

Refernces

- Abdel-Tawwab, M., Abdel-Rahman, A.M. and Ismael, N.E.M. (2008). Evaluation of commercial live bakers' yeast, *Saccharomyces cerevisiae* as a growth and immunity promoter for Fry Nile tilapia, *Oreochromis niloticus* (L.) challenged in situ with *Aeromonas hydrophila*. *Aquaculture* **280**, 185-189.
- Agellon, L. B., Emery, C. J., Jones, J. M., Davis, S. L., Dingle, A. D. and Chen, T. T.(1988). Promotion of rapid growth of rainbow trout (*Salmo gairdneri*) by a recombinant fish growth hormone. *Canadian Journal of Fisheries and Aquatic Sciences* **45**, 146-151.
- Agerso, Y. and Guardabassi, L. (2005). Identification of Tet 39, a novel class of tetracycline resistance determinant in *Acinetobacter* spp. of environmental and clinical origin. *Journal of Antimicrobial Chemotherapy* **55**, 566-569.
- Ajitha, S., Sridhar, M., Sridhar, N., Singh, I.S.B. and Carghese, V. (2004). Probiotic effects of lactic acid bacteria against *Vibrio alginolyticus* in *Penaeus* (*Fenneropenaeus*) *Indicus* (H. Milne Edwards). *Asian Fisheries Science* **17**, 71-80.
- Alarcon, F.J., Diaz, M., Moyano, F.J. and Abellan, E. (1998). Characterization and functional properties of digestive proteases in two sparids: gilthead seabream (*Sparus aurata*) and common dentex (*Dentex dentex*). *Fish Physiology and Biochemistry* **19**, 257-267.
- Alcaide, E., Blasco, M.D. and Esteve, C. (2005). Occurrence of drug-resistant bacteria in two European eel farms. *Applied and Environmental Microbiology* **71**, 3348-3350.
- Alcock, R.E., Sweetman, A. and Jones, K.C. (1999). Assessment of organic contaminant fate in wastewater treatment plants I. Selected

- compounds and physiochemical properties. *Chemosphere* **38**, 2247-2262.
- Alderman, D.J. and Hastings, T.S. (1998). Antibiotic use in aquaculture: development of antibiotic resistance - potential for consumer health risks. *International Journal of Food Science and Technology* **33**, 139-155.
- Al-Dohail, M. A., Hashim, R. and Aliyu-Paiko, M. (2009). Effects of the probiotic, *Lactobacillus acidophilus*, on the growth performance, haematology parameters and immunoglobulin concentration in African Catfish (*Clarias gariepinus*, Burchell 1822) fingerling. *Aquaculture Research* **40**, 1642-1652.
- Alexander, J. and Ingram, G.A. (1992). Non cellular non specific defence mechanism of fish. *Annual Review of Fish Diseases* **2**, 249-279.
- Aly, S.M., Abd-El-Rahman, A.M., John, G. and Mohamed, M. (2008a). Characterization of Some Bacteria Isolated from *Oreochromis niloticus* and their Potential Use as Probiotics. *Aquaculture* **277**, 1-6.
- Aly, S.M., Ahmed ,Y.A., Ghareeb , A.A. and Mohamed, M.F. (2008b). Studies on *Bacillus subtilis* and *Lactobacillus acidophilus*, as potential probiotics, on the immune response and resistance of Tilapia nilotica (*Oreochromis niloticus*) to challenge infections. *Fish and Shellfish Immunology* **25**, 128-136.
- Amábile-Cuevas, C., Gárdenas-García, M. and Ludgar, M., (1995). Antibiotic resistance. *American Science* **83**, 320-329.
- Amar, C.E., Kiron, V., Satoh, S., Okamoto, N. and Watabane, T. (2000). Effects of dietary β - carotene on the immune response of rainbow trout, *Oncorhynchus mykiss*. *Fish Science* **66**, 1068-1075.
- Andersen, D. E., Reid, S. D., Moon, T.W. and Perry, S.F. (1991). Metabolic effects associated with chronically elevated cortisol in

- rainbow trout (*Oncorhynchus mykiss*). *Canadian Journal of Fisheries and Aquatic Sciences* **48**, 1811-1817.
- Anderson, D.P., Siwicki, A.K. and Rumsey, G.L. (1995). Injection or immersion delivery of selected immunostimulants to trout demonstrate enhancement of nonspecific defense mechanisms and protective immunity. In: Shariff M., Arthur J.R. and Subasinghe, R.P. (Eds.), *Diseases in Asian Aquaculture: II. Fish Health Section. Asian Fisheries Society, Manila*, Pp. 413- 426.
- Andlid, T., Blomberg, L., Gustafsson, L. and Blomberg, A. (1999). Characterisation of *Saccharomyces cerevisiae* CBS 7764 isolated from rainbow trout intestine. *Systematic and Applied Microbiology* **22**, 145-155.
- Andlid, T., Vazquez, J.R. and Gustafsson, L. (1998). Yeast isolated from the intestine of rainbow trout adhere to and grow in intestinal mucus. *Molecular Marine Biology and Biotechnology* **7**, 115-126.
- Angulo, F.J., Nargund, V.N. and Chiller, T.C. (2004). Evidence of an association between use of anti-microbial agents in food animals and anti-microbial resistance among bacteria isolated from humans and the human health consequences of such resistance. *Journal of veterinary medicine* **51**, 374-379.
- Anson, M. L. (1938). The estimation of pepsin, trypsin, papain, and cathepsin with hemoglobin. *Journal of General Physiology* **22**, 79-89.
- AOAC. (Association of Official Analytical Chemists), *Official Methods of Analysis* (1990) 15th ed. Arlington, Virginia, 22201, USA.
- APHA (American Public Health Association) (1995). *Standard methods of the examination of water and wastewater 19th edition. Washington, D.C.*

- Asokan, R.M., Arumugam, M. and Mullalnadhan, P. (1997). Activation of prophenoloxidase in the plasma and haemocytes of the marine mussel *Perna viridis* Linnaeus. *Developmental and comparative Immunology* **21**, 1-12
- Austin, B., Stuckey, L.F., Robertson, P.A.W., Effendi, I. and Griffith D.R.W. (1995). A probiotic strain of *Vibrio alginolyticus* effective in reducing diseases caused by *Aeromonas salmonicida*, *Vibrio anguillarum* and *Vibrio ordalii*. *Journal of fish diseases* **18**, 93-96.
- Avnimelech, Y., Mozes, N., Diab, S. and Kochba, M. (1995). Rates of organic carbon and nitrogen degradation in intensive fish ponds. *Aquaculture* **134**, 211-216.
- Bache`re, E. (2003). Anti-infectious immune effectors in marine invertebrates: potential tools for disease control in larviculture. *Aquaculture* **227**, 427-438.
- Bairagi, A., Ghosh, K., Sen, S.K. and Ray, A.K. (2002). Enzyme producing bacterial flora isolated from fish digestive tracts. *Aquaculture International* **10**, 109- 121.
- Balarin, J.D. and Haller, R.D. (1979). African tilapia farm shows the profit potential. *Fish Farming International* **6**, 16-18.
- Balcázar, J.L., Decamp, O., Vendrell, D., de Blas, I. and Ruiz-Zarzuela, I. (2006a). Health and nutritional properties of probiotics in fish and shellfish. *Microbial Ecology in Health and Disease* **18**, 65-70.
- Balcázar, J. L., Blas, I., Ruiz-Zarzuela, I., Cunningham, D. Vendrell, D. and Muzquiz, J. L. (2006b). The role of the probiotics in aquaculture. *Veterinary Microbiology* **114**, 173-186.
- Bardócz, S. (1993). The role of dietary polyamines. *European Journal of Clinical Nutrition* **47**, 683- 690.

- Barnard, E.A. (1973). Comparative biochemistry and physiology of digestion. In: Prosser C.L. (Ed.), *Comparative Animal Physiology*. Academic Press, New York, Pp. 133-164.
- Bass, J., Oldham, J., Sharma, M. and Kambadur, R., (1999). Growth factors controlling muscle development. *Domestic animal endocrinology* **17**, 191-197.
- Bezerra, R.S., Lins, E.J.F., Alencar, R.B., Paiva, P.M.G., Chaves, M.E.C., Coelho, L.C.B.B. and Carvalho Jr, L.B. (2005). Alkaline proteinase from intestine of Nile tilapia (*Oreochromis niloticus*). *Process Biochemistry* **40**, 1829-1834.
- Bisharat, N. and Raz, R. (1996). *Vibrio* infection in Israel due to changes in fish marketing. *Lancet* **348**, 1585-1586.
- Bordas, M.A., Balebona, M.C., Zorrilla, I., Borrego, J.J. and Moriñigo, M. (1996). Kinetics of adhesion of selected fish-pathogenic *Vibrio* strain to skin mucus of gilt-head sea bream. *Applied and Environmental Microbiology* **62**:3650-3654.
- Borlongan, L.G. (1990). Studies on the digestive lipase of milkfish, *Chanos chanos*. *Aquaculture* **89**, 315-325.
- Boyd, C.E. (1995). Chemistry and efficacy of amendments used to treat water and soil quality imbalances in shrimp ponds. In: Browdy C.L. and Hopkins J.S. (Eds.), *Swimming through troubled waters. Proceedings of the Special Session on Shrimp Farming, Aquaculture*, World Aquaculture Society, Baton Rouge, USA, Pp. 166-188.
- Boyd, C.E. and Massaut, L., (1999). Risks associated with the use of chemicals in pond aquaculture. *Aquacultural Engineering* **20**, 113-132.
- Boyd, C.E., Hollerman, W.D., Plumb, J.A. and Saeed, M. (1984). Effect of treatment with a commercial bacterial suspension on water

- quality in channel catfish ponds. *Progressive Fish Culturist* **46**, 36-40.
- Braun, V. and Braun, M. (2002). Active transport of iron and siderophore antibiotics. *Current Opinion in Microbiology* **5**, 194-201.
- Braun, V. and Killmann, H. (1999). Bacterial solutions to the iron-supply problem. *The Journal of Trends in Biochemistry and Science* **24**, 104-106.
- Brock, T.D. and Madigan, M.T. (1997). *Biology of Microorganisms*. Prentice Hall Inc, New Jersey.
- Bushman, F. (2002). Conjugation, transposition, and antibiotic resistance. In *Lateral DNA Transfer. Mechanisms and Consequences*. Cold Spring Harbor, NY, USA: Cold Spring Harbor Laboratory Press, pp. 27-72.
- Buts, J.P., De Keyser, N., Kolanowski, J., Sokal, E. and Van Hoof, F. (1993). Maturation of villus and crypt cell functions in rat small intestine. Role of dietary polyamines. *Digestive diseases and sciences* **38**, 1091-1098.
- Buts, J.P., De Keyser, N. and De Raedemaeker, L. (1994). *Saccharomyces boulardii* enhances rat intestinal enzyme expression by endoluminal release of polyamines. *Pediatrics Research* **36**, 522-527.
- Byun, J.W. (1997). Probiotic effect of *Lactobacillus* sp.DS-12 in flounder. *Journal of General and Applied Microbiology* **43**, 305-308.
- Cabello, F.C. (2004). Antibiotics and aquaculture in Chile: implications for human and animal health. *Revista médica de Chile* [on line] **132**: 1001-1006.

- Cabello, F.C. (2006). Heavy use of prophylactic antibiotics in aquaculture: a growing problem for human and animal health and for the environment. *Environmental Microbiology* **8**, 1137-1144.
- Camus, A.C., Burrow, R.M., Hemstreet, W.G., Thure, R.L. and Hawke, J.P. (1998). Aeromonas bacterial infection-Motile Aeromonal Septicemia. *Southern Regional Aquaculture Center Publication*, No. 478.
- Carnevali, O., De Vivo, L. Sulpizio, R., Gioacchini, G., Olivotto, I. Silvi, S. and Cresci, A. (2006). Growth improvement by probiotic in European sea bass juveniles (*Dicentrarchus labrax*, L.), with particular attention to IGF-1, myostatin and cortisol gene expression. *Aquaculture* **258**, 430-438.
- Casas, C., Anderson, E.C., Ojo, K.K., Keith, I., Whelan, D., Rainnie, D. and Roberts, M.C. (2005). Characterization of pRAS1-like plasmids from atypical North American psychrophilic *Aeromonas salmonicida*. *FEMS Microbiology Letters* **242**, 59-63.
- Casula, G. and Cutting, S.M. (2002). Bacillus probiotics: spore germination in the gastrointestinal tract. *Applied and Environmental Microbiology* **68**, 2344-52.
- Chan, C.R., Lee, D.N., Cheng, Y.H., Hsieh, D.J.Y. and Weng, C.F. (2008). Feed deprivation and re-feeding on alterations of proteases in Tilapia *Oreochromis mossambicus*. *Zoological Studies* **47**, 207-214.
- Chipman, D.M. and Sharon, N. (1969). Mechanism of lysozyme action. *Science* **165**, 454-465.
- Chiu, C. H., Guu, Y.K. Liu, C.H., Pan, T.M. and Cheng, W. (2007). Immune responses and gene expression in white shrimp, *Litopenaeus vannamei*, induced by *Lactobacillus plantarum*. *Fish and Shellfish Immunology* **23**, 364-377.

- Chythanya, R., Karunasagar, I. and Karunasagar, I. (2002). Inhibition of shrimp pathogenic vibrios by a marine *Pseudomonas* I-2 strain. *Aquaculture* **208**, 1-10.
- Clements, K.D. (1997). Fermentation and gastrointestinal microorganisms in fishes. In: Mackie R.I. Withe B.A. and Isaacson R.E. (Eds.), *Gastrointestinal Microbiology*. Chapman and Hall Microbiology Series, International Thomson Publishing, New York. Pp. 156-198
- Cobb, C.S., Levy, M.G. and Noga, E.J. (1998). Acquired immunity to amyloodiniosis is associated with an antibody response. *Diseases of Aquatic Organisms* **34**, 125-133.
- Committee on Drug Use in Food Animals. (1999). The use of drugs in food animals: benefits and risks. Based on reports commissioned by the Panel on Animal Health, Food Safety, and Public Health (a joint activity of the [USA] National Research Council and the [USA] Institute of Medicine. Wallingford, UK: CABI Publishing, and Washington, DC: National Academy Press. 290 pp.
- Cuesta, A., Meseguer, J. and Esteban, M.A. (2004). Total serum immunoglobulin M levels are affected by immunomodulators in seabream (*Sparus aurata* L.). *Veterinary Immunology and Immunopathology*, **101**, 203-210.
- Daboor, S.M. (2006). Studies on bacterial flora and its role in the clean up of hazardous pollutants in the River Nile. Ph.D. Thesis, Botany Department, Faculty of science, Zagazeg University, Egypt.
- Daboor, S.M. (2008). Microbiological Profiles of El-Qanater El-Khairia Fish Farm. *Global Veterinaria* **2**, 51-55.
- Danese, P., Zanca, A. and Bartazzoni, M.G. (1994). Occupational contact dermatitis from tylosin. *Contact dermatitis* **30**, 122-123.

- Das, K.M. and Tripathi, S.D. (1991). Studies on the digestive enzymes of grass carp, *Ctenopharyngodon idella* (Val.). *Aquaculture* **92**, 21-32.
- De Schrijver, R and Ollevier, F. (2000). Protein digestion in juvenile turbot (*Scophthalmus maximus*) and effects of dietary administration of *Vibrio proteolyticus*. *Aquaculture* **186**, 107-116.
- De Silva, S. S. and Anderson, T. A. (1995). Metabolism. In: De Silva, S. S. and Anderson, T. A. (Eds.), *Fish Nutrition in Aquaculture*. Champaign & Hall, London, pp 41-102.
- Deeseenthum, S., Leelavatcharamas, V. and Brooks, J.D. (2007). Effect of feeding *Bacillus* sp. as probiotic bacteria on growth of Giant Fresh water prawn, (*Macrobrachium rosenbergii* de man). *Pakistan Journal of Biological Sciences* **10**, 1481-1485.
- Dhage, K.P. (1968). Studies of the digestive enzymes in the three species of the major carps of India. *Journal of Biological Sciences* **11**, 63-74.
- Ding, X., Li, Z.J., Chen, Y.Q., Lin, H.Z., Yang, Y.Y. and Yang, K. (2004). Effects of probiotics on growth and activities of digestive enzymes of *Pennaus vannamei*. *Journal of Fishery Sciences of China* **11**, 580-584.
- Douglas, L.J. (1989). Adhesion to surfaces. In: Rose, A.H., Harrison, J.S. (Eds.), *the Yeast*. London, pp. 239-275.
- Dufour, C., Dandrifosse, G., Forget, P., Vermesse, F., Romain, N. and Lepoint, P. (1988). Spermine and spermidine induce intestinal maturation in the rat. *Gastroenterology* **95**, 112-116.
- Duncan, B. (1955). "Multiple range and multiple (F) tests". *Biometrics* **11**, 1-42.
- El-Haroun, E.R., Goda, A.M. A-S. and Chowdury, M.A.K. (2006). Effect of dietary probiotic Biogen® supplementation as a growth

- promoter on growth performance and feed utilization of Nile tilapia *Oreochromis niloticus* (L.). *Aquaculture Research* **37**, 1473-1480.
- Ellis, A.E. (1999). Immunity to bacteria in fish. *Fish and Fish Shellfish Immunology* **9**, 291- 308.
- Engstad, R.E., Robertsen, B. and Frivold, E., (1992). Yeast glucan induces increase in activity of lysozyme and complement-mediated haemolytic activity in Atlantic salmon blood. *Fish and Shellfish Immunology* **2**, 287-297.
- Erasmus, J.H., Cook, P.A. and Coyne, V.E. (1997). The role of bacteria in the digestion of seaweed by the abalone *Haliotis midae*. *Aquaculture* **155**, 381-390.
- Esiobu, N., Armenta, L. and Ike, J., (2002). Antibiotic resistance in soil and water environments. *International Journal of Environmental Health Research* **12**, 133-144.
- FAO (Food and Agriculture Organization of the United Nations) (2004). Fishstat Plus. Aquaculture Production 1950-2002.
- FAO (Food and Agriculture Organization of the United Nations). Responsible use of antibiotics in aquaculture (2005). FAO fisheries technical paper. No.469.
- FAO (Food and Agriculture Organization of the United Nations) (2006). *State of world Aquaculture*. Room: FAO Fisheries. Technical paper; No.500.
- FAO (Food and Agriculture Organization of the United Nations) (2009). FAO Fisheries Department, Fishery information, Data and Statistics Unit, *Fishstat Plus*, Version 2.30.
- FAO/WHO/OIE, (2006). Expert Consultation on antimicrobial use in aquaculture and antimicrobial resistance. *Seoul, Republic of South Korea*, June 13-16.

- Fletcher, T.C. (1986) Modulation of non-specific host defenses in fish. *Veterinary Immunology and Immunopathology* **12**, 59-67.
- Floch, M.N., Gorbach, S.L. and Lucky, T.D. (1970). Symposium: The intestinal microflora. *American Journal of Clinical Nutrition* **23**, 1425-1540.
- Fouz, B., Devesa, K., Gravningen, J. and Toranzo Barja, A. E. (1991). Antibacterial action of the mucus of turbot. *Bulletin of the European Association of Fish Pathologists* **10**, 56-59.
- Fukami, K., Nishijima, T. and Ishida, Y. (1997). Stimulative and inhibitory effects of bacteria on the growth of microalgae. *Hydrobiologia* **358**, 185-191.
- Fuller, R. (1987). A review, probiotics in man and animals. *Journal of Applied Bacteriology* **66**, 365-378.
- Fuller, R. (1989). Probiotics in man and animals. *Journal of Applied Bacteriology* **66**, 365-378.
- Fuller, R. (1992). History and development of probiotics. In: Fuller R. (Ed.), Probiotics: The Scientific Basis. Chapman and Hall, London, Pp. 1-8.
- Gannam, A.L. and Lovell, R.T. (1991). Effects of feeding 17α -methyltestosterone, 11 ketotestosterone, 17β -estradiol, and 3,5,3-triiodothyronin to channel catfish. *Ictalurus punctatus*. *Aquaculture* **92**, 377-388.
- Ganong, W. P. (1983). The pituitary gland. In: Review of medical physiology. Ed: W. F. Ganong, Lange Medical Publisher. Los Altos. 11th ed., pp. 323-335.
- Gatesoupe, F.J. (1999). The use of probiotics in aquaculture. *Aquaculture* **180**, 147-165.
- Gatesoupe, F.J., Zambonino-Infante, J.L., Cahu, C. and Quazuguel, P. (1997). Early weaning of seabass larvae, *Dicentrarchus labrax*: the

- effect on microbiota, with particular attention to iron supply and exoenzymes. *Aquaculture* **158**, 117-127.
- Gatesoupe, F.J. (2007). Live yeasts in the gut: Natural occurrence, dietary introduction, and their effects on fish health and development. *Aquaculture* **267**, 20-30
- Gawlicka, A., Parent, B., Horn, M.H., Ross, N., Opstad, I. and Torrissen, O.J. (2000). Activity of digestive enzymes in yolk-sac larvae of Atlantic halibut (*Hippoglossus hippoglossus*): indication of readiness for first feeding. *Aquaculture* **184**, 303-314.
- Ghosh, K., Sen, S.K. and Ray, A.K. (2002). Characterization of bacilli isolated from the gut of rohu, *Labeo rohita* fingerlings and its significance in digestion. *Journal of Applied Aquaculture* **12**, 33-42.
- Ghosh, K., Sen, S.K. and Ray, A.K. (2005). Feed utilization efficiency and growth performance in Rohu, *Labeo rohita* (Hamilton, 1822), fingerlings fed yeast extract powder supplemented diets. *Acta Ichthyologica Et Piscatoria* **35**, 111-117.
- Gibson, L.F., Woodworth, J. and George, A.M. (1998). Probiotic activity of *Aeromonas media* on the Pacific oyster, *Crassostrea gigas*, when challenged with *Vibrio tubiashii*. *Aquaculture* **169**, 111-120.
- Gildberg, A. and Mikkelsen, H. (1998). Effects of supplementing the feed to Atlantic cod (*Gadus morhua*) fry with lactic acid bacteria and immuno-stimulating peptides during a challenge trial with *Vibrio anguillarum*. *Aquaculture* **167**, 103-113.
- Gill, H.S. (2003). Probiotics to enhance anti-infective defences in the gastrointestinal tract. *Best practice and research in clinical gastroenterology* **17**, 755-773.
- Gisbert, E., Sarasquete, M.C., Williot, P. and Castello-Orvay, F. (1999). Histochemistry of the development of the digestive system of

- Siberian sturgeon during early ontogeny. *Journal of Fish Biology* **55**, 596-616.
- Godfrey, T., and West, S. (1996). Industrial Enzymology. Macmillan Publishers Inc., New York, NY, pp. 3-10. In : Ochoa-Solano, J. and Olmos-Soto, J (2006). The functional property of *Bacillus* for shrimp feeds. *Food Microbiology*, **23**, 519-525.
- Gomez, G.D. and Balcázar, J.L. (2008). A review on the interactions between gut microbiota and innate immunity of fish. *FEMS Immunology and Medical Microbiology* **52**, 145-154.
- Gomez, R., Geovanny, D. and Shen, M.A. (2008). Influence of probiotics on the growth and digestive enzyme activity of White Pacific shrimp, *Litopenaeus vannamei*. *Journal of Ocean University of China* **7**, 215-218.
- Gomez-Gil, B., Roque, A. and Turnbull, J.F. (2000). The use and selection of probiotic bacteria for use in the culture of larval aquatic organisms. *Aquaculture* **191**, 259-270.
- Gram, L., Lovold, T., Nielsen, J., Melchiorson, J. and Spanggaard, B. (2001). In vitro antagonism of the probiont *Pseudomonas fluorescens* strain AH2 against *Aeromonas salmonicida* does not confer protection of salmon against furunculosis. *Aquaculture* **199**, 1-11.
- Green, A. and Green, M. (2003). Probiotics in Asian Shrimp Aquaculture. *Asian Aquaculture Magazine* March and April, 28–29.
- Greenlees, K.J. (2003). Animal drug human food safety toxicology and antimicrobial resistance – the square peg. *International Journal of Toxicology* **22**: 131–134.
- Gullian, M., Thompson, F. and Rodriguez, J. (2004). Selection of probiotic bacteria and study of their immunostimulatory effect in *Penaeus vannamei*. *Aquaculture* **233**, 1-14.

- Hagopian, D. S. and Riley, J. G. (1998). A closer look at the bacteriology of nitrification. *Aquacultural Engineering* **18**, 223-244
- Havenaar, R., Ten Brink, B. and Huis in 't Veld, J.H.J. (1992). In: Fuller R. (Ed.), *Probiotics, The Scientific Basis*. Chapman & Hall, London, Pp. 209-224.
- Hepher, B., Liao, I.C., Cheng, S.I.I. and Hsieh, C.S. (1983). Food utilization by red tilapia. Effect of diet composition, feeding level and temperature on utilization efficiencies for maintenance and growth. *Aquaculture* **32** 255-275.
- Heyman, M. and Me´nard, S. (2002). Probiotic microorganisms: how they affect intestinal pathophysiology. *Cellular and Molecular Life Sciences* **59**, 1-15.
- Hidalgo, M.C., Urea, E. and Sanz, A. (1999). Comparative study of digestive enzymes in fish with different nutritional habits. Proteolytic and amylase activities. *Aquaculture* **170**, 267-283
- Higgs, D.A., Fagerlund, U.H.M., Eales, J.G. and McBride, J.R. (1982). Application of thyroid and steroid hormones as anabolic agents in fish culture. *Comparative Biochemistry and physiology* **73 B**, 143-146.
- Holmstrom, C., Egan, S., Franks, A., McCloy, S. and Kjelleberg, S. (2002). Antifouling activities expressed by marine surface associated *Pseudoalteromonas* species. *FEMS Microbiology Ecology* **41**, 47-58.
- Holt, J.G., Krieg, N.R., Sneath, P.H.A., Staley, J.T. and Williams, S.T. (1994). *Bergey's Manual of Determinative Bacteriology*. 9th ed. Maryland, USA: Williams & Wilkins, Baltimore. pp 787.

- Holzappel, W.H., Harberer, P., Snel, J., Schillinger, U. and Huis in't Veld, J. (1998). Overview of gut flora and probiotics. *International Journal of Food Microbiology* **41**, 85-101.
- Hoverstad, T. (1989). The normal microflora and short-chain fatty acids. In: Grubb R., Midtvedt T. and Norin E. (Eds.), *The Regulatory and Protective Role of the Normal Microflora* MacMillan, London, Pp. 89-108.
- Huang, F., Yan, A.S., Zhang, G.R. and Zou, G.W. (1999). The protease and amylase of *Hypophthalmichthys molitrix* and *Aristichys nobilis*. *Journal of Fishery Sciences of China* **6**, 14-17.
- Hutchinson, T.H. and Manning, M.J. (1996). Seasonal trends in serum lysozyme activity and total protein concentration in dab (*Limanda limanda* L.) sampled from Lyme Bay, UK. *Fish and Shellfish Immunology* **6**, 473-482.
- Huis in't Veld, J.H.J., Havenaar, R. and Marteau, P. (1994) Establishing a scientific basis for probiotic R&D. *Trends In Biotechnology* **12**, 6-8.
- Irianto, A. and Austin, B. (2002a). Use of probiotics to control furunculosis in rainbow trout, *Oncorhynchus mykiss* (Walbaum). *Journal of Fish Diseases* **25**, 333-342.
- Irianto, A., Austin, B. (2002b) Probiotics in aquaculture. *Journal of Fish Diseases* **25**, 633-642.
- Itami, T., Asano, M., Tokushige, K., Kubono, K., Nakagawa, A., Takeno, N., Nishimura, H., Maeda, M., Kondo, M. and Takahashi, Y. (1998). Enhancement of disease resistance of Kuruma shrimp, *Penaeus japonicus*, after oral administration of peptidoglycan derived from *Bifidobacterium thermophilum*. *Aquaculture* **164**, 277-288.

- Jacobsen, C.N., Nielsen, V.R., Hayford, A.E., Moller, P.L., Michaelsen, K.F., Paerregaard, A., Sandstorm, B., Tvede, M. and Jakobsen, M. (1999). Screening of probiotic activities of forty seven strains of *Lactobacillus* spp. by *in vitro* techniques and evaluation of the colonization ability of five selected strains in humans. *Applied and Environmental Microbiology* **11**, 4949-4956.
- Joborn, A., Olsson, J.C., Westerdahl, A., Conway, P.L. and Kjelleberg, S. (1997). Colonization in the fish intestinal tract and production of inhibitory substances in intestinal mucus and faecal extracts by *Carnobacterium* sp. strain K1. *Journal of Fish Diseases* **20**, 383-392.
- Jørgensen, J.B., Lunde, H. and Robertsen, B. (1993). Peritoneal and head kidney cell response to intraperitoneally injected yeast glucan in Atlantic salmon. *Journal of Fish Diseases* **16**, 313-325.
- Jory, E.D. (1998). Use of probiotics in penaeid shrimp growout. *Aquaculture Magazine* Issue January/February **24**, 62-67.
- Jun-sheng, L., Jian-lin, L. and Ting-ting, W. (2006). Ontogeny of protease, amylase and lipase in the alimentary tract of hybrid juvenile tilapia (*Oreochromis niloticus* x *Oreochromis aureus*) *Fish Physiology and Biochemistry* **32**, 295-303.
- Kar, N. and Ghosh, K. (2008). Enzyme producing bacteria in the gastrointestinal tracts of *Labeo rohita* (Hamilton) and *channa punctatus* (Bloch). *Turkish Journal of Fisheries and aquatic sciences* **8**, 115-120.
- Kawai, S. and Ikeda, S. (1972). Studies on digestive enzymes of fishes. Effect of dietary change on the activities of digestive enzymes in carp intestine. *Bulletin of the Japanese Society of the Scientific Fisheries*, **38**, 265-270.

- Kemper, N. (2008). Veterinary antibiotics in the aquatic and terrestrial Environment. *Ecological indicator* **8**, 1 - 13.
- Kennedy, S.B., Tucker, J.W., Neidic, C.L., Vermer, G.K., Cooper, V.R. and Jarrell, J.L.(1998). Bacterial management strategies for stock enhancement of warmwater marine fish: a case study with common snook (*Centropomus undecimalis*). *Bulletin of Marine Science* **62**, 573-88.
- Kesarcodi-Watson, A., Kaspar, H., Lategan, M.J. and Gibson, L. (2008) Probiotics in aquaculture: the need, principles and mechanisms of action and screening processes. *Aquaculture* **274**, 1-14.
- Kihara, M. and Sakata, T. (1997). Fermentation of dietary carbohydrates to short-chain fatty acids by gut microbes and its influence on intestinal morphology of a detritivorous teleost Tilapia (*Oreochromis niloticus*). *Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology* **118**, 1201-1207.
- Kim, D. and Austin, B. (2006). Innate immune responses in rainbow trout(*Oncorhynchus mykiss*, Walbaum) induced by probiotics. *Fish and Shellfish Immunology* **21**, 513-524.
- Klahan, R., Areechon,N., Yoonpundh,R. and Engkagul, A. (2009). Characterization and activity of digestive enzymes in different sizes of Nile tilapia (*Oreochromis niloticus* L.). *Kasetsart Journal (Natural Science)*, **43**, 143-153.
- Kvietys, P.R. and Granger, D.N., (1981). Effect of volatile fatty acids on blood flow and oxygen uptake by the dog colon. *Gastroenterology* **80**, 962-969.
- L’Abee-Lund, T.M. and Sørum, H. (2001). Class 1 integrons mediate antibiotic resistance in the fish pathogen *Aeromonas salmonicida* worldwide. *Microbial Drug Resistance* **7**, 263-272.

- Lackey, B.R., Gray, S.L. and Henricks, D.M. (1999). The insuline-like growth (IGF) system and gonadotropin regulation: actions and interactions. *Cytokine Growth Factor Rev.* **10**, 201-217.
- Laconi, S. and Pompei, R. (2007). Study and characterization of intestinal yeasts of mullet (*Mugil spp*) for potential probiotic use. *Journal of Food, Agriculture and environment* **5**,475-480.
- Lall, S.P. and Oliver, G. (1993). Role of micronutrients in immune response and disease resistance in fish. In: Kaushik S.J. and Luquet P. (Eds.), *Fish Nutrition in Practice*, INRA, 78026 Versailles Cedex, France. Pp, 101-117.
- Lall, S.P. (2010). Disorders of nutrition and metabolism. In: Leatherland J. and Woo P. (Eds), *Fish Diseases and Disorders*, Volume 2. CABI, Wallingford, UK . Pp 202-237.
- Langhammer, J.P. (1989). Untersuchungen zum Verbleib antimikrobiell wirksamer Aezneistoffe als in Gülle und im landwirtschaftlichen Umfeld. PhD dissertation, Universita" t Bonn, Germany, p. 138.
- Lara-Flores, M., Olvera-Novoa, M.A., Guzmán-Méndez, B.E. and López-Madrid, W. (2003). Use of the bacteria *Streptococcus faecium* and *Lactobacillus acidophilus*, and the yeast *Saccharomyces cerevisiae* as growth promoters in Nile tilapia (*Oreochromis niloticus*). *Aquaculture* **216**, 193-201.
- Le Roith, D., Bondy, C., Yakar, S., Liu, J.L. and Butler, A. (2001). The somatomedin hypothesis. *Endocrine Reviews* **22**, 53-74.
- Lemieux, H., Blier,P. and Dutil, J.D. (1999). Do digestive enzymes set a physiological limit on growth rate and food conversion efficiency in the Atlantic cod (*Gadus morhua*). *Fish Physiology and Biochemistry* **20**, 293-303.

- Leonard, C., Soderhall, K. and Ratcliffe, N.A. (1985). Studies on prophenoloxidase and protease activity of *Blaberus craniifer* haemocyte. *Insect Biochemistry* **15**, 803-810.
- Li, J., Tan, B. and Mai, K. (2009). Dietary probiotic *Bacillus* OJ and isomaltooligosaccharides influence the intestine microbial populations, immune responses and resistance to white spot syndrome virus in shrimp (*Litopenaeus vannamei*). *Aquaculture* **291**, 35- 40.
- Li, J., Tan, B., Mai, K., Ai, O., Zhang, W. Xu,W., Liufu, Z. and Ma, H. (2006). Comparative study between probiotic bacterium *Arthrobacter* XE-7 and chloramphenicol on protection of *Penaeus chinensis* post-larvae from pathogenic vibrios. *Aquaculture* **253**, 140- 147.
- Li, P., Burr, G.S., Goff, J., Whiteman, K.W., Davis, K.B., Vega, R.R., Neill, W.H. and Gatlin III, D.M. (2005). A preliminary study on the effects of dietary supplementation of brewers yeast and nucleotides, singularly or in combination, on juvenile red drum (*Sciaenops ocellatus*). *Aquaculture Research* **36**, 1120-1127.
- Li, P., Lewis, D.H. and Gatlin, D.M., (2004). Dietary oligonucleotide influences immune responses and resistance of hybrid striped bass (*Morone chrysops* × *M. saxatilis*) to *Streptococcus iniae* infection. *Fish and Shellfish Immunology* **16**, 561-569.
- Li, S.N. and Fan, D.F. (1997). Activity of esterases from different tissues of freshwater fish and responses of their isoenzymes to inhibitors. *Journal of Toxicology and Environmental Health* **51**, 149-157.
- Limsuwan, T. and Lovell, R.T. (1981). Intestinal synthesis and absorption of vitamin B12 in channel catfish. *Journal of Nutrition* **111**: 2125-2132.

- Liu, S., Zang, X., Liu, B., Zhang, X., KKIU, A., Zhang, X. and Liang, B.(2007). Effect of growth hormone transgenic *Synechocystis* on growth, feed efficiency, muscle composition, haematology and histology of turbot (*Scophthalmus maximus* L.). *Aquaculture research* **38**, 1283-1292.
- Lovell, R.D. and Limsuwan, T. (1982). Intestinal synthesis and dietary nonessentiality of vitamin B12 for *Tilapia nilotica*. *Transactions of the American Fisheries Society* **111**, 485-490.
- Lowry, O.H., Rosebrough, N.J., Farr, A.L. and Randall, R.J. (1951). Protein measurement with the Folin - phenol reagent. *Journal of Biological Chemistry* **193**, 265-275.
- Lunden T, Lilius, E.M. and Bylund, G. (2002). Respiratory burst activity of rainbow trout (*Oncorhynchus mykiss*) phagocytes is modulated by antimicrobial drugs. *Aquaculture* **207**, 203-212.
- Maassen, C.B.M., van Holten-Neelen, C. and Balk, F. (2000). Strain-dependent induction of cytokine profiles in the gut by orally administered *Lactobacillus* strains. *Vaccine* **18**, 2613-2623.
- MacDonald, N.L., Stark, J.R. and Austin, B. (1986). Bacterial microflora in the gastro-intestinal tract of Dover sole (*Solea solea* L.), with emphasis on the possible role of bacteria in the nutrition of the host. *FEMS Microbiology Letters* **39**, 107-111.
- Macey, B.M. and Coyne, V.E. (2005). Improved growth rate and disease resistance in farmed *Halotis midae* through probiotic treatment. *Aquaculture* **245**, 249- 261.
- MacLatchy, D.L. and Eales, J.G. (1990). Growth hormone stimulates hepatic thyroxin 5-monodeiodinase activity and 3,5,3-triiodothyronine levels in rainbow trout, *Salmo gairdneri*. *General and Comparative Endocrinology* **78**, 164-172

- Manning, M.J.(1998). Immune defense system. In: Black K. and Pickering A. (Eds.), *Biology of farmed fish*, Sheffield Academic Press Ltd, 19 Kingfield Road, England. Pp., 181-221.
- Matsuzaki, T. and Chin, J. (2000). Modulating immune responses with probiotic bacteria. *Immunology and Cell Biology*. **78**, 67-73.
- Matty, A.J. (1986). Nutrition, hormones and growth. *Fish Physiology and Biochemistry* 2:141-150.
- McDermott, P.F., Zhao, S., Wagner, D.D., Simjee, S., Walker, R.D. and White, D.G. (2002). The food safety perspective of antibiotic resistance. *Animal biotechnology* **13**: 71-84.
- Miettinen, M., Vuopio-Varkila, J. and Varkila, K. (1996). Production of human tumor necrosis factor alpha, interleukin-6, and interleukin-10 is induced by lactic acid bacteria. *Infection and Immunity* **64**, 5403-5405.
- Ministry of Health and Welfare, Japan. (1999). *Vibrio parahaemolyticus*, Japan, 1996-1998. *Infectious Agents Surveillance Report* **20**, 159-160.
- Mohanty, S.N., Swain, S.K. and Tripathi, S.D. (1996). Rearing of catla (*Catla catla* Ham.) spawn on formulated diets. *Journal of Aquaculture in the Tropics* **11**, 253-258.
- Moriarty, D. (1997). The role of microorganisms in aquaculture ponds. *Aquaculture* **151**, 333-349.
- Moriarty, D. J.W. (1996). Microbial Biotechnology: A key to sustainable aquaculture. *INFOFISH International* 4/96, 29-33.
- Moriarty, D.J.W. (1998). Control of luminous *Vibrio* species in penaeid aquaculture ponds. *Aquaculture* **164**, 351-358.
- Moyner, K., Roed, K.H., Sevatdal, S. and Heum, M. (1993). Changes in non-specific immune parameters in Atlantic salmon, *Salmo salar*

- L., induced by *Aeromonas salmonicida* infection. *Fish and Shellfish Immunology* **3**, 253-265.
- Munilla-Moran, R., Stark, J.R. and Barbour, A. (1990). The role of exogenous enzymes in digestion in cultured turbot larvae (*Scophthalmus maximus* L.). *Aquaculture* **88**, 337-350.
- NRC (National Research Council) (1993). Nutrient requirements of fish. National Academy press, Washington, DC, USA.
- Nayak, S.K., Swain, P., and Mukherjee, S.C. (2007). Effect of dietary supplementation of probiotic and vitamin C on the immune response of Indian major carp, *Labeo rohita* (Ham.). *Fish and Shellfish Immunology* **23**, 892-896.
- Nikoskelainen, S., Ouwehand, A.C., Bylund, G. and Salminen, S. (2001). Protection of rainbow trout (*Oncorhynchus mykiss*) from furunculosis by *Lactobacillus rhamnosus*. *Aquaculture* **198**, 229-236.
- Nils, H.A. (1983). Handbook of immunoprecipitation- in Gel Techniques. Published by Blackwell Scientific publications, Oxford, London. Edinburgh Roston Melbourne. pp. 7-21.
- Ochoa-Solano, L. J., and Olmos-Soto, J. (2006). The functional property of *Bacillus* for shrimps feeds. *Food Microbiology*, **23**, 519-525.
- Olmos, S.J., Sanchez, G.A. and DeAnda, R. (1998). Regulations of the *aprE* (subtilisin) gene in *abrB* mutants of *Bacillus subtilis*. *Asia-Pacific Journal of Molecular Biology and Biotechnology* **6**, 97-103.
- Olsson, J.C., Joborn, A., Westerdahl, A., Blomberg, L., Kjelleberg, S. and Conway, P.L. (1996). Is the turbot, *Scophthalmus maximus* (L.), intestine a portal of entry for the fish pathogen *Vibrio anguillarum*? *Journal of Fish Diseases* **19**, 225-234.

- Olsson, J.C., Westerdahl, A., Conway, P.L. and Kjelleberg, S. (1992). Intestinal colonization potential of turbot (*Scophthalmus maximus*) - and dab (*Limanda limanda*) - associated bacteria with inhibitory effects against *Vibrio anguillarum*. *Applied and Environmental Microbiology* **58**, 551-556.
- Ortuño, J., Cuesta, A., Rodríguez, A., Esteban, M.A. and Meseguer, J. (2002). Oral administration of yeast, *Saccharomyces cerevisiae*, enhances the cellular innate immune response of gilthead seabream (*Sparus aurata* L.). *Veterinary Immunology and Immunopathology* **85**, 41-50.
- Panigrahi, A., Kiron,V.,Kobayashi, T., Puangkaew, J., Satoh, S. and Sugita, H., (2004). Immune responses in rainbow trout *Oncorhynchus mykiss* induced by a potential probiotic bacteria *Lactobacillus rhamnosus* JCM 1136. *Veterinary Immunology and Immunopathology* **102** 379-388.
- Panigrahi, A., Kiron, V., Puangkaewa, J., Kobayashib, T., Satoh, S. and Sugita, H. (2005). The viability of probiotic bacteria as a factor influencing the immune response in rainbow trout *Oncorhynchus mykiss*. *Aquaculture* **243**, 241- 254.
- Parker, R.B.(1974) Probiotics. The other half of the antibiotics story. *Animal Nutrition and Health* **29**, 4-8.
- Parry, R.M., Chandan,R.C. and Shahani, K.M.(1965). A rapid and sensitive assay of muramidase. *Proceeding of Society for Experimental Biology and Medicine* **119**, 384-386.
- Perdigon, G., Alvarez, S., Nader de Macas, M.E., Roux, M.E., Pesce de Ruiz and Holgado, A. (1990). The oral administration of lactic acid bacteria increases the mucosal intestinal immunity in response to enteropathogens. *Journal of Food Protection* **53**, 404-410.

- Perdigon, G., Galdeano, C.M., Valdez, J.C. and Medici, M. (2002). Interaction of lactic acid bacteria with the gut immune system. *European Journal of Clinical Nutrition* **56**, (Suppl. 4) S21-S26.
- Peres, A. Zambonino-Infante, J.L. and Cahu, C. (1998). Dietary regulation of activities and mRNA levels of trypsin and amylase in sea bass (*Dicentrarchus labrax*) larvae. *Fish Physiology and Biochemistry* **19**, 145-152.
- Petersen, A., Andersen, J.S., Kaewmak, T., Somsiri, T., and Dalsgaard, A. (2002). Impact of integrated fish farming on antimicrobial resistance in a pond environment. *Applied and Environmental Microbiology* **68**, 6036-6042.
- Peulen, O., Deloyer, P. and Dandrifosse, G. (2002). Maturation of intestinal digestive and immune systems by food polyamines. In: Zabielski R. Gregory P.C. and Westrom B. (Eds.), *Biology of the Intestine in Growing Animals*, vol. 1. Elsevier, Amsterdam. Pp. 145-167
- Picchietti S., Mazzini, M., Taddei, A. R., Renna, R., Fausto, A.M., Mulero, V., Carnevali, O., Cresci, A. and Abelli, L. (2007). Effects of administration of probiotic strains on GALT of larval gilthead seabream: Immunohistochemical and ultrastructural studies. *Fish and Shellfish Immunology* **22**, 57-67.
- Pirarat, N., Kobayashi, T., Katagiri, T., Maita, M. and Endo, M. (2006). Protective effects and mechanisms of a probiotic bacterium *Lactobacillus rhamnosus* against experimental *Edwardsiella tarda* infection in tilapia (*Oreochromis niloticus*). *Veterinary Immunology and Immunopathology* **113**, 339-347.
- Plisetzkaya, E.M. (1989). Physiology of fish endocrine pancreas. *Fish Physiology and Biochemistry* **7**, 39- 48. In: De Silva, S. S. and

- Anderson, T. A. (Eds.), Fish Nutrition in Aquaculture. Champaign and Hall, London, pp 41-102.
- Puangkaew, J., Kiron, V., Somamoto, T., Okamoto, N., Satoh, S., Takeuchi, T. and Watanabe, T. (2004). Nonspecific immune response of rainbow trout (*Oncorhynchus mykiss*, Walbaum) in relation to different status of vitamin E and highly unsaturated fatty acids. *Fish and shellfish Immunology* **16**, 25-39.
- Querroz, J.F. and Boyd, C.E. (1998). Effects of a bacterial inoculum in channel cat fish ponds. *Journal of the World Aquaculture Society* **29**, 67- 73.
- Reid, G. (1999). The scientific basis for probiotic strains of *Lactobacillus*. *Applied and Environmental Microbiology* **65**, 3763-3766.
- Reid, G., Howard, J. and Gan, B.S. (2001). Can bacterial interference prevent infection?. *Trends in Microbiology* **9**, 424-428.
- Rengpipat, S., Phianphak, W., Piyatiratitivorakul, S. and Menasveta, P. (1998). Effects of a probiotic bacterium on black tiger shrimp *Penaeus monodon* survival and growth. *Aquaculture* **167**, 301-313.
- Rengpipat, S., Rukpratanporn, S., Piyatiratitivorakul, S. and Menasaveta, P. (2000). Immunity enhancement in black tiger shrimp (*Penaeus monodon*) by a probiont bacterium (*Bacillus* S11). *Aquaculture* **191**, 271-288.
- Reyes-Becerril, M., Tovar-Ramírez, D., Ascencio-Valle, F., Civera-Cerecedo, R., Gracia-López, V. and Barbosa-Solomieu, V. (2008). Effects of dietary live yeast *Debaryomyces hansenii* on the immune and antioxidant system in juvenile leopard grouper *Mycteroperca rosacea* exposed to stress. *Aquaculture* **280**, 39-44.
- Rhodes, G., Huys, G., Swings, J., McGann, P., Hiney, M., Smith, P. and Pickup, R.W. (2000). Distribution of oxytetracycline resistance plasmids between aeromonads in hospital and aquaculture

- environments: implication of Tn1721 in dissemination of the tetracycline resistance determinant Tet A. *Applied and Environmental Microbiology* **66**: 3883-3890.
- Ringø E., Olsen, R.E., Gifstad, T.Ø., Dalmo, R.A., Amlund, H., Hemre, G.I. and Bakke, A.M. (2010). Prebiotics in aquaculture: a review. *Aquaculture Nutrition* **16**, 117-136.
- Ringø, E. and Gatesoupe, F.J. (1998). Lactic acid bacteria in fish: a review. *Aquaculture* **160**, 177-203.
- Ringø, E., Bendiksen, H.R., Gausen, S.J., Sundsfjord, A. and Olsen, R.E. (1998) The effect of dietary fatty acids on lactic acid bacteria associated with the epithelial mucosa and from faecalia of Arctic charr, *Salvelinus alpinus* (L.). *Journal of Applied Microbiology* **85**, 855-864.
- Ringø, E., Jostensen, J.P. and Olsen, R.E. (1992). Production of eicosapentaenoic acid by freshwater *Vibrio*. *Lipids* **27**, 564-566.
- Rinkinen, M., Jalava, K., Westermarck, E., Salminen, S. and Ouwehand, A.C., (2003a). Interaction between probiotic lactic acid bacteria and canine enteric pathogens: a risk factor for intestinal *Enterococcus faecium* colonization?. *Veterinary Microbiology* **92**, 111-119.
- Rinkinen, M., Westermarck, E., Salminen, S. and Ouwehand, A.C. (2003b). Absence of host specificity for in vitro adhesion of probiotic lactic acid bacteria to intestinal mucus. *Veterinary Microbiology* **97**, 55-61.
- Riquelme, C., Araya, R. and Escibano, R. (2000). Selective incorporation of bacteria by *Argopecten purpuratus* larvae: implications for the use of probiotics in culturing systems of the Chilean scallop. *Aquaculture* **181**, 25-36.

- Robertson, P.A.W., C.O'Dowd, C. Burrells, P. Williams and B. Austin (2000). Use of *Carnobacterium* sp. as a probiotic for Atlantic salmon *Salmo salar* L. and rainbow trout *Oncorhynchus mykiss*, Walbaum. *Aquaculture* **185**, 235-243.
- Roediger, W.E.W. (1982). The effect of bacterial metabolites on nutrition and function of the colonic mucosa. Symbiosis between men and bacteria. In: Kasper H., Goebell H. (Eds.), *Colon and Nutrition, Proceedings of the Falk Symposium Titisee*. MTP Press, Lancaster, PA, Pp. 11-24.
- Ross, D.A., Wilson, M.R., Miller, N.W., Clem, L.W. and Warr, G.W. (1998). Evolutionary variation of immunoglobulin μ heavy chain RNA processing pathways: origins, effects, and implications. *Immunological Reviews* **166**, 143-151.
- Sáenz de Rodrigáñez, M.A., Díaz-Rosales, P., Chabrillón, M., Smidt, H., Arijo, S., León Rubio, J.M., Alarcón, F.J., Balebona, M.C., Moriñigo, M.A., Cara, J.B. and Moyano, F.J. (2009). Effect of dietary administration of probiotics on growth and intestine functionality of juvenile Senegalese sole (*Solea senegalensis*, Kaup 1858). *Aquaculture Nutrition*. **15**, 177-185.
- Sahoo, P.K. and Mukherjee, S.C., (2001). Effect of dietary β -1,3 glucan on immune responses and disease resistance of healthy and aflatoxin B1-induced immunocompromised rohu (*Labeo rohita* Hamilton). *Fish and Shellfish Immunology* **11**, 683-695.
- Sahu, M.K., Swarnakumar, N.S., Sivakumar, K., Thangaradjou, T. and Kannan, L. (2008). Probiotics in aquaculture: Importance and future perspectives. *Indian Journal of Microbiology* **48**, 299-308.
- Sakai, M., Taniguchi, K., Mamoto, K., Ogawa, H. and Tabata, M. (2001). Immunostimulant effects of nucleotide isolated from yeast RNA on carp, *Cyprinus carpio* L. *Journal of Fish Diseases* **24**, 433-438.

- Salinas, I., Cuesta, A., Esteban, M.A. and Meseguer, J. (2005). Dietary administration of *Lactobacillus delbrückii* and *Bacillus subtilis*, single or combined, on gilthead seabream cellular innate immune responses. *Fish & Shellfish Immunology* **19**, 67-77.
- Salle, A. J. (1974). Fundamental Principles of Bacteriology. 7th ed. Tata McGraw Hill Publishing Company Ltd., New Delhi, India.
- Salminen, S., Isolauri, E. and Salminen, E. (1996). Clinical uses of probiotics for stabilizing the gut mucosal barrier: Successful strains for future challenges. *Antonie Van Leeuwenhoek* **70**, 347-358.
- Salminen, S., Ouwehand, A., Benno, Y. and Lee, Y.K. (1999). Probiotics: how should they be defined. *Trends in Food Science and Technology* **10**, 107-110.
- Sancho, V. J., Nacerte, B.R. and Colli, S. M. (2000). Hand book of Microbiological Culture media. Scharlau Chemie, S.A., La Jota, 86, 08016 Barcelona, Spain.
- Schillinger, U. (1999). Isolation and identification of lactobacilli from novel-type probiotic and mild yoghurts and their stability during refrigerated storage. *International Journal of Food Microbiology*, **47**, 79-87.
- Schlitz, L.A. (1987). Methods in clinical chemistry. The C.V. Mosby cost Louis 742-746.
- Shariff, M., Yusoff, F.M., Devaraja, T.N. and Srinivasa R., P.S. (2001). The effectiveness of commercial microbial product in poorly prepared tiger shrimp, *Penaeus monodon* Fabricius ponds. *Aquaculture Research* **32**, 181-188.
- Sharma, O.P. and Bhukhar, S.K.S. (2000). Effect of Aquazyn-TM-1000, a probiotic on the water quality and growth of *Cyprinus carpio* var. communis (L.). *Indian Journal of Fisheries* **47**, 209-213.

- Shiau, S.Y. (2002). Tilapia, *Oreochromis* spp. In: Nutrient Requirements and Feeding of Finfish for Aquaculture, C.D. Webster and C. Lim (eds), pp.273-292. CABI. London.
- Shirasaka, N., Nishi, K. and Shimizu, S. (1995). Occurrence of a furan fatty acid in marine bacteria. *Biochimica et Biophysica Acta* **1258**, 225-227.
- Siwicki, A.K. and Studnicka, M. (1987). The phagocytic activity of neutrophils and serum lysozyme activity in experimentally infected carp, *Cyprinus carpio* L. *Journal of Fish Biology* **31**, 57- 60.
- Siwicki, A.K., Anderson, D.P. and Rumsey, G.L. (1994). Dietary intake of immunostimulants by rainbow trout affects non-specific immunity and protection against furunculosis. *Veterinary Immunology and Immunopathology* **41**, 125-139.
- Skjolstrup, J., Nielsen, P.H., Frier, J.O. and McLean, E. (1998). Performance characteristics of 16 fluidised bed biofilters in a novel laboratory-scale recirculation system for rainbow trout: 17 nitrification rates, oxygen consumption and sludge collection. *Aquaculture Engineering* **18**, 265-276.
- Smith, B.W. and Roe, J.H. (1949). A photometric method for the determination of α - amylase in blood and urine, with use of the starch- iodine color. *Journal of Biological chemistry* **179**, 53-59.
- Smith, P. , Hiney, M.P. and Samuelsen, D.B. (1994). Bacterial resistance to antimicrobial agents used in fish farming: a critical evaluation of method and meaning. *Annual review, Journal of Fish Diseases* **4**, 273- 313
- Smith, L.S. (1989). Digestive functions in teleost fishes. In: J.E. Halver (Ed.), Fish Nutrition, 2nd Ed. Academic Press, San Diego: 331-421.

- Smith, V.J. and Söderhäll, K.J. (1991). A comparison of phenoloxidase activity in the blood of marine invertebrates. *Developmental and Comparative Immunology* **15**, 251-261
- Smoragiewicz, W., Bielecka, M., Babuchawowski, A., Boutard, A. and Dubeau, H. (1993). Les probiotiques. *Canadian Journal of Microbiology* **39**, 1089-1095.
- Sonnenschein, A.L., Losick, R. and Hoch, J.A. (1993). *Bacillus subtilis* and others Gram-Positive bacteria: Biochemistry, physiology and molecular genetics. *American Society for Microbiology*, Washington, DC, 987pp.
- Sørum, H. (2006) Antimicrobial drug resistance in fish pathogens. In *Antimicrobial Resistance in Bacteria of Animal Origin*. Aarestrup, F.M. (ed.). Washington, DC, USA: American Society for Microbiology Press, pp. 213-238 (Chapter13).
- SOU (Statens Offentliga Utredningar, Sweden) (1997). Toxicological and related effects of antibacterial feed additives. Doc. no. 132.
- Stones, C.S. and Mills, D.V. (2004). The use of live yeast and yeast culture products in aquaculture. *International AquaFeed* **7**, 28-34.
- Stosik, M. and Szenfeld, J. (1996). Use of CERBIO probiotic in carp nutrition. *Med Weter* **52**, 467-469.
- Subasinghe, R.P. (2005). Epidemiological approaches to aquatic animal health management: opportunities and challenges for developing countries to increase aquatic production through aquaculture. *Preventive Veterinary Medicine* **67**, 117-24.
- Sugita, H., Miyajima, C. and Deguchi, Y. (1991a). The vitamin B₁₂-producing ability of the intestinal microflora of freshwater fish. *Aquaculture* **92**, 267-276.
- Sugita, H., Okano, R., Suzuki, Y., Iwai, D., Mizukami, M., Akiyama, N. and Matsuura, S. (2002). Antibacterial ability of intestinal bacteria

- from larval and juvenile Japanese flounder against fish pathogen. *Fisheries Science* **68**, 1004-1011
- Sugita, H., Shibuya, K., Harada, H. and Deguchi, Y. (1997). Antibacterial abilities of intestinal microflora of the river fish. *Fisheries Science*, **63**, 378-383.
- Sugita, H., Takahashi, J., Miyajima, C. and Deguchi, Y. (1991b). The vitamin B₁₂-producing ability of the intestinal microflora of rainbow trout *Oncorhynchus mykiss*. *Agriculture Biological and Chemistry* **55**, 893-894.
- Suhendra, T., Handoko, J. Octaviano, D., Porubcan, R.S. and Douillet, P.A. (1997). Management with bacterial probiotics for *Vibrio* and virus control in an Indonesian prawn farm. In: Alston D.E., Green B.W. and Clifford III H.C. (Eds.), *Proceedings of the IV Central American Aquaculture Symposium: Sustainable Culture of Shrimp and Tilapia*. Pp. 201-202.
- Sung, H.H. and Song, Y.L. (1996) Tissue localization of *Vibrio* antigen delivered by immersion to tiger shrimp (*Penaeus monodon*). *Aquaculture* **145**, 41-54.
- Sung, H.H., Song, Y.L. and Kou, G.H. (1991). Potential uses of bacterin to prevent shrimp vibriosis. *Fish and Shellfish Immunology* **1**, 311-312.
- Sung, H.H., Yang, Y.L. and Song, Y.L. (1996). Enhancement of microbicidal activity in the tiger shrimp *Penaeus monodon* via immunostimulation. *Journal of Crustacean Biology* **16**, 278-284
- Suzer, C., Çoban, D. Kamaci, H. O., Saka, S., Firat ,K., Otgucuoğlu, O. and Küçükşari, H.(2008). Lactobacillus spp. bacteria as probiotics in gilthead sea bream (*Sparus aurata*, L.) larvae: Effects on growth performance and digestive enzyme activities. *Aquaculture* **280**, 140-145.

- SVARM (Swedish Veterinary Antimicrobial Resistance Monitoring) (2001). Report. Statens Veterinärmedicinska Anstalt [National Veterinary Institute], Upsala, Sweden. B. Bengtsson and C. Wallén (eds). Wikströms, Upsala, Sweden.
- Swain, S.K., Rangacharyulu, P.V., Sarkar, S. and Das, K. M.(1996). Effect of a probiotic supplement on growth, nutrient utilization and carcass composition in mrigal fry. *Journal of Aquaculture* 4, 29-35 (Cent. Inst. Fresh Water Aquacult., Kausalyaganga, Bhubaneshwar, Orissa, India).
- Tabor, C.W. and Tabor, H., (1985). Polyamines in microorganisms. *Microbiology Reveiw* **49**, 81- 99.
- Tacon, A.G.J., Metian, M. and Hasan, M.R. (2010). Feed ingredients and fertilizers for farmed aquatic animals: sources and composition. *FAO Fisheries and Aquacultrure Technical Paper No. 540*. Rome; FAO 2009, p 210.
- Tannock, G.W. (1997). Modification of the normal microbiota by diet, stress, antimicrobial agents, and probiotics. In: Mackie R.I., With B.A., Isaacson, R.E. (Eds.), *Gastrointestinal Microbiology*, Vol. 2, *Gastrointestinal Microbes and Host Interactions*. Chapman and Hall Microbiology Series, International Thomson Publishing, New York, Pp. 434-465.
- Taoka, Y., Maeda, H., Jo, J.Y., Jeon, M.J., Bai, S.C., Lee, W.J., Yuge, K. and Koshio, S. (2006a). Growth, stress tolerance and non-specific immune response of Japanese flounder *Paralichthys olivaceus* to probiotics in a closed recirculating system. *Fisheries Science* **72**, 310-321.
- Taoka, Y., Maeda, H., Jo, J.Y., Kim, S.M., Park, S.I., Yoshikawa, T. and Sakata, T. (2006b). Use of live and dead probiotic cells in tilapia, *Oreochromis niloticus*. *Fisheries Science* **72**, 755-766.

- Taoka, Y., Maeda,H., Jo, J.Y. and Sakata, T.(2007). Influence of commercial probiotics on the digestive enzyme activities of tilapia, *Oreochromis niloticus*. *Aquaculture Science* **55**, 183-189.
- Teitz, N.W. and Fiereck, E.A. (1966). A specific method for serum lipase determination. *Clinica Chimica Acta* **13**, 352-358.
- Tengjaroenkul,B., Smith,B., Caceci,T. and Smith, S.(2000). Distribution of intestinal enzyme activities along the intestinal tract of cultured Nile tilapia, *Oreochromis niloticus*. *Aquaculture* **182**, 317-327.
- Thanardkit, P., Khunrae, P., Suphantharika, M., Verduyn, C. (2002). Glucan from spent brewer's yeast: preparation, analysis and use as a potential immunostimulants in shrimp feed. *World Journal of Microbiology and Biotechnology* **18**, 527-539.
- Thompson, F.L., Abreu, P.C. and Cavalli, R. (1999). The use of microorganisms as food source for *Penaeus paulensis* larvae. *Aquaculture* **174**, 139-153.
- Timmerson, J.A. and Gerard, P. (1990). Observations on the use of commercial bacterial suspensions in ponds. *Bulletin of France Pêche Piscicene* **316**, 28-30.
- Tovar-Ramírez, D., Zambonino-Infante J., Cahu, C., Gatesoupe, F.J. and Va'zquez-Jua'rez, R. (2004). Influence of dietary live yeast on European sea bass (*Dicentrarchus labrax*) larval development. *Aquaculture* **234**, 415-427.
- Tovar-Ramírez D., Zambonino-Infante, J.L., Cahu, C., Gatesoupe, F.J., Va'zquez-Jua'rez, R. and Le'sel, R., (2002). Effect of live yeast incorporation in compound diet on digestive enzyme activity in sea bass (*Dicentrarchus labrax*) larvae. *Aquaculture* **204**, 113- 123.
- Trewavas,E.(1983) Tilapiine fishes of the genera *Sarotherodon*,*Oreochromis* and *Danakilia*. *British Museum Natural History* , London.

- Trust, T.J. and Sparrow, R.A.H. (1974). The bacterial flora in the alimentary tract of freshwater salmonid fishes. *Canadian Journal of Microbiology* **20**, 1219-1228.
- Tsai, H.J., Chen, H.M. and Lo, C.F. (1994). Secretory synthesis of active recombinant fish growth hormone by insect cells using a baculovirus vector. *Canadian Journal of Fisheries and aquatic sciences* **51**, 1-7
- Tsai, H.J., Hsih, M.H. and Kuo, J.C. (1997). *Escherichia coli* produced fish growth hormone as a feed additive to enhance the growth of juvenile black seabream (*Acanthopagrus schlegeli*). *Journal of Applied Ichthyology* **13**, 70-82
- Tsai, H.J., Lin, K.L., Kuo, J.C. and Chen, S.W. (1995). Highly efficient expression of fish growth hormone by *Escherichia coli* cells. *Applied and Environmental Microbiology* **61**, 4116-4119.
- Vázquez-Juárez, R., Andlid, T. and Gustafsson, L. (1997). Adhesion of yeast isolated from fish gut to crude intestinal mucus of rainbow trout, *Salmo gairdner*. *Molecular Marine Biology and Biotechnology* **6**, 64-71.
- Vázquez-Juárez, R., Ascensio, F., Andlid, T., Gustafsson, L. and Wadström, T. (1993). The expression of potential colonisation factors of yeasts isolated from fish during different growth conditions. *Canadian Journal of Microbiology* **39**, 1135-1141.
- Venkat, H.K., Narottam, P.S. and Jain, K.K. (2004). Effect of feeding *Lactobacillus*-based probiotics on the gut microflora, growth and survival of postlarvae of *Macrobrachium rosenbergii* (de Man). *Aquaculture Research* **35**, 501-507.
- Verschuere, L., Rombaut, G., Sorgeloos, P. and Verstraete, W. (2000). Probiotic bacteria as biological control agents in aquaculture. *Microbiology and Molecular Biology Reviews* **64**, 655-671.

- Vijayan, M.M., Pereira, C., Grau, E.G. and Iwama, G.K., (1997). Metabolic responses associated with confinement stress in tilapia: the role of cortisol. *Comparative Biochemistry and Physiology - Part C* **116**, 89-95.
- Villamil, L. Tafalla, C. Figueras, A. and Novoa, B. (2002). Evaluation of Immunomodulatory Effects of Lactic Acid Bacteria in Turbot (*Scophthalmus maximus*). *Clinical and diagnostic laboratory immunology* **9** 1318-1323.
- Vine, N.G., Leukes, W.D. and Kaiser, H. (2006). Probiotics in marine larviculture. *FEMS Microbiology Review* **30**, 404-427.
- Vine, N.G., Leukes, W.D., and Kaiser, H. (2004a). *In vitro* growth characteristics of five candidate aquaculture probiotics and two fish pathogens grown in fish intestinal mucus. *FEMS Microbiology Letters* **231**, 145-152.
- Vine, N.G., Leukes, W.D., Kaiser, H., Daya, S., Baxter, J. and Hecht, T. (2004b). Competition for attachment of aquaculture candidate probiotic and pathogenic bacteria on fish intestinal mucus. *Journal of Fish Diseases* **27**, 319-326.
- Waché, Y., Auffray, F., Gatesoupe, F.J., Zambonino, J., Gayet, V., Labbé, L. and Quentel, C. (2006). Cross effects of the strain of dietary *Saccharomyces cerevisiae* and rearing conditions on the onset of intestinal microbiota and digestive enzymes in rainbow trout, *Onchorhynchus mykiss*, fry. *Aquaculture* **258**, 470-478.
- Wang, Y.B. (2007). Effect of probiotics on growth performance and digestive enzyme activity of the shrimp *Penaeus vannamei*. *Aquaculture* **269**, 259-264.
- Wang, Y.B. and Xu, Z.R. (2006). Effect of probiotics for common carp (*Cyprinus carpio*) based on growth performance and digestive

- enzyme activities. *Animal Feed Science and Technology*. **127**, 283-292.
- Wang, Y.B., Xu, Z.R. and Xia, M.S. (2005). The effectiveness of commercial probiotics in Northern White Shrimp (*Penaeus vannamei* L.) Ponds Fish Science **71**, 1034-1034-1039.
- Wang, Y.B., Tian, Z.Q., Yao, J.T. and Li, W.F. (2008). Effect of probiotics, *Enterococcus faecium*, on tilapia (*Oreochromis niloticus*) growth performance and immune response. *Aquaculture* **277**, 203-207.
- Watts, M., Munday, B.L. and Burke, C.M. (2001). cDNA sequences and organization of IgM heavy chain genes in two holostean fish. *Developmental & Comparative Immunology* **19**, 153-164.
- Weinstein, M.R., Litt, M., Kertsez, D.A., Wyper, P., Ross, D., Coulter, M., McGreer, A., Facklam, R., Ostach, C., Willey, B.M., Borezyk, A., Low, D.E. and the investigative team (1997). Invasive infection due to a fish pathogen: *streptococcus iniae*. New England Journal of Medicine **337**, 589-594
- Westerdahl, A., Olsson, J.C., Kjelleberg, S. and Conway, P.L. (1991). Isolation and characterization of turbot (*Scophthalmus maximus*)-associated bacteria with inhibitory effects against *Vibrio anguillarum*. *Applied and Environmental Microbiology* **57**, 2223-2228.
- Winkelmann, G. (1991). Handbook of Microbial Iron Chelates, CRC Press, Boca Raton, FL
- Witte, W. (1998). Medical consequences of antibiotic use in agriculture. *Science* **279**, 996-997.
- Witten, P.E., Renwranz, L. and Villwock, W. (1998). Haematogram of the tilapia *Oreochromis niloticus* (Cichlidae, Teleostei) and application of a putative phenoloxidase for differentiating between

- neutrophilic granulocytes and monocytes. *Canadian Journal of Zoology* **76**, 310-319.
- Yanbo,W. and Zirong X. (2006). Effect of probiotics for common carp (*Cyprinus carpio*) based on growth performance and digestive enzyme activities. *Animal feed science and technology* **127**, 283-292.
- Yoshida, T., Kruger, R. and Inglis, V. (1995). Augmentation of non-specific protection in African catfish, *Clarias gariepinus* (Burchell), by the long-term oral administration of immunostimulants. *Journal of Fish Diseases* **18**, 195-198.
- Zambonino-Infante, J.L. and Cahu, C.L. (2001). Ontogeny of the gastrointestinal tract of the marine fish larvae. *Comparative Biochemistry and Physiology (C)* **130**, 477-487.
- Zeng-fu, S., Tian-xing, W.U., Li-sheng,C., Li-jing,Z. and Xiao- dong, Z. (2006). Effect of dietary supplementation with *Clostridium butyricum* on the growth performance and humoral immune response in *Miichthys miiuy*. *Jornal of Zhejiang University Science (B)* **7**, 596-602.
- Zhou, X., Wang, Y. and Li, W. (2009). Effect of probiotic on larvae shrimp (*Penaeus vannamei*) based on water quality, survival rate and digestive enzyme activities. *Aquaculture* **287**, 349-353.
- Zhou, X., Tian,Z. and Wang, Y. (2010). Effect of treatment with probiotics as water additives on tilapia (*Oreochromis niloticus*) growth performance and immune response. *Fish Physiology and Biochemistry* **36**, 501-509.
- Ziaei-Nejad, S., Rezaei, M.H., Takami, G.A., Lovett, D.L., Mirvaghefi, A.R. and Shakouri, M.(2006) The effect of *Bacillus* spp. bacteria used as probiotics on digestive enzyme activity, survival and growth in the Indian white shrimp, *Fenneropenaeus indicus*. *Aquaculture* **252**, 516-524.

- Zohar, Y., 1989: Endocrinology and fish farming: aspects in reproduction, growth and smoltification. *Fish Physiology and Biochemistry* 7, 395- 405.