The impact of dietary long-chain polyunsaturated fatty acids on respiratory illness in infants and children. *Curr Allergy Asthma Rep* **12**: 564-573.
- Hartweg J, Farmer AJ, Holman RR & Neil A (2009) Potential impact of omega-3 treatment on cardiovascular disease in type 2 diabetes. *Curr Opin Lipidol* **20**: 30-38.
- Harwood JL & Guschina IA (2009) The versatility of algae and their lipid metabolism. *Biochimie* **91**: 679-684.
- Hastings N, Agaba M, Tocher DR, Leaver MJ, Dick JR, Sargent JR & Teale AJ (2001) A vertebrate fatty acid desaturase with Delta 5 and Delta 6 activities. *Proc Natl Acad Sci U S A* **98**: 14304-14309.
- Hatoum R, Labrie S & Fliss I (2012) Antimicrobial and probiotic properties of yeasts: from fundamental to novel applications. *Front Microbiol* **3**: 421.
- Helland IB, Smith L, Blomen B, Saarem K, Saugstad OD & Drevon CA (2008) Effect of supplementing pregnant and lactating mothers with n-3 very-long-chain fatty acids on children's IQ and body mass index at 7 years of age. *Pediatrics* **122**: e472-479.

- Higashiyama K, Murakami K, Tsujimura H, Matsumoto N & Fujikawa S (1999) Effects of dissolved oxygen on the morphology of an arachidonic acid production by *Mortierella alpina* 1S-4. *Biotechnol Bioeng* **63**: 442-448.
- Hong KK & Nielsen J (2012) Metabolic engineering of *Saccharomyces cerevisiae*: a key cell factory platform for future biorefineries. *Cell Mol Life Sci* **69**: 2671-2690.
- Howe LR (2007) Inflammation and breast cancer. Cyclooxygenase/prostaglandin signaling and breast cancer. *Breast Cancer Res* **9**: 210.
- Hsu JM, Wang PH, Liu BH & Ding ST (2004) The effect of dietary docosahexaenoic acid on the expression of porcine lipid metabolism-related genes. *J Anim Sci* **82**: 683-689.
- Itariu BK, Zeyda M, Hochbrugger EE, *et al.* (2012) Long-chain n-3 PUFAs reduce adipose tissue and systemic inflammation in severely obese nondiabetic patients: a randomized controlled trial. *Am J Clin Nutr* **96**: 1137-1149.
- Jakobsson A, Westerberg R & Jacobsson A (2006) Fatty acid elongases in mammals: their regulation and roles in metabolism. *Prog Lipid Res* **45**: 237-249.
- Jones R, Adel-Alvarez LA, Alvarez OR, Broaddus R & Das S (2003) Arachidonic acid and colorectal carcinogenesis. *Mol Cell Biochem* **253**: 141-149.
- Judge MP, Harel O & Lammi-Keefe CJ (2007) A docosahexaenoic acid-functional food during pregnancy benefits infant visual acuity at four but not six months of age. *Lipids* **42**: 117-122.
- Kainou K, Kamisaka Y, Kimura K & Uemura H (2006) Isolation of Delta12 and omega3-fatty acid desaturase genes from the yeast *Kluyveromyces lactis* and their heterologous expression to produce linoleic and alpha-linolenic acids in *Saccharomyces cerevisiae*. *Yeast* **23**: 605-612.
- Kajiwarra S (2002) Molecular cloning and characterization of the delta-9 fatty acid desaturase gene and its promoter region from *Saccharomyces kluyveri*. *FEMS Yeast Res* **2**: 333-339.
- Karakousis A, Tan L, Ellis D, Alexiou H & Wormald PJ (2006) An assessment of the efficiency of fungal DNA extraction methods for maximizing the detection of medically important fungi using PCR. *J Microbiol Methods* **65**: 38-48.
- Karatay SE & Donmez G (2010) Improving the lipid accumulation properties of the yeast cells for biodiesel production using molasses. *Bioresour Technol* **101**: 7988-7990.
- Kaur N, Chugh V & Gupta A (2012) Essential fatty acids as functional components of foods- a review. *Journal of Food Science and Technology* 1-15.
- Kedia G, Wang R, Patel H & Pandiella SS (2007) Use of mixed cultures for the fermentation of cereal-based substrates with potential probiotic properties. *Process Biochemistry* **42**: 65-70.

- Kelesidis T & Pothoulakis C (2012) Efficacy and safety of the probiotic *Saccharomyces boulardii* for the prevention and therapy of gastrointestinal disorders. *Therap Adv Gastroenterol* **5**: 111-125.
- Khozin-Goldberg I, Iskandarov U & Cohen Z (2011) LC-PUFA from photosynthetic microalgae: occurrence, biosynthesis, and prospects in biotechnology. *Appl Microbiol Biotechnol* **91**: 905-915.
- Kiseleva LL, Serebriiskaya TS, Horvath I, Vigh L, Lyukevich AA & Los DA (2000) Expression of the gene for the delta9 acyl-lipid desaturase in the thermophilic cyanobacterium. *J Mol Microbiol Biotechnol* **2**: 331-338.
- Knutzon DS, Thurmond JM, Huang YS, *et al.* (1998) Identification of delta-5-desaturase from *Mortierella alpina* by heterologous expression in bakers' yeast and Canola. *J Biol Chem* **273**: 29360-29366.
- Kolanowski W & WeiBbrodt J (2007) Sensory quality of dairy products fortified with fish oil. *International Dairy Journal* **17**: 1248-1253.
- Kramer JK, Parodi PW, Jensen RG, Mossoba MM, Yurawecz MP & Adlof RO (1998) Rumenic acid: a proposed common name for the major conjugated linoleic acid isomer found in natural products. *Lipids* **33**: 835.
- Kris-Etherton PM, Lefevre M, Mensink RP, Petersen B, Fleming J & Flickinger BD (2012) Trans fatty acid intakes and food sources in the U.S. population: NHANES 1999-2002. *Lipids* **47**: 931-940.
- Krivoruchko A, Siewers V & Nielsen J (2011) Opportunities for yeast metabolic engineering: Lessons from synthetic biology. *Biotechnol J* **6**: 262-276.
- Kumura H, Tanoue Y, Tsukahara M, Tanaka T & Shimazaki K (2004) Screening of dairy yeast strains for probiotic applications. *J Dairy Sci* **87**: 4050-4056.
- Kuriki K, Wakai K, Matsuo K, *et al.* (2007) Gastric cancer risk and erythrocyte composition of docosahexaenoic acid with anti-inflammatory effects. *Cancer Epidemiol Biomarkers Prev* **16**: 2406-2415.
- Kurtzman C & Suzuki M (2010) Phylogenetic analysis of ascomycete yeasts that form coenzyme Q-9 and the proposal of the new genera *Babjeviella*, *Meyerozyma*, *Millerozyma*, *Priceomyces*, and *Scheffersomyces*. *Mycoscience* **51**: 2-14.
- Kurtzman CP & Fell JW (2001) *The Yeasts, A Taxonomic Study*. Blackwell, Oxford, UK.
- Kurtzman CP, Robnett CJ & Basehoar-Powers E (2008) Phylogenetic relationships among species of *Pichia*, *Issatchenkia* and *Williopsis* determined from multigene sequence analysis, and the proposal of *Barnettozyma* gen. nov., *Lindnera* gen. nov. and *Wickerhamomyces* gen. nov. *FEMS Yeast Res* **8**: 939-954.

- Kurtzman CP, Fell JW & Boekhout T (2011) *The Yeasts, A Taxonomic Study*. Elsevier, Amsterdam.
- Kushnirov VV (2000) Rapid and reliable protein extraction from yeast. *Yeast* **16**: 857-860.
- Kwamin F, Nartey NO, Codjoe FS & Newman MJ (2013) Distribution of *Candida* species among HIV-positive patients with oropharyngeal candidiasis in Accra, Ghana. *J Infect Dev Ctries* **7**: 41-45.
- Lawson RE, Moss AR & Givens DI (2001) The role of dairy products in supplying conjugated linoleic acid to man's diet: a review. *Nutr Res Rev* **14**: 153-172.
- Lee SJ, Seo PS, Kim CH, Kwon O, Hur BK & Seo JW (2009) Isolation and characterization of the eicosapentaenoic acid biosynthesis gene cluster from *Shewanella* sp. BR-2. *J Microbiol Biotechnol* **19**: 881-887.
- Leonard AE, Pereira SL, Sprecher H & Huang YS (2004) Elongation of long-chain fatty acids. *Prog Lipid Res* **43**: 36-54.
- Li MC, Li H, Wei DS & Xing LJ (2006) Cloning and molecular characterization of delta12-fatty acid desaturase gene from *Mortierella isabellina*. *World J Gastroenterol* **12**: 3373-3379.
- Li Y, Monroig O, Zhang L, *et al.* (2010) Vertebrate fatty acyl desaturase with Delta4 activity. *Proc Natl Acad Sci USA* **107**: 16840-16845.
- Libisch B, Michaelson LV, Lewis MJ, Shewry PR & Napier JA (2000) Chimeras of Delta6-fatty acid and Delta8-sphingolipid desaturases. *Biochem Biophys Res Commun* **279**: 779-785.
- Libkind D, Arts MT & van Broock M (2008) Fatty acid composition of cold-adapted carotenogenic basidiomycetous yeasts. *Rev Argent Microbiol* **40**: 193-197.
- Lindqvist Y, Huang W, Schneider G & Shanklin J (1996) Crystal structure of delta9 stearoyl-acyl carrier protein desaturase from castor seed and its relationship to other di-iron proteins. *EMBO J* **15**: 4081-4092.
- Liu Y, Jandacek R, Rider T, Tso P & McNamara RK (2009) Elevated delta-6 desaturase (FADS2) expression in the postmortem prefrontal cortex of schizophrenic patients: relationship with fatty acid composition. *Schizophr Res* **109**: 113-120.
- Lopez Alonso D, Garc  a-Maroto F, Rodr  guez-Ru  z J, Garrido JA & Vilches MA (2003) Evolution of the membrane-bound fatty acid desaturases. *Biochemical Systematics and Ecology* **31**: 1111-1124.
- Los DA & Murata N (1998) Structure and expression of fatty acid desaturases. *Biochim Biophys Acta* **1394**: 3-15.

- Los DA, Mironov KS & Allakhverdiev SI (2013) Regulatory role of membrane fluidity in gene expression and physiological functions. *Photosynth Res* **116**: 489-509.
- Makinen K, Berger B, Bel-Rhlim R & Ananta E (2012) Science and technology for the mastership of probiotic applications in food products. *J Biotechnol* **162**: 356-365.
- Malerba G, Schaeffer L, Xumerle L, *et al.* (2008) SNPs of the FADS gene cluster are associated with polyunsaturated fatty acids in a cohort of patients with cardiovascular disease. *Lipids* **43**: 289-299.
- Marquardt A, Stohr H, White K & Weber BH (2000) cDNA cloning, genomic structure, and chromosomal localization of three members of the human fatty acid desaturase family. *Genomics* **66**: 175-183.
- Martin CE, Oh CS & Jiang Y (2007) Regulation of long chain unsaturated fatty acid synthesis in yeast. *Biochim Biophys Acta* **1771**: 271-285.
- McCann JC & Ames BN (2005) Is docosahexaenoic acid, an n-3 long-chain polyunsaturated fatty acid, required for development of normal brain function? An overview of evidence from cognitive and behavioral tests in humans and animals. *Am J Clin Nutr* **82**: 281-295.
- McDonough VM, Stuke JE & Martin CE (1992) Specificity of unsaturated fatty acid-regulated expression of the *Saccharomyces cerevisiae* OLE1 gene. *J Biol Chem* **267**: 5931-5936.
- Meesapyodsuk D & Qiu X (2012) The front-end desaturase: structure, function, evolution and biotechnological use. *Lipids* **47**: 227-237.
- Meesapyodsuk D, Reed DW, Savile CK, Buist PH, Schafer UA, Ambrose SJ & Covello PS (2000) Substrate specificity, regioselectivity and cryptoregiochemistry of plant and animal omega-3 fatty acid desaturases. *Biochem Soc Trans* **28**: 632-635.
- Meng X, Yang J, Xu X, Zhang L, Nie Q & Xian M (2009) Biodiesel production from oleaginous microorganisms. *Renewable Energy* **34**: 1-5.
- Menrad K (2003) Market and marketing of functional food in Europe. *Journal of Food Engineering* **56**: 181-188.
- Micallef M, Lexis L & Lewandowski P (2007) Red wine consumption increases antioxidant status and decreases oxidative stress in the circulation of both young and old humans. *Nutr J* **6**: 27.
- Michaelson LV, Napier JA, Lewis M, Griffiths G, Lazarus CM & Stobart AK (1998b) Functional identification of a fatty acid delta5 desaturase gene from *Caenorhabditis elegans*. *FEBS Lett* **439**: 215-218.

- Miettinen TA, Puska P, Gylling H, Vanhanen H & Vartiainen E (1995) Reduction of serum cholesterol with sitostanol-ester margarine in a mildly hypercholesterolemic population. *N Engl J Med* **333**: 1308-1312.
- Miroux B & Walker JE (1996) Over-production of proteins in *Escherichia coli*: mutant hosts that allow synthesis of some membrane proteins and globular proteins at high levels. *J Mol Biol* **260**: 289-298.
- Misra A, Singhal N, Sivakumar B, Bhagat N, Jaiswal A & Khurana L (2011) Nutrition transition in India: secular trends in dietary intake and their relationship to diet-related non-communicable diseases. *J Diabetes* **3**: 278-292.
- Mitchell AG & Martin CE (1995) A novel cytochrome b5-like domain is linked to the carboxyl terminus of the *Saccharomyces cerevisiae* delta-9 fatty acid desaturase. *J Biol Chem* **270**: 29766-29772.
- Moslehi-Jenabian S, Pedersen LL & Jespersen L (2010) Beneficial effects of probiotic and food borne yeasts on human health. *Nutrients* **2**: 449-473.
- Murayama SY, Negishi Y, Umeyama T, *et al.* (2006) Construction and functional analysis of fatty acid desaturase gene disruptants in *Candida albicans*. *Microbiology* **152**: 1551-1558.
- Murphy RA, Mourtzakis M & Mazurak VC (2012) n-3 polyunsaturated fatty acids: the potential role for supplementation in cancer. *Curr Opin Clin Nutr Metab Care* **15**: 246-251.
- Murphy RA, Yeung E, Mazurak VC & Mourtzakis M (2011) Influence of eicosapentaenoic acid supplementation on lean body mass in cancer cachexia. *Br J Cancer* **105**: 1469-1473.
- Nakamura MT & Nara TY (2004) Structure, function, and dietary regulation of delta6, delta5, and delta9 desaturases. *Annu Rev Nutr* **24**: 345-376.
- Napier JA, Hey SJ, Lacey DJ & Shewry PR (1998) Identification of a *Caenorhabditis elegans* Delta6-fatty-acid-desaturase by heterologous expression in *Saccharomyces cerevisiae*. *Biochem J* **330** (Pt 2): 611-614.
- Nevoigt E (2008) Progress in metabolic engineering of *Saccharomyces cerevisiae*. *Microbiol Mol Biol Rev* **72**: 379-412.
- Norris JM, Yin X, Lamb MM, *et al.* (2007) Omega-3 polyunsaturated fatty acid intake and islet autoimmunity in children at increased risk for type 1 diabetes. *JAMA* **298**: 1420-1428.
- Odds FC & Bernaerts R (1994) CHROMagar Candida, a new differential isolation medium for presumptive identification of clinically important *Candida* species. *J Clin Microbiol* **32**: 1923-1929.

- Olsen SF, Osterdal ML, Salvig JD, Weber T, Tabor A & Secher NJ (2007) Duration of pregnancy in relation to fish oil supplementation and habitual fish intake: a randomised clinical trial with fish oil. *Eur J Clin Nutr* **61**: 976-985.
- Olstorpe M, Schnurer J & Passoth V (2009) Screening of yeast strains for phytase activity. *FEMS Yeast Res* **9**: 478-488.
- Orikasa Y, Nishida T, Yamada A, *et al.* (2006) Recombinant production of docosahexaenoic acid in a polyketide biosynthesis mode in *Escherichia coli*. *Biotechnol Lett* **28**: 1841-1847.
- Oura T & Kajiwara S (2004) *Saccharomyces kluyveri* FAD3 encodes an omega3 fatty acid desaturase. *Microbiology* **150**: 1983-1990.
- Ozen AE, Pons A & Tur JA (2012) Worldwide consumption of functional foods: a systematic review. *Nutr Rev* **70**: 472-481.
- Ozhak-Baysan B, Ogunc D, Colak D, Ongut G, Donmez L, Vural T & Gunseren F (2012) Distribution and antifungal susceptibility of *Candida* species causing nosocomial candiduria. *Med Mycol* **50**: 529-532.
- Palmer DJ, Sullivan T, Gold MS, Prescott SL, Heddle R, Gibson RA & Makrides M (2012) Effect of n-3 long chain polyunsaturated fatty acid supplementation in pregnancy on infants' allergies in first year of life: randomised controlled trial. *BMJ* **344**: e184.
- Papanikolaou S, Sarantou S, Komaitis M & Aggelis G (2004) Repression of reserve lipid turnover in *Cunninghamella echinulata* and *Mortierella isabellina* cultivated in multiple-limited media. *J Appl Microbiol* **97**: 867-875.
- Park WJ, Kothapalli KS, Reardon HT, Kim LY & Brenna JT (2009) Novel fatty acid desaturase 3 (FADS3) transcripts generated by alternative splicing. *Gene* **446**: 28-34.
- Pedrono F, Blanchard H, Kloareg M, D'Andrea S, Daval S, Rioux V & Legrand P (2010) The fatty acid desaturase 3 gene encodes for different FADS3 protein isoforms in mammalian tissues. *J Lipid Res* **51**: 472-479.
- Pennacchia C, Blaiotta G, Pepe O & Villani F (2008) Isolation of *Saccharomyces cerevisiae* strains from different food matrices and their preliminary selection for a potential use as probiotics. *J Appl Microbiol* **105**: 1919-1928.
- Pereira SL, Leonard AE & Mukerji P (2003) Recent advances in the study of fatty acid desaturases from animals and lower eukaryotes. *Prostaglandins Leukot Essent Fatty Acids* **68**: 97-106.
- Pereira SL, Huang YS, Bobik EG, Kinney AJ, Stecca KL, Packer JC & Mukerji P (2004) A novel omega3-fatty acid desaturase involved in the biosynthesis of eicosapentaenoic acid. *Biochem J* **378**: 665-671.

- Peter S, Chopra S & Jacob JJ (2013) A fish a day, keeps the cardiologist away! - A review of the effect of omega-3 fatty acids in the cardiovascular system. *Indian J Endocrinol Metab* **17**: 422-429.
- Petrini GA, Altabe SG & Uttaro AD (2004) Trypanosoma brucei oleate desaturase may use a cytochrome b5-like domain in another desaturase as an electron donor. *Eur J Biochem* **271**: 1079-1086.
- Picataggio S, Rohrer T, Deanda K, Lanning D, Reynolds R, Mielenz J & Eirich LD (1992) Metabolic engineering of Candida tropicalis for the production of long-chain dicarboxylic acids. *Biotechnology (N Y)* **10**: 894-898.
- Plekhanov AY (1999) Rapid staining of lipids on thin-layer chromatograms with amido black 10B and other water-soluble stains. *Anal Biochem* **271**: 186-187.
- Potenza MA, Marasciulo FL, Tarquinio M, *et al.* (2007) EGCG, a green tea polyphenol, improves endothelial function and insulin sensitivity, reduces blood pressure, and protects against myocardial I/R injury in SHR. *Am J Physiol Endocrinol Metab* **292**: E1378-1387.
- Priji P, Unni KN, Sajith S & Benjamin S (2013) Candida tropicalis BPU1, a novel isolate from the rumen of the Malabari goat, is a dual producer of biosurfactant and polyhydroxybutyrate. *Yeast* **30**: 103-110.
- Prior PL & Galduroz JC (2012) (N-3) Fatty acids: molecular role and clinical uses in psychiatric disorders. *Adv Nutr* **3**: 257-265.
- Rabilloud T (2000) Detecting proteins separated by 2-D gel electrophoresis. *Anal Chem* **72**: 48A-55A.
- Rabilloud T (2009a) Detergents and chaotropes for protein solubilization before two-dimensional electrophoresis. *Methods Mol Biol* **528**: 259-267.
- Rabilloud T (2009b) Membrane proteins and proteomics: love is possible, but so difficult. *Electrophoresis* **30 Suppl 1**: S174-180.
- Racine RA & Deckelbaum RJ (2007) Sources of the very-long-chain unsaturated omega-3 fatty acids: eicosapentaenoic acid and docosahexaenoic acid. *Curr Opin Clin Nutr Metab Care* **10**: 123-128.
- Raitakari OT, Salo P & Ahotupa M (2008) Carotid artery compliance in users of plant stanol ester margarine. *Eur J Clin Nutr* **62**: 218-224.
- Ratledge C (2004) Fatty acid biosynthesis in microorganisms being used for Single Cell Oil production. *Biochimie* **86**: 807-815.
- Rizos EC & Elisaf MS (2013) Current evidence and future perspectives of omega-3 polyunsaturated fatty acids for the prevention of cardiovascular disease. *Eur J Pharmacol* **706**: 1-3.

- Rodriguez-Vargas S, Sanchez-Garcia A, Martinez-Rivas JM, Prieto JA & Randez-Gil F (2007) Fluidization of membrane lipids enhances the tolerance of *Saccharomyces cerevisiae* to freezing and salt stress. *Appl Environ Microbiol* **73**: 110-116.
- Roe M, Pinchen H, Church S, *et al.* (2013) Trans fatty acids in a range of UK processed foods. *Food Chem* **140**: 427-431.
- Rose TM, Henikoff JG & Henikoff S (2003) CODEHOP (CONsensus-DEgenerate Hybrid Oligonucleotide Primer) PCR primer design. *Nucleic Acids Res* **31**: 3763-3766.
- Russell NJ & Nichols DS (1999) Polyunsaturated fatty acids in marine bacteria--a dogma rewritten. *Microbiology* **145** (Pt 4): 767-779.
- Sakuradani E, Abe T, Iguchi K & Shimizu S (2005) A novel fungal omega3-desaturase with wide substrate specificity from arachidonic acid-producing *Mortierella alpina* 1S-4. *Appl Microbiol Biotechnol* **66**: 648-654.
- Sambrook JF & Russell DW (2001) *Molecular cloning A Laboratory Manual*. Cold Spring Harbor Laboratory Press, New York.
- Sayanova O & Napier JA (2011) Transgenic oilseed crops as an alternative to fish oils. *Prostaglandins Leukot Essent Fatty Acids* **85**: 253-260.
- Schaeffer L, Gohlke H, Muller M, *et al.* (2006) Common genetic variants of the FADS1 FADS2 gene cluster and their reconstructed haplotypes are associated with the fatty acid composition in phospholipids. *Hum Mol Genet* **15**: 1745-1756.
- Schiano V, Laurenzano E, Brevetti G, De Maio JJ, Lanero S, Scopacasa F & Chiariello M (2008) Omega-3 polyunsaturated fatty acid in peripheral arterial disease: effect on lipid pattern, disease severity, inflammation profile, and endothelial function. *Clin Nutr* **27**: 241-247.
- Schuster M, Wasserbauer E, Einhauer A, Ortner C, Jungbauer A, Hammerschmid F & Werner G (2000a) Protein expression strategies for identification of novel target proteins. *J Biomol Screen* **5**: 89-97.
- Schuster M, Einhauer A, Wasserbauer E, *et al.* (2000b) Protein expression in yeast; comparison of two expression strategies regarding protein maturation. *J Biotechnol* **84**: 237-248.
- Serhan CN, Yacoubian S & Yang R (2008) Anti-inflammatory and proresolving lipid mediators. *Annu Rev Pathol* **3**: 279-312.
- Shanklin J & Cahoon EB (1998) Desaturation and Related Modifications of Fatty Acids1. *Annu Rev Plant Physiol Plant Mol Biol* **49**: 611-641.
- Simopoulos AP (2002) The importance of the ratio of omega-6/omega-3 essential fatty acids. *Biomed Pharmacother* **56**: 365-379.

Simopoulos AP (2004) Omega-3 fatty acids and antioxidants in edible wild plants. *Biol Res* **37**: 263-277.

Simopoulos AP (2008) The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Exp Biol Med (Maywood)* **233**: 674-688.

Sjogren P, Sierra-Johnson J, Gertow K, *et al.* (2008) Fatty acid desaturases in human adipose tissue: relationships between gene expression, desaturation indexes and insulin resistance. *Diabetologia* **51**: 328-335.

Snoek IS & Steensma HY (2006) Why does *Kluyveromyces lactis* not grow under anaerobic conditions? Comparison of essential anaerobic genes of *Saccharomyces cerevisiae* with the *Kluyveromyces lactis* genome. *FEMS Yeast Res* **6**: 393-403.

Spector AA & Yorek MA (1985) Membrane lipid composition and cellular function. *J Lipid Res* **26**: 1015-1035.

Sprecher H, Luthria DL, Mohammed BS & Baykousheva SP (1995) Reevaluation of the pathways for the biosynthesis of polyunsaturated fatty acids. *J Lipid Res* **36**: 2471-2477.

Spychalla JP, Kinney AJ & Browse J (1997) Identification of an animal omega-3 fatty acid desaturase by heterologous expression in *Arabidopsis*. *Proc Natl Acad Sci U S A* **94**: 1142-1147.

Stender S & Dyerberg J (2003) *The influence of trans fatty acids on health Fourth edition*. The Danish Nutrition Council, Copenhagen.

Subramaniam R, Dufreche S, Zappi M & Bajpai R (2010) Microbial lipids from renewable resources: production and characterization. *J Ind Microbiol Biotechnol* **37**: 1271-1287.

Suresha GS, Kumar S & Santha IM (2013) Functional expression of *Brassica juncea* oleate desaturase gene (Bjfad2) in *Escherichia coli*. *Biologia* **68**: 599-605.

Takaishi K, Miyoshi J, Matsumura T, Honda R, Ohba T & Katabuchi H (2009) Hypertriglyceridemic acute pancreatitis during pregnancy: prevention with diet therapy and omega-3 fatty acids in the following pregnancy. *Nutrition* **25**: 1094-1097.

Tamura K, Stecher G, Peterson D, Filipinski A & Kumar S (2013) MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Mol Biol Evol* **30**: 2725-2729.

Tamura Y, Yoshida Y, Sato R & Kumaoka H (1976) Fatty acid desaturase system of yeast microsomes. Involvement of cytochrome b5-containing electron-transport chain. *Arch Biochem Biophys* **175**: 284-294.

Tehlivets O, Scheuringer K & Kohlwein SD (2007) Fatty acid synthesis and elongation in yeast. *Biochim Biophys Acta* **1771**: 255-270.

- Tocher DR, Leaver MJ & Hodgson PA (1998) Recent advances in the biochemistry and molecular biology of fatty acyl desaturases. *Prog Lipid Res* **37**: 73-117.
- Ton VK & Rao R (2004) Functional expression of heterologous proteins in yeast: insights into Ca^{2+} signaling and Ca^{2+} -transporting ATPases. *Am J Physiol Cell Physiol* **287**: C580-589.
- Torok T & King AD, Jr. (1991) Comparative study on the identification of food-borne yeasts. *Appl Environ Microbiol* **57**: 1207-1212.
- Tsuzuki T, Shibata A, Kawakami Y, Nakagaya K & Miyazawa T (2007) Anti-angiogenic effects of conjugated docosahexaenoic acid in vitro and in vivo. *Biosci Biotechnol Biochem* **71**: 1902-1910.
- Tully AM, Roche HM, Doyle R, *et al.* (2003) Low serum cholesteryl ester-docosahexaenoic acid levels in Alzheimer's disease: a case-control study. *Br J Nutr* **89**: 483-489.
- Tur JA, Bibiloni MM, Sureda A & Pons A (2012) Dietary sources of omega-3 fatty acids: public health risks and benefits. *Br J Nutr* **107 Suppl 2**: S23-52.
- Turner D, Zlotkin SH, Shah PS & Griffiths AM (2009) Omega-3 fatty acids (fish oil) for maintenance of remission in Crohn's disease. *Cochrane Database Syst Rev* CD006320.
- Turner D, Walsh CM, Benchimol EI, *et al.* (2008) Severe paediatric ulcerative colitis: incidence, outcomes and optimal timing for second-line therapy. *Gut* **57**: 331-338.
- Tusnady GE & Simon I (2001) The HMMTOP transmembrane topology prediction server. *Bioinformatics* **17**: 849-850.
- Uauy R & Dangour AD (2009) Fat and fatty acid requirements and recommendations for infants of 0-2 years and children of 2-18 years. *Ann Nutr Metab* **55**: 76-96.
- Uemura H (2012) Synthesis and production of unsaturated and polyunsaturated fatty acids in yeast: current state and perspectives. *Appl Microbiol Biotechnol* **95**: 1-12.
- Venegas-Caleron M, Muro-Pastor AM, Garces R & Martinez-Force E (2006) Functional characterization of a plastidial omega-3 desaturase from sunflower (*Helianthus annuus*) in cyanobacteria. *Plant Physiol Biochem* **44**: 517-525.
- Wada H, Avelange-Macherel MH & Murata N (1993) The desA gene of the cyanobacterium *Synechocystis* sp. strain PCC6803 is the structural gene for delta-12 desaturase. *J Bacteriol* **175**: 6056-6058.
- Wang L, Wu D, Tang P & Yuan Q (2013) Effect of organic acids found in cottonseed hull hydrolysate on the xylitol fermentation by *Candida tropicalis*. *Bioprocess Biosyst Eng* **36**: 1053-1061.
- Wartinann T & Kunze G (2000) Genetic transformation and biotechnological application of the yeast *Arxula adenivorans*. *Appl Microbiol Biotechnol* **54**: 619-624.

- Wartmann T, Boer E, Pico AH, Sieber H, Bartelsen O, Gellissen G & Kunze G (2002) High-level production and secretion of recombinant proteins by the dimorphic yeast *Arxula adeninivorans*. *FEMS Yeast Res* **2**: 363-369.
- Warude D, Joshi K & Harsulkar A (2006) Polyunsaturated fatty acids: biotechnology. *Crit Rev Biotechnol* **26**: 83-93.
- Watanabe K, Oura T, Sakai H & Kajiwara S (2004) Yeast Delta 12 fatty acid desaturase: gene cloning, expression, and function. *Biosci Biotechnol Biochem* **68**: 721-727.
- Wendel M & Heller AR (2009) Anticancer actions of omega-3 fatty acids--current state and future perspectives. *Anticancer Agents Med Chem* **9**: 457-470.
- Wessels HP & Spiess M (1988) Insertion of a multispanning membrane protein occurs sequentially and requires only one signal sequence. *Cell* **55**: 61-70.
- White TJ, Bruns T, Lee S & Taylor J (1990) Amplification and Direct Sequencing of Fungal Ribosomal RNA Genes for Phylogenetics. *PCR protocols. A guide to methods and applications*, (Innis MA, Gelfand DH, Sninsky JJ & White TJ, eds.), pp. 315-322. Academic Press, San Diego, CA.
- Wongwathanarat P, Michaelson LV, Carter AT, *et al.* (1999) Two fatty acid delta9-desaturase genes, *ole1* and *ole2*, from *Mortierella alpina* complement the yeast *ole1* mutation. *Microbiology* **145** (Pt 10): 2939-2946.
- Xue Z, Sharpe PL, Hong SP, *et al.* (2013) Production of omega-3 eicosapentaenoic acid by metabolic engineering of *Yarrowia lipolytica*. *Nat Biotechnol* **31**: 734-740.
- Yadav NS, Wierzbicki A, Aegerter M, *et al.* (1993) Cloning of higher plant omega-3 fatty acid desaturases. *Plant Physiol* **103**: 467-476.
- Yan Z, Zhuo L, Mulan J, Xia W, Yangmin G, Yinbo Z & Fenghong H (2013) Clone and identification of bifunctional delta-12/delta-15 fatty acid desaturase LKFAD15 from *Lipomyces kononenkoae*. *Food Science and Biotechnology* **22**: 573-576.
- Yazawa H, Iwahashi H, Kamisaka Y, Kimura K & Uemura H (2010) Improvement of polyunsaturated fatty acids synthesis by the coexpression of CYB5 with desaturase genes in *Saccharomyces cerevisiae*. *Appl Microbiol Biotechnol* **87**: 2185-2193.
- Yin D, Cui D & Jia B (2007) Construction of a high-efficient expression vector of Delta12 fatty acid desaturase in peanut and its prokaryotical expression. *J Genet Genomics* **34**: 81-88.
- Zainal Z, Longman AJ, Hurst S, Duggan K, Caterson B, Hughes CE & Harwood JL (2009) Relative efficacies of omega-3 polyunsaturated fatty acids in reducing expression of key proteins in a model system for studying osteoarthritis. *Osteoarthritis Cartilage* **17**: 896-905.

Zdobnov EM & Apweiler R (2001) InterProScan--an integration platform for the signature-recognition methods in InterPro. *Bioinformatics* **17**: 847-848.

Zhang JT, Chen M, Han E & Wang C (1998) Dissection of de novo membrane insertion activities of internal transmembrane segments of ATP-binding-cassette transporters: toward understanding topological rules for membrane assembly of polytopic membrane proteins. *Mol Biol Cell* **9**: 853-863.

Zhang X, Li M, Wei D & Xing L (2008) Identification and characterization of a novel yeast omega3-fatty acid desaturase acting on long-chain n-6 fatty acid substrates from *Pichia pastoris*. *Yeast* **25**: 21-27.

Zhang YB, Jiang ML & Hu XJ (2004) Cloning of *Brassica napus* omega-3 fatty acid desaturases. Oil Crops Research Institute, Hubei, China (Unpublished work).