

References

References

- Abbott, S.L., Powers, C., Kaysner, C.A., Takeda, Y., Ishibashi, M., Joseph, S.W. and Janda, J.M., 1989. Emergence of a restricted bioserovar of *Vibrio parahaemolyticus* as the predominant cause of Vibrio-associated gastroenteritis on the West Coast of the United States and Mexico. *Journal of Clinical Microbiology*, 27(12), 2891-2893.
- Achtman, M., Wain, J., Weill, F.X., Nair, S., Zhou, Z., Sangal, V., Krauland, M.G., Hale, J.L., Harbottle, H., Uesbeck, A. and Dougan, G., 2012. Multilocus sequence typing as a replacement for serotyping in *Salmonella enterica*. *PLoS Pathogens*, 8(6), e1002776.
- Adachi, O., Kawai, T., Takeda, K., Matsumoto, M., Tsutsui, H., Sakagami, M., Nakanishi, K. and Akira, S., 1998. Targeted disruption of the MyD88 gene results in loss of IL-1-and IL-18-mediated function. *Immunity*, 9(1), 143-150.
- Aguilera, L., Ferreira, E., Giménez, R., Fernández, F.J., Taulés, M., Aguilar, J., Vega, M.C., Badia, J. and Baldomà, L., 2012. Secretion of the housekeeping protein glyceraldehyde-3-phosphate dehydrogenase by the LEE-encoded type III secretion system in enteropathogenic *Escherichia coli*. *The International Journal of Biochemistry and Cell Biology*, 44(6), 955-962.
- Ainsa JA, Ryding NJ, Hartley N, Findlay KC, Bruton CJ, Chater KF. 2000. WhiA, a protein of unknown function conserved among gram positive bacteria, is essential for sporulation in *Streptomyces coelicolor*A3(2). *Journal of Bacteriology* 182:5470–5478.
- Akeda, Y., Kodama, T., Saito, K., Iida, T., Oishi, K. and Honda, T., 2011. Identification of the *Vibrio parahaemolyticus* type III secretion system 2-associated chaperone VocC for the T3SS2-specific effector VopC. *FEMS Microbiology Letters*, 324(2), 156-164.
- Akinbi, H.T., Epaud, R., Bhatt, H. and Weaver, T.E., 2000. Bacterial killing is enhanced by expression of lysozyme in the lungs of transgenic mice. *The Journal of Immunology*, 165(10), 5760-5766.

- Alam, M.J., Miyoshi, S.I. and Shinoda, S., 2003. Studies on pathogenic *Vibrio parahaemolyticus* during a warm weather season in the Seto Inland Sea, Japan. *Environmental Microbiology*, 5(8), 706-710.
- Alipour, M., Issazadeh, K. and Soleimani, J., 2014. Isolation and identification of *Vibrio parahaemolyticus* from seawater and sediment samples in the southern coast of the Caspian Sea. *Comparative Clinical Pathology*, 23(1), 129-133.
- Al-Othrubi, S.M., Alfizah, H., Son, R., Humin, N. and Rahaman, J., 2011. Rapid detection and E-test antimicrobial susceptibility testing of *Vibrio parahaemolyticus* isolated from seafood and environmental sources in Malaysia. *Saudi Medical Journal*, 32, 400-406.
- Altschul, S.F., Gish, W., Miller, W., Myers, E.W. and Lipman, D.J., 1990. Basic local alignment search tool. *Journal of Molecular Biology*, 215, 403-410.
- Alvarez, A.H., Martinez-Cadena, G., Silva, M.E., Saavedra, E. and Avila, E.E., 2007. Entamoeba histolytica: ADP-ribosylation of secreted glyceraldehyde-3-phosphate dehydrogenase. *Experimental Parasitology*, 117(4), 349-356.
- Anderson, D.P. and Siwicki, A.K., 1995. Basic haematology and serology for fish health programs. In: Shariff, M., Authur, J.R., Subasinghe, R.P., editors. *Diseases in Asian aquaculture II, fish health section*. Manila, Philippines: Asian Fisheries Society; 185e202.
- Appleby, T.C., Kinsland, C., Begley, T.P. and Ealick, S.E., 2000. The crystal structure and mechanism of orotidine 5'-monophosphate decarboxylase. *Proceedings of the National Academy of Sciences*, 97(5), 2005-2010.
- Arora, S.K., Neely, A.N., Blair, B., Lory, S. and Ramphal, R., 2005. Role of motility and flagellin glycosylation in the pathogenesis of *Pseudomonas aeruginosa* burn wound infections. *Infection and Immunity*, 73(7), 4395-4398.
- Arunkumar, T., Vasuki, A. and Narendrakumar, G., 2017. In silico analysis on docking studies of haemolysin protein in *Vibrio Paraheamolyticus*. *Biomedical and Pharmacology Journal*, 10(4), 1879-1886.

- Avitia, M., Escalante, A.E., Rebollar, E.A., Moreno-Letelier, A., Eguiarte, L.E. and Souza, V., 2014. Population expansions shared among coexisting bacterial lineages are revealed by genetic evidence. *PeerJ*, 2, e696.
- Ayyappan, S., Jena, J.K., Gopalakrishnan, A. and Pandey, A.K., 2011. Handbook of fisheries and aquaculture. Shrimp farming, pp 548-570.
- Aznar, R., Ludwig, W., Amann, R.I. and Schleifer, K.H., 1994. Sequence determination of rRNA genes of pathogenic *Vibrio* species and whole-cell identification of *Vibrio vulnificus* with rRNA-targeted oligonucleotide probes. *International Journal of Systematic and Evolutionary Microbiology*, 44(2), 330-337.
- Baba, K., Yamasaki, S., Nishibuchi, M. and Takeda, Y., 1992. Examination by site-directed mutagenesis of the amino acid residues of the thermostable direct hemolysin of *Vibrio parahaemolyticus* required for its hemolytic activity. *Microbial Pathogenesis*, 12(4), 279-287.
- Bag, P.K., Nandi, S., Bhadra, R.K., Ramamurthy, T., Bhattacharya, S.K., Nishibuchi, M., Hamabata, T., Yamasaki, S., Takeda, Y. and Nair, G.B., 1999. Clonal diversity among recently emerged strains of *Vibrio parahaemolyticus* O3: K6 associated with pandemic spread. *Journal of Clinical Microbiology*, 37(7), 2354-2357.
- Baker-Austin, C., Stockley, L., Rangdale, R. and Martinez-Urtaza, J., 2010. Environmental occurrence and clinical impact of *Vibrio vulnificus* and *Vibrio parahaemolyticus*: a European perspective. *Environmental Microbiology Reports*, 2(1), 7-18.
- Bambino, K. and Chu, J., 2017. Zebrafish in toxicology and environmental health. In Current topics in developmental biology (Vol. 124, pp. 331-367). Academic Press.
- Banerjee, S.K., Kearney, A.K., Nadon, C.A., Peterson, C.L., Tyler, K., Bakouche, L., Clark, C.G., Hoang, L., Gilmour, M.W. and Farber, J.M., 2014. Phenotypic and genotypic characterization of Canadian clinical isolates of *Vibrio parahaemolyticus* collected from 2000 to 2009. *Journal of Clinical Microbiology*, 52(4), 1081-1088.

- Barbazuk, W.B., Korf, I., Kadavi, C., Heyen, J., Tate, S., Wun, E., Bedell, J.A., McPherson, J.D. and Johnson, S.L., 2000. The syntenic relationship of the zebrafish and human genomes. *Genome Research*, 10(9), 1351-1358.
- Baron, C., 2009. Mechanistic and Structural Analysis of Type IV Secretion Systems. *Bacterial Secreted Proteins: Secretory Mechanisms and Role in Pathogenesis*, 117.
- Barrow, G.I. and D.C. Miller., 1974. Growth studies on *Vibrio parahaemolyticus* in relation to pathogenicity. In: International Symposium of *Vibrio parahaemolyticus*. Fujino, T.,G. Sakaguchi, R. Sakazaki, et al. (eds.), Saikon, Tokyo, pp.205–210.
- Bauer Ellingsen, A., Olsen, J.S., Granum, P.E., Rorvik, L.M. and González-Escalona, N., 2013. Genetic characterization of *trh* positive *Vibrio* spp. isolated from Norway. *Frontiers in Cellular and Infection Microbiology*, 3, 107.
- Bechlars, S., Wüstenhagen, D.A., Drägert, K., Dieckmann, R., Strauch, E. and Kubick, S., 2013. Cell-free synthesis of functional thermostable direct hemolysins of *Vibrio parahaemolyticus*. *Toxicon*, 76, 132-142.
- Behera, B.K., Paria, P., Das, A., Bhowmick, S., Sahoo, A.K. and Das, B.K., 2017. Molecular characterization and pathogenicity of a virulent *Acinetobacter baumannii* associated with mortality of farmed Indian Major Carp *Labeo rohita* (Hamilton 1822). *Aquaculture*, 471,157-162.
- Bej, A.K., Patterson, D.P., Brasher, C.W., Vickery, M.C., Jones, D.D. and Kaysner, C.A., 1999. Detection of total and hemolysin-producing *Vibrio parahaemolyticus* in shellfish using multiplex PCR amplification of *tl*, *tdh* and *trh*. *Journal of Microbiological Methods*, 36(3), 215-225.
- Bennuru, S., Semnani, R., Meng, Z., Ribeiro, J.M., Veenstra, T.D. and Nutman, T.B., 2009. *Brugia malayi* excreted/secreted proteins at the host/parasite interface: stage-and gender-specific proteomic profiling. *PLoS Neglected Tropical Diseases*, 3(4), .e410.

- Ben-Yaakov, R. and Salomon, D., 2018. New players in the regulatory network of *Vibrio parahaemolyticus* type VI secretion system 1. *BioRxiv*, 464727.
- Beye, M., Fahsi, N., Raoult, D. and Fournier, P.E., 2018. Careful use of *16S rRNA* gene sequence similarity values for the identification of Mycobacterium species. *New Microbes and New Infections*, 22, 24-29.
- Bhattacharjee, R.N., Park, K.S., Kumagai, Y., Okada, K., Yamamoto, M., Uematsu, S., Matsui, K., Kumar, H., Kawai, T., Iida, T. and Honda, T., 2006. VP1686, a Vibrio type III secretion protein, induces toll-like receptor-independent apoptosis in macrophage through NF- κ B inhibition. *Journal of Biological Chemistry*, 281(48), 36897-36904.
- Bhattacharya, A., Tejero, R. and Montelione, G.T., 2007. Evaluating protein structures determined by structural genomics consortia. *Proteins: Structure, Function, and Bioinformatics*, 66, 778-795.
- Bhowmick, P.P., Khushiramani, R., Raghunath, P., Karunasagar, I. and Karunasagar, I., 2008. Molecular typing of *Vibrio parahaemolyticus* isolated from seafood harvested along the south-west coast of India. *Letters in Applied Microbiology*, 46(2), 198-204.
- Bhowmik, S.K., Pazhani, G.P. and Ramamurthy, T., 2014. Phylogenetic and in silico functional analyses of thermostable-direct hemolysin and *tdh*-related encoding genes in *Vibrio parahaemolyticus* and other Gram-negative bacteria. *BioMed Research International*, 2014.
- Bhuiyan, N.A., Ansaruzzaman, M., Kamruzzaman, M., Alam, K., Chowdhury, N.R., Nishibuchi, M., Faruque, S.M., Sack, D.A., Takeda, Y. and Nair, G.B., 2002. Prevalence of the pandemic genotype of *Vibrio parahaemolyticus* in Dhaka, Bangladesh, and significance of its distribution across different serotypes. *Journal of Clinical Microbiology*, 40(1), 284-286.
- Bilung, L.M., Radu, S., Bahaman, A.R., Rahim, R.A. and Napis, S., 2005. Random Amplified Polymorphic DNA-PCR typing of *Vibrio parahaemolyticus* isolated from local cockles (*Anadara granosa*). *American Journal of Immunology*, 1(1), 31-36.

- Bradford, M.M., 1976. A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Analytical Biochemistry*, 72(1-2), 248-254.
- Broberg, C.A., Calder, T.J. and Orth, K., 2011. *Vibrio parahaemolyticus* cell biology and pathogenicity determinants. *Microbes and Infection*, 13(12-13), 992-1001.
- Budd, A., Blandin, S., Levashina, E.A. and Gibson, T.J., 2004. Bacterial α 2-macroglobulins: colonization factors acquired by horizontal gene transfer from the metazoan genome?. *Genome Biology*, 5(6), R38.
- Burdette, D.L., Seemann, J. and Orth, K., 2009. Vibrio VopQ induces PI3-kinase-independent autophagy and antagonizes phagocytosis. *Molecular Microbiology*, 73(4), 639-649.
- 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(7), 1137-1144.
- Caburlotto, G., Gennari, M., Ghidini, V., Tafi, M. and Lleo, M.M., 2009. Presence of T3SS2 and other virulence-related genes in *tdh*-negative *Vibrio parahaemolyticus* environmental strains isolated from marine samples in the area of the Venetian Lagoon, Italy. *FEMS Microbiology Ecology*, 70(3), 506-514.
- Caburlotto, G., Lleò, M.M., Hilton, T., Huq, A., Colwell, R.R. and Kaper, J.B., 2010. Effect on human cells of environmental *Vibrio parahaemolyticus* strains carrying type III secretion system 2. *Infection and Immunity*, 78(7), 3280-3287.
- Castell, J.V., Gómez-Lechón, M.J., David, M., Andus, T., Geiger, T., Trullenque, R., Fabra, R. and Heinrich, P.C., 1989. Interleukin-6 is the major regulator of acute phase protein synthesis in adult human hepatocytes. *FEBS Letters*, 242(2), 237-239.
- Causey, D.R., Pohl, M.A., Stead, D.A., Martin, S.A., Secombes, C.J. and Macqueen, D.J., 2018. High-throughput proteomic profiling of the fish liver following bacterial infection. *BMC Genomics*, 19(1), 719.

- Ceccarelli, D., Hasan, N.A., Hug, A. and Colwell, R.R., 2013. Distribution, and dynamics of epidemic, and pandemic *Vibrio parahaemolyticus* virulence factors. *Frontiers in Cellular and Infection Microbiology*, 3, 97.
- Chang, S.C. and Lee, C.Y., 2017. OpaR and RpoS are positive regulators of a virulence factor PrtA in *Vibrio parahaemolyticus*. *Microbiology*, 164(2), 221-231.
- Chanphong, J. and Adams, A., 1994. Isolation and partial characterisation of immunoglobulin from snakehead fish (*Channa striatus*). *The AAHRI Newsletter*, 3.
- Chao, G., Wang, F., Zhou, X., Jiao, X., Huang, J., Pan, Z., Zhou, L. and Qian, X., 2011. Origin of *Vibrio parahaemolyticus* O3: K6 pandemic clone. *International Journal of Food Microbiology*, 145(2-3), 459-463.
- Chatterjee, B.D., Neogy, K.N. and Gorbach, S.L., 1970. Study of *V. parahaemolyticus* from cases of diarrhea in Calcutta. *Indian Journal of Medical Research*, 58, 234-238.
- Chatterjee, S. and Haldar, S., 2012. *Vibrio* related diseases in aquaculture and development of rapid and accurate identification methods. *Journal of Marine Science Research and Development*, S1, 002.
- Chen, F.R., Liu, P.C. and Lee, K.K., 2000. Lethal attribute of serine protease secreted by *Vibrio alginolyticus* strains in kuruma prawn *Penaeus japonicus*. *Zeitschrift für Naturforschung C*, 55, 94-99.
- Cheng, Y., Ma, Z., Kim, B.H., Wu, W., Cayting, P., Boyle, A.P., Sundaram, V., Xing, X., Dogan, N., Li, J. and Euskirchen, G., 2014. Principles of regulatory information conservation between mouse and human. *Nature*, 515(7527), 371.
- Chiou, C.S., Hsu, S.Y., Chiu, S.I., Wang, T.K. and Chao, C.S., 2000. *Vibrio parahaemolyticus* serovar O3:K6 as cause of unusually high incidence of food-borne disease outbreaks in Taiwan from 1996 to 1999. *Journal of Clinical Microbiology*, 38, 4621-4625.
- Chitlaru, T., Gat, O., Grosfeld, H., Inbar, I., Gozlan, Y. and Shafferman, A., 2007. Identification of in vivo-expressed immunogenic proteins by serological proteome

- analysis of the *Bacillus anthracis* secretome. *Infection and Immunity*, 75(6), 2841-2852.
- Chonsin, K., Matsuda, S., Theethakaew, C., Kodama, T., Junjhon, J., Suzuki, Y., Suthienkul, O. and Iida, T., 2016. Genetic diversity of *Vibrio parahaemolyticus* strains isolated from farmed Pacific white shrimp and ambient pond water affected by acute hepatopancreatic necrosis disease outbreak in Thailand. *FEMS Microbiology Letters*, 363(2).
- Chowdhury, A., Ishibashi, M., Thiem, V.D., Tuyet, D.T.N., Van Tung, T., Chien, B.T., von Seidlein, L., Canh, D.G., Clemens, J., Trach, D.D. and Nishibuchi, M., 2004. Emergence and serovar transition of *Vibrio parahaemolyticus* pandemic strains isolated during a diarrhea outbreak in Vietnam between 1997 and 1999. *Microbiology and Immunology*, 48(4), 319-327.
- Chowdhury, N.R., Chakraborty, S., Eampokalap, B., Chaicumpa, W., Chongsa-Nguan, M., Moolasart, P., Mitra, R., Ramamurthy, T., Bhattacharya, S.K., Nishibuchi, M. and Takeda, Y., 2000. Clonal dissemination of *Vibrio parahaemolyticus* displaying similar DNA fingerprint but belonging to two different serovars (O3 [ratio] K6 and O4 [ratio] K68) in Thailand and India. *Epidemiology and Infection*, 125(1), 17-25.
- Chowdhury, N.R., Chakraborty, S., Eampokalap, B., Chaicumpa, W., Chongsa-Nguan, M., Moolasart, P., Mitra, R., Ramamurthy, T., Bhattacharya, S.K., Nishibuchi, M. and Takeda, Y., 2000. Clonal dissemination of *Vibrio parahaemolyticus* displaying similar DNA fingerprint but belonging to two different serovars (O3:K6 and O4:K68) in Thailand and India. *Epidemiology and Infection*, 125 (1), 17-25.
- Christie-Oleza, J.A., Armengaud, J., Guerin, P. and Scanlan, D.J., 2015. Functional distinctness in the exoproteomes of marine *S ynechococcus*. *Environmental Microbiology*, 17(10), 3781-3794.
- Coburn, B., Sekirov, I. and Finlay, B. B. 2007. Type III secretion systems and disease. *Clinical Microbiology Reviews*, 20(4), 535–549.

- Comas, I., Coscolla, M., Luo, T., Borrell, S., Holt, K.E., Kato-Maeda, M., Parkhill, J., Malla, B., Berg, S., Thwaites, G. and Yeboah-Manu, D., 2013. Out-of-Africa migration and Neolithic coexpansion of *Mycobacterium tuberculosis* with modern humans. *Nature Genetics*, 45(10), 1176.
- Cook, D.W., O'Leary, P.A.U.L., Hunsucker, J.C., Sloan, E.M., Bowers, J.C., Blodgett, R.J. and DePaola, A.N.G.E.L.O., 2002. *Vibrio vulnificus* and *Vibrio parahaemolyticus* in US retail shell oysters: a national survey from June 1998 to July 1999. *Journal of Food Protection*, 65(1), 79-87.
- Cooper, J.E. and Feil, E.J., 2004. Multilocus sequence typing—what is resolved?. *Trends in Microbiology*, 12(8), 373-377.
- Cordova, J.L., Astorga, J., Silva, W. and Riquelme, C., 2002. Characterization by PCR of *Vibrio parahaemolyticus* isolates collected during the 1997–1998 Chilean outbreak. *Biological Research*, 35: 433-440.
- Cornejo-Granados, F., Zatarain-Barrón, Z.L., Cantu-Robles, V.A., Mendoza-Vargas, A., Molina-Romero, C., Sánchez, F., Pozo-Yauner, D., Hernández-Pando, R. and Ochoa-Leyva, A., 2017. Secretome prediction of two *M. tuberculosis* clinical isolates reveals their high antigenic density and potential drug targets. *Frontiers in Microbiology*, 8, 128.
- Cua, D.J. and Tato, C.M., 2010. Innate IL-17-producing cells: the sentinels of the immune system. *Nature Reviews Immunology*, 10(7), 479-489.
- Daniels, N.A., MacKinnon, L., Bishop, R., Altekuse, S., Ray, B., Hammond, R.M., Thompson, S., Wilson, S., Bean, N.H., Griffin, P.M. and Slutsker, L., 2000. *Vibrio parahaemolyticus* infections in the United States, 1973–1998. *The Journal of Infectious Diseases*, 181(5), 1661-1666.
- Daniels, N.A., MacKinnon, L., Bishop, R., Altekuse, S., Ray, B., Hammond, R.M., Thompson, S., Wilson, S., Bean, N.H., Griffin, P.M. and Slutsker, L., 2000. *Vibrio parahaemolyticus* infections in the United States, 1973–1998. *The Journal of Infectious Diseases*, 181(5), 1661-1666.
- Daniels, N.A., Ray, B., Easton, A., Marano, N., Kahn, E., McShan II, A.L., Del Rosario, L., Baldwin, T., Kingsley, M.A., Puhr, N.D. and Wells, J.G., 2000.

- Emergence of a new *Vibrio parahaemolyticus* serotype in raw oysters: a prevention quandary. Journal of the American Medical Association, 284(12), 1541-1545.
- Das, A., Acharya, S., Behera, B.K., Paria, P., Bhowmick, S., Parida, P.K. and Das, B.K., 2018. Isolation, identification and characterization of *Klebsiella pneumoniae* from infected farmed Indian Major Carp *Labeo rohita* (Hamilton 1822) in West Bengal, India. Aquaculture, 482, 111-116.
- Das, B., Manna, S.K., Sarkar, P. and Batabyal, K., 2009. Occurrence of *Vibrio parahaemolyticus* in different finfish and shellfish species. Journal of Food Safety, 29(1), 118-125.
- Dash, P., Patel, S., Dixit, A., Garg, L.C. and Sahoo, P.K., 2015. Four pro-inflammatory cytokines of rohu (*Labeo rohita*) during early developmental stages, their tissue distribution and expression by leucocytes upon in-vitro stimulation. Fish and Shellfish Immunology, 47(2), 913-922.
- de Souza Santos, M. and Orth, K., 2014. Intracellular *Vibrio parahaemolyticus* escapes the vacuole and establishes a replicative niche in the cytosol of epithelial cells. MBio, 5(5), e01506-14.
- Deb, B.C., 1975. Studies on *Vibrio parahaemolyticus* infection in Calcutta as compared to cholera infection. In Progress in Drug Research/Fortschritte der Arzneimittelforschung/Progrès des Recherches Pharmaceutiques, 490-502, Birkhäuser Basel.
- Deepanjali, A., Kumar, H.S. and Karunasagar, I., 2005. Seasonal variation in abundance of total and pathogenic *Vibrio parahaemolyticus* bacteria in oysters along the southwest coast of India. Applied and Environmental Microbiology, 71(7), 3575-3580.
- Deepanjali, A., Kumar, H.S. and Karunasagar, I., 2005. Seasonal variation in abundance of total and pathogenic *Vibrio parahaemolyticus* bacteria in oysters along the

- southwest coast of India. *Applied and Environmental Microbiology*, 71(7), 3575-3580.
- Deng, W., Marshall, N.C., Rowland, J.L., McCoy, J.M., Worrall, L.J., Santos, A.S., Strynadka, N.C. and Finlay, B.B., 2017. Assembly, structure, function and regulation of type III secretion systems. *Nature Reviews Microbiology*, 15(6), 323.
- Denner, E.B., Vybirdal, D., Fischer, U.R., Velimirov, B. and Busse, H.J., 2002. *Vibrio calviensis* sp. nov., a halophilic, facultatively oligotrophic 0.2 microm-filamentous marine bacterium. *International Journal of Systematic and Evolutionary Microbiology*, 52(2), 549-553.
- DePaola, A., Kaysner, C.A., Bowers, J. and Cook, D.W., 2000. Environmental investigations of *Vibrio parahaemolyticus* in oysters after outbreaks in Washington, Texas, and New York (1997 and 1998). *Applied and Environmental Microbiology*, 66(11), 4649-4654.
- DePaola, A.N.G.E.L.O., Hopkins, L.H. and McPhearson, R.M., 1988. Evaluation of four methods for enumeration of *Vibrio parahaemolyticus*. *Applied and Environmental Microbiology*, 54 (2), 617-618.
- Donovan, T.J. and Van Netten, P., 1995. Culture media for the isolation and enumeration of pathogenic *Vibrio* species in foods and environmental samples. In *Progress in Industrial Microbiology*, 34, 203-217.
- Drancourt, M., Bollet, C., Carlioz, A., Martelin, R., Gayral, J.P. and Raoult, D., 2000. 16S ribosomal DNA sequence analysis of a large collection of environmental and clinical unidentifiable bacterial isolates. *Journal of Clinical Microbiology*, 38(10), 3623-3630.
- Dundas, J., Ouyang, Z., Tseng, J., Binkowski, A., Turpaz, Y. and Liang, J., 2006. CASTp: computed atlas of surface topography of proteins with structural and

- topographical mapping of functionally annotated residues. Nucleic Acids Research, 34, W116-W118.
- Edenberg, H.J., 2007. The genetics of alcohol metabolism: role of alcohol dehydrogenase and aldehyde dehydrogenase variants. Alcohol Research and Health, 30(1), 5.
- Egea, L., Aguilera, L., Gimenez, R., Sorolla, M.A., Aguilar, J., Badía, J. and Baldoma, L., 2007. Role of secreted glyceraldehyde-3-phosphate dehydrogenase in the infection mechanism of enterohemorrhagic and enteropathogenic *Escherichia coli*: interaction of the extracellular enzyme with human plasminogen and fibrinogen. The International Journal of Biochemistry and Cell Biology, 39(6), 1190-1203.
- Egidius, E., 1987. Vibriosis: pathogenicity and pathology. A review. Aquaculture, 67(1-2), 15-28.
- Eisenberg, D., Lüthy, R. and Bowie, J.U., 1997. VERIFY3D: Assessment of protein models with three-dimensional profiles. Methods in Enzymology, 277, 396-404.
- El-Benna, J., Hurtado-Nedelec, M., Marzaioli, V., Marie, J.C., Gougerot-Pocidalo, M.A. and Dang, P.M.C., 2016. Priming of the neutrophil respiratory burst: role in host defense and inflammation. Immunological Reviews, 273(1), 180-193.
- Elola-Lopez, A., Esquivel, M.J., Muñoz-Bergmann, C., Beltran, S., Osorio, C.G. and Trombert, A.N., 2015. PCR restriction fragment length polymorphism analyses of *V. parahaemolyticus* MAM-7 virulence gene in clinical and environmental strains. Electronic Journal of Biology, 11(3), 119-25.
- Emerson, D., Agulto, L., Liu, H. and Liu, L., 2008. Identifying and characterizing bacteria in an era of genomics and proteomics. Bioscience, 58(10), 925-936.
- Erwin, D.P., Nydam, S.D. and Call, D.R., 2012. *Vibrio parahaemolyticus* ExsE is requisite for initial adhesion and subsequent type III secretion system 1-dependent autophagy in HeLa cells. Microbiology, 158(Pt 9), 2303.
- Evans, B.C., Nelson, C.E., Shann, S.Y., Beavers, K.R., Kim, A.J., Li, H., Nelson, H.M., Giorgio, T.D. and Duvall, C.L., 2013. Ex vivo red blood cell hemolysis assay for

- the evaluation of pH-responsive endosomolytic agents for cytosolic delivery of biomacromolecular drugs. *Journal of Visualized Experiments*, 73, e50166.
- FAO 2011. Fishery and Aquaculture Statistics.
<http://www.fao.org/docrep/019/i3507t/i3507t.pdf>
- Farhan, H. and Rabouille, C., 2011. Signalling to and from the secretory pathway. *Journal of Cell Science*, 124(2), 171-180.
- Farmer, J.J. and Janda, M., 2004. Family I. Vibrionaceae. In Bergey's Manual of Systematic Bacteriology, 2nd edn., pp. 491–546. Edited by M. Garrity, G. New York: Springer.
- Felsenstein, J., 1985. Confidence limits on phylogenies: an approach using the bootstrap. *Evolution*, 39(4), 783-791.
- Fishbein, M., Webz, B., Landry, W.L. and MacFachern, B., 1974. *Vibrio parahaemolyticus* isolated in the U.S.: 1969-1972. In: Takeda, Y. eds. International Symposium on *Vibrio parahaemolyticus*. Tokyo: Saikou Publ. Co. p53
- Fitzgerald, K.A., Palsson-McDermott, E.M., Bowie, A.G., Jefferies, C.A., Mansell, A.S., Brady, G., Brint, E., Dunne, A., Gray, P., Harte, M.T. and McMurray, D., 2001. Mal (MyD88-adapter-like) is required for Toll-like receptor-4 signal transduction. *Nature*, 413(6851), 78.
- Flärdh, K., Leibovitz, E., Buttner, M.J. and Chater, K.F., 2000. Generation of a non-sporulating strain of *Streptomyces coelicolor* A3 (2) by the manipulation of a developmentally controlled ftsZ promoter. *Molecular Microbiology*, 38(4), 737-749.
- Fu, Y.X., 1997. Statistical tests of neutrality of mutations against population growth, hitchhiking and background selection. *Genetics*, 147 (2), 915-925.
- Fuenzalida, L., Hernández, C., Toro, J., Rioseco, M.L., Romero, J. and Espejo, R.T., 2006. *Vibrio parahaemolyticus* in shellfish and clinical samples during two large epidemics of diarrhoea in southern Chile. *Environmental Microbiology*, 8(4), 675-683.

- Fujino, T. 1974. Discovery of *Vibrio parahaemolyticus*. In: International Symposium of *Vibrio parahaemolyticus*. Fujino, T., G. Sakaguchi, R. Sakazaki, et al. (eds.), Saikou, Tokyo, pp. 1–4.
- Fujino, T., Okuno, Y., Nakada, D., Aoyama, A., Fukai, K., Mukai, T. and Ueho, T., 1953. On the bacteriological examination of shirasu-food poisoning. Medical Journal of Osaka University, 4(2/3), 299-304.
- Fukui, T., Shiraki, K., Hamada, D., Hara, K., Miyata, T., Fujiwara, S., Mayanagi, K., Yanagihara, K., Iida, T., Fukusaki, E. and Imanaka, T., 2005. Thermostable direct hemolysin of *Vibrio parahaemolyticus* is a bacterial reversible amyloid toxin. Biochemistry, 44(29), 9825-9832.
- Gamble, M.D. and Lovell, C.R., 2011. In faunal burrows are enrichment zones for *Vibrio parahaemolyticus*. Applied. Environmental. Microbiology, 77(11), 3703-3714.
- Gao, F., Kodama, T., Chen, X., Okada, K. and Honda, T., 2007. A targeting approach for delivery of polymer microparticle-antibody conjugate against *Vibrio parahaemolyticus* induced cytotoxicity to human intestinal epithelial cells. Journal of Drug Targeting, 15(6), 428-436.
- Gardell, A.M., Yang, J., Sacchi, R., Fangue, N.A., Hammock, B.D. and Kültz, D., 2013. Tilapia (*Oreochromis mossambicus*) brain cells respond to hyperosmotic challenge by inducing myo-inositol biosynthesis. Journal of Experimental Biology, 216(24), 4615-4625.
- Gavilan, R.G., Zamudio, M.L. and Martinez-Urtaza, J., 2013. Molecular epidemiology and genetic variation of pathogenic *Vibrio parahaemolyticus* in Peru. PLoS Neglected Tropical Diseases, 7(5), e2210.
- Gennari, M., Ghidini, V., Caburlotto, G. and Lleo, M.M., 2012. Virulence genes and pathogenicity islands in environmental *Vibrio* strains nonpathogenic to humans. FEMS Microbiology Ecology, 82(3), 563-573.
- Gevers, D., Cohan, F.M., Lawrence, J.G., Spratt, B.G., Coenye, T., Feil, E.J., Stackebrandt, E., Van de Peer, Y., Vandamme, P., Thompson, F.L. and Swings, J., 2005. Phylogeny and epidemiology of *Vibrio cholerae*. Proceedings of the National Academy of Sciences of the United States of America, 102(37), 13429-13434.

- J., 2005. Re-evaluating prokaryotic species. *Nature Reviews Microbiology*, 3(9), 733.
- Ghenem, L., Elhadi, N., Alzahrani, F. and Nishibuchi, M., 2017. *Vibrio Parahaemolyticus*: A review on distribution, pathogenesis, virulence determinants and epidemiology. *Saudi journal of medicine and medical sciences*, 5(2), 93.
- Gil, A.I., Miranda, H., Lanata, C.F., Prada, A., Hall, E.R., Barreno, C.M., Nusrin, S., Bhuiyan, N.A., Sack, D.A. and Nair, G.B., 2007. O3: K6 serotype of *Vibrio parahaemolyticus* identical to the global pandemic clone associated with diarrhea in Peru. *International Journal of Infectious Diseases*, 11(4), 324-328.
- González-Escalona, N., Cachicas, V., Acevedo, C., Rioseco, M.L., Vergara, J.A., Cabello, F., Romero, J. and Espejo, R.T., 2005. *Vibrio parahaemolyticus* diarrhea, Chile, 1998 and 2004. *Emerging Infectious Diseases*, 11(1), 129.
- González-Escalona, N., Martinez-Urtaza, J., Romero, J., Espejo, R.T., Jaykus, L.A. and DePaola, A., 2008. Determination of molecular phylogenetics of *Vibrio parahaemolyticus* strains by multilocus sequence typing. *Journal of Bacteriology*, 190(8), 2831-2840.
- Gopal, S., Otta, S.K., Kumar, S., Karunasagar, I., Nishibuchi, M. and Karunasagar, I., 2005. The occurrence of *Vibrio* species in tropical shrimp culture environments; implications for food safety. *International Journal of Food Microbiology*, 102(2), 151-159.
- Gotoh, K., Kodama, T., Hiyoshi, H., Izutsu, K., Park, K.S., Dryselius, R., Akeda, Y., Honda, T. and Iida, T., 2010. Bile acid-induced virulence gene expression of *Vibrio parahaemolyticus* reveals a novel therapeutic potential for bile acid sequestrants. *PloS One*, 5(10), e13365.
- Gralnick, J.A. and Newman, D.K., 2007. Extracellular respiration. *Molecular Microbiology*, 65(1), 1-11.
- Green, E. R. and Mecsas, J. 2016. Bacterial Secretion Systems: An Overview. *Microbiology Spectrum*, 4(1).

- Gront, D., Kmiecik, S., Blaszczyk, M., Ekonomiuk, D. and Kolinski, A., 2012. Optimization of protein models. Wiley Interdisciplinary reviews: Computational Molecular Science, 2, 479-493.
- Guo, D., Zhang, Z., Tang, X., Wang, J., Pan, Y. and Yongzhao, 2013. Antimicrobial resistance and molecular typing of pathogenic *Vibrio parahaemolyticus* isolated from seafood in Shanghai retail markets. Journal of Pure and Applied Microbiology, 7(4), 3085-3090.
- Gupta, M.K., Subramanian, V. and Yadav, J.S., 2009. Immunoproteomic identification of secretory and subcellular protein antigens and functional evaluation of the secretome fraction of *Mycobacterium immunogenum*, a newly recognized species of the *Mycobacterium chelonae*-*Mycobacterium abscessus* group. Journal of Proteome Research, 8, 2319–2330.
- Hally, R.J., Rubin, R.A., Fraimow, H.S. and Hoffman-Terry, M.L., 1995. Fatal *Vibrio parahemolyticus* septicemia in a patient with cirrhosis. Digestive Diseases and Sciences, 40(6), 1257-1260.
- Han, D., Tang, H., Lu, J., Wang, G., Zhou, L., Min, L. and Han, C., 2014. Population structure of clinical *Vibrio parahaemolyticus* from 17 coastal countries, determined through multilocus sequence analysis. PLoS One, 9(9), e107371.
- Hanada, K., Shiu, S.H. and Li, W.H., 2007. The nonsynonymous/synonymous substitution rate ratio versus the radical/conservative replacement rate ratio in the evolution of mammalian genes. Molecular Biology and Evolution, 24(10), 2235-2241.
- Hara-Kudo, Y., Nishina, T., Nakagawa, H., Konuma, H., Hasegawa, J. and Kumagai, S., 2001. Improved method for detection of *Vibrio parahaemolyticus* in seafood. Applied and Environmental Microbiology, 67(12), 5819-5823.
- Hart, E., Yang, J., Tauschek, M., Kelly, M., Wakefield, M.J., Frankel, G., Hartland, E.L. and Robins-Browne, R.M., 2008. RegA, an AraC-like protein, is a global transcriptional regulator that controls virulence gene expression in *Citrobacter rodentium*. Infection and Immunity, 76(11), 5247-5256.

- Harth, E., Matsuda, L., Hernández, C., Rioseco, M.L., Romero, J., González-Escalona, N., Martínez-Urtaza, J. and Espejo, R.T., 2009. Epidemiology of *Vibrio parahaemolyticus* outbreaks, southern Chile. Emerging Infectious Diseases, 15(2), 163.
- He, Y., Wang, H. and Chen, L., 2015. Comparative secretomics reveals novel virulence-associated factors of *Vibrio parahaemolyticus*. Frontiers in Microbiology, 6, 707.
- Heidelberg, J.F., Heidelberg, K.B. and Colwell, R.R., 2002. Bacteria of the γ -subclass Proteobacteria associated with zooplankton in Chesapeake Bay. Applied and Environmental Microbiology, 68(11), 5498-5507.
- Heinemann, F.S and Ozols, J., 1998. Isolation and structural analysis of microsomal membrane proteins. Frontiers in Bioscience, 3, 483-493.
- Henderson, B., and Martin, A. C. 2014). Protein moonlighting: a new factor in biology and medicine. Biochemical Society Transactions, 42, 1671–1678.
- Henzler-Wildman, K. and Kern, D., 2007. Dynamic personalities of proteins. Nature, 450, 964-972.
- Hofer, E., 1983. Primeiro isolamento e identificação de *Vibrio parahaemolyticus* no Brasil de infecção gastrointestinal humana. Reviews in Microbiology, 14(3), 174-175.
- Holt, K.E., Vu, T., Nga, T., Pham, D., Vinh, H., Wook, D., Phan, M. and Tra, V., 2013. Tracking the establishment of local endemic populations of an emergent enteric pathogen. Proceedings of the National Academy of Sciences of the United States of America. 110 (43), 17522–17527.
- Honda, S.I., Goto, I., Minematsu, I., Ikeda, N., Asano, N., Ishibashi, M., Kinoshita, Y., Nishibuchi, M., Honda, T. and Miwatani, T., 1987. Gastroenteritis due to Kanagawa negative *Vibrio parahaemolyticus*. The Lancet, 329(8528), 331-332.
- Honda, T.A.K.E.S.H.I., Ni, Y.X. and Miwatani, T.O.S.H.I.O., 1988. Purification and characterization of a hemolysin produced by a clinical isolate of Kanagawa

- phenomenon-negative *Vibrio parahaemolyticus* and related to the thermostable direct hemolysin. *Infection and Immunity*, 56(4), 961-965.
- Hood, R.D., Singh, P., Hsu, F., Güvener, T., Carl, M.A., Trinidad, R.R., Silverman, J.M., Ohlson, B.B., Hicks, K.G., Plemel, R.L. and Li, M., 2010. A type VI secretion system of *Pseudomonas aeruginosa* targets a toxin to bacteria. *Cell Host and Microbe*, 7(1), 25-37.
- Hurley, C.C., Quirke, A., Reen, F.J. and Boyd, E.F., 2006. Four genomic islands that mark post-1995 pandemic *Vibrio parahaemolyticus* isolates. *BMC genomics*, 7(1), 104.
- Iguchi, T., Kondo, S. and Hisatsune, K., 1995. *Vibrio parahaemolyticus* O serotypes from O1 to O13 all produce R-type lipopolysaccharide: SDS-PAGE and compositional sugar analysis. *FEMS Microbiology Letters*, 130(2-3), 287-292.
- Iida, T., Tang, G.Q., Suttipitug, S., Yamamoto, K., Miwatani, T. and Honda, T., 1995. Isolation of mutant toxins of *Vibrio parahaemolyticus* hemolysin by in vitro mutagenesis. *Toxicon*, 33(2), 209-216.
- Iredell, J., Blanckenberg, D., Arvand, M., Grauling, S., Feil, E.J. and Birtles, R.J., 2003. Characterization of the natural population of *Bartonella henselae* by multilocus sequence typing. *Journal of Clinical Microbiology*, 41(11), 5071-5079.
- Islam, M.S., Tasmin, R., Khan, S.I., Bakht, H.B.M., Mahmood, Z.H., Rahman, M.Z., Bhuiyan, N.A., Nishibuchi, M., Nair, G.B., Sack, R.B. and Huq, A., 2004. Pandemic strains of O3: K6 *Vibrio parahaemolyticus* in the aquatic environment of Bangladesh. *Canadian Journal of Microbiology*, 50(10), 827-834.
- Islam, N., Nagy, A., Garrett, W.M., Shelton, D., Cooper, B. and Nou, X., 2016. Different cellular origins and functions of extracellular proteins from *Escherichia coli* O157: H7 and O104: H4 as determined by comparative proteomic analysis. *Applied and Environmental Microbiology* 82(14), 4371-4378.

- Jackson, H., 1974. Temperature relationships of *Vibrio parahaemolyticus*. In: International Symposium of *Vibrio parahaemolyticus*. Fujino, T., G. Sakaguchi, R. Sakazaki, et al. (eds.), Saikon, Tokyo, pp. 139–145.
- Jagadeesan, B., Koo, O.K., Kim, K.P., Burkholder, K.M., Mishra, K.K., Aroonnual, A. and Bhunia, A.K., 2010. LAP, an alcohol acetaldehyde dehydrogenase enzyme in Listeria, promotes bacterial adhesion to enterocyte-like Caco-2 cells only in pathogenic species. *Microbiology*, 156(9), 2782-2795.
- Jamroz, M., Orozco, M., Kolinski, A. and Kmiecik, S., 2012. Consistent view of protein fluctuations from all-atom molecular dynamics and coarse-grained dynamics with knowledge-based force-field. *Journal of Chemical Theory and Computation*, 9(1), 119-125.
- Japan Infectious Disease Surveillance Centre. Bacterial food poisoning in Japan, 1998-2007. IASR 29:213-215., August 2008.
- Jay, J.M., 2000. Foodborne gastroenteritis caused by Vibrio, Yersinia, and Campylobacter species. In: Heldman DR, editor, editor. *Modern Food Microbiology*. Gaithersburg, MD: Aspen Publisher; pp. 549–68.
- Jayasree, L., Janakiram, P. and Madhavi, R., 2006. Characterization of Vibrio spp. Associated with Diseased Shrimp from Culture Ponds of Andhra Pradesh (India). *Journal of the World Aquaculture Society*, (37) 4, 523-532.
- Jeffery, C., 2018. Intracellular proteins moonlighting as bacterial adhesion factors. *AIMS Microbiology*, 4, 362-376.
- Jiang, N., Tang, L., Xie, R., Li, Z., Burkinshaw, B., Liang, X., Sosa, D., Aravind, L., Dong, T., Zhang, D. and Zheng, J., 2018. *Vibrio parahaemolyticus*RhsP represents a widespread group of pro-effectors for type VI secretion systems. *Nature Communications*, 9(1), 3899.
- Jiang, W., Han, X., Wang, Q., Li, X., Yi, L., Liu, Y. and Ding, C., 2014. *Vibrio parahaemolyticus* enolase is an adhesion-related factor that binds plasminogen and functions as a protective antigen. *Applied Microbiology and Biotechnology*, 98(11), 4937-4948.

- Johnson, C.N., Flowers, A.R., Noriea, N.F., Zimmerman, A.M., Bowers, J.C., DePaola, A. and Grimes, D.J., 2010. Relationships between environmental factors and pathogenic vibrios in the northern Gulf of Mexico. *Applied Environmental Microbiology*, 76(21), 7076-7084.
- Johnson, C.N., Flowers, A.R., Young, V.C., Gonzalez-Escalona, N., DePaola, A., Noriea, N.F. and Grimes, D.J., 2009. Genetic relatedness among *tdh*+ and *trh*+ *Vibrio parahaemolyticus* cultured from Gulf of Mexico oysters (*Crassostrea virginica*) and surrounding water and sediment. *Microbial Ecology*, 57(3), 437.
- Jones, J.L., Lüdeke, C.H., Bowers, J.C., Garrett, N., Fischer, M., Parsons, M.B., Bopp, C.A. and DePaola, A., 2012. Biochemical, serological, and virulence characterization of clinical and oyster *Vibrio parahaemolyticus* isolates. *Journal of Clinical Microbiology*, 50(7), 2343-2352.
- Julie, D., Solen, L., Antoine, V., Jaufrey, C., Annick, D. and Dominique, H.H., 2010. Ecology of pathogenic and non-pathogenic *Vibrio parahaemolyticus* on the French Atlantic coast. Effects of temperature, salinity, turbidity and chlorophyll a. *Environmental Microbiology*, 12(4), 929-937.
- Jung, M.H., and Jung, S.J., 2017. Gene expression regulation of the TLR9 and MyD88-dependent pathways in rock bream against rock bream iridovirus (RBIV) infection. *Fish and Shellfish Immunology*, 70, 507-514.
- Kalia, V.C., Kumar, R., Kumar, P. and Koul, S., 2016. A Genome-Wide Profiling Strategy as an Aid for Searching Unique Identification Biomarkers for Streptococcus. *Indian Journal of Microbiology*, 56, 46-58.
- Kam, K.M., Luey, C.K., Parsons, M.B., Cooper, K.L., Nair, G.B., Alam, M., Islam, M.A., Cheung, D.T., Chu, Y.W., Ramamurthy, T. and Pazhani, G.P., 2008. Evaluation and validation of a PulseNet standardized pulsed-field gel electrophoresis protocol for subtyping *Vibrio parahaemolyticus*: an international multicenter collaborative study. *Journal of Clinical Microbiology*, 46(8), 2766-2773.
- Kang, C.H., Shin, Y., Jang, S., Yu, H., Kim, S., An, S., Park, K. and So, J.S., 2017. Characterization of *Vibrio parahaemolyticus* isolated from oysters in Korea:

- Resistance to various antibiotics and prevalence of virulence genes. Marine Pollution Bulletin, 118(1-2), 261-266.
- Kapur, S.K. and Katz, A.J., 2013. Review of the adipose derived stem cell secretome. Biochimie, 95(12), 2222-2228.
- Karched, M., Bhardwaj, R.G., Tiss, A. and Asikainen, S., 2019. Proteomic analysis and virulence assessment of *Granulicatella adiacens* secretome. Frontiers in Cellular and Infection Microbiology, 9, 104.
- Khan, A., Alsahli, M. and Rahmani, A., 2018. Myeloperoxidase as an active disease biomarker: Recent biochemical and pathological perspectives. Medical Sciences, 6(2), 33.
- Khoudaja, S., Lamari, F. and Bakhrouf, A., 2013. Characterization of *Vibrio parahaemolyticus* isolated from farmed sea bass (*Dicentrarchus labrax*) during disease outbreaks. International Aquatic Research, 5(1), 13.
- Kim, S.K., Yang, J.Y. and Cha, J., 2002. Cloning and sequence analysis of a novel metalloprotease gene from *Vibrio parahaemolyticus*. Gene, 283(1-2), 277-286.
- Kim, Y.B., Okuda, J., Matsumoto, C., Takahashi, N., Hashimoto, S. and Nishibuchi, M., 1999. Identification of *Vibrio parahaemolyticus* strains at the species level by PCR targeted to the *toxR* gene. Journal of Clinical Microbiology, 37(4), 1173-1177.
- King, S.J., Leigh, J.A., Heath, P.J., Luque, I., Tarradas, C., Dowson, C.G. and Whatmore, A.M., 2002. Development of a multilocus sequence typing scheme for the pig pathogen *Streptococcus suis*: identification of virulent clones and potential capsular serotype exchange. Journal of Clinical Microbiology, 40(10), 3671-3680.
- Kishishita, M., Matsuoka, N.A.O.K.I., Kumagai, K.E.I.K.O., Yamasaki, S.H.I.N.J.I., Takeda, Y.O.S.H.I.F.U.M.I. and Nishibuchi, M.I.T.S.U.A.K.I., 1992. Sequence variation in the thermostable direct hemolysin-related hemolysin (*trh*) gene of *Vibrio parahaemolyticus*. Applied and Environmental Microbiology, 58(8), 2449-2457.

- Kita-Tsukamoto, K., Oyaizu, H., Nanba, K. and Simidu, U., 1993. Phylogenetic relationships of marine bacteria, mainly members of the family Vibrionaceae, determined on the basis of *16S rRNA* sequences. International Journal of Systematic and Evolutionary Microbiology, 43(1), 8-19.
- Kmiecik, S. and Kolinski, A., 2011. Simulation of chaperon in effect on protein folding: a shift from nucleation–condensation to framework mechanism. Journal of the American Chemical Society, 133, 10283-10289.
- Kobayashi, T., Enomoto, S., Sakazaki, R. and Kuwahara, S. 1963. A new selective medium for pathogenic Vibrios TCBS agar (modified Nakanishi's agar). Japanese Journal of Bacteriology, 18, 387-391.
- Kobir, A., Shi, L., Boskovic, A., Grangeasse, C., Franjevic, D. and Mijakovic, I., 2011. Protein phosphorylation in bacterial signal transduction. Biochimica et Biophysica Acta (BBA)-General Subjects, 1810(10), 989-994.
- Kodama, T., Hiyoshi, H., Gotoh, K., Akeda, Y., Matsuda, S., Park, K.S., Cantarelli, V.V., Iida, T. and Honda, T., 2008. Identification of two translocon proteins of *Vibrio parahaemolyticus* type III secretion system 2. Infection and Immunity, 76(9), 4282-4289.
- Kolbert, C.P. and Persing, D.H., 1999. Ribosomal DNA sequencing as a tool for identification of bacterial pathogens. Current Opinion in Microbiology, 2(3), 299-305.
- Kolinski, A., 2004. Protein modeling and structure prediction with a reduced representation. Acta Biochimica Polonica, 51, 349-371.
- Kopac, S. and Cohan, F.M., 2011. A theory-based pragmatism for discovering and classifying newly divergent bacterial species. In: Tibayrenc, M. (Ed.), Genetics and Evolution of Infectious Diseases. Elsevier, Burlington, MA, pp. 21–41.
- Krachler, A.M., Ham, H. and Orth, K., 2011. Outer membrane adhesion factor multivalent adhesion molecule 7 initiates host cell binding during infection by gram-negative pathogens. Proceedings of the National Academy of Sciences, 108(28), 11614-11619.

- Krieger, E., Nabuurs, S.B. and Vriend, G., 2005. Homology modeling, in structural bioinformatics. In: Bourne PE, Weissig H eds. Hoboken, NH: Wiley & Sons, pp44.
- Kumar, B.K., Deekshit, V.K., Raj, J.R.M., Rai, P., Shivanagowda, B.M., Karunasagar, I. and Karunasagar, I., 2014. Diversity of *Vibrio parahaemolyticus* associated with disease outbreak among cultured *Litopenaeus vannamei* (Pacific white shrimp) in India. Aquaculture, 433, 247-251
- Kumar, K., Pani Prasad, K., Tripathi, G., Raman, R.P., Kumar, S., Tembhurne, M., Purushothaman, C.S., 2014. Isolation identification and pathogenicity of a virulent *Aeromonas jandaei* associated with mortality of farmed *Pangasianodon hypophthalmus*, in India. Israeli Journal of Aquaculture-Bamidgeh. 67, 1127.
- Kumar, S., Stecher, G. and Tamura, K., 2016. MEGA7: molecular evolutionary genetics analysis version 7.0 for bigger datasets. Molecular Biology and Evolution, 33(7), 1870-1874.
- Kundu, N., Tichkule, S., Pandit, S.B. and Chattopadhyay, K., 2017. Disulphide bond restrains the C-terminal region of thermostable direct hemolysin during folding to promote oligomerization. Biochemical Journal, 474(2), 317-331.
- Laemmli, U.K., 1970. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. Nature, 227(5259), 680.
- Laguri, C., Phillips-Jones, M.K. and Williamson, M.P., 2003. Solution structure and DNA binding of the effector domain from the global regulator PrrA (RegA) from Rhodobacter sphaeroides: insights into DNA binding specificity. Nucleic Acids Research, 31(23), 6778-6787.
- Lai, X.H., Wang, S.Y., Edebro, H. and Sjöstedt, A., 2003. Francisella strains express hemolysins of distinct characteristics. FEMS Microbiology Letters, 224(1), 91-95.
- Lalitha, M.K., Walter, N.M., Jesudason, M. and Mathan, V.I., 1983. An outbreak of gastroenteritis due to *Vibrio parahaemolyticus* in Vellore. The Indian Journal of Medical Research, 78, 611.

- Laohaprerthisan, V., Chowdhury, A., Kongmuang, U., Kalnauwakul, S., Ishibashi, M., Matsumoto, C. and Nishibuchi, M., 2003. Prevalence and serodiversity of the pandemic clone among the clinical strains of *Vibrio parahaemolyticus* isolated in southern Thailand. *Epidemiology and Infection*, 130, 395-406.
- Lara-Ochoa, C., Oropeza, R. and Huerta-Saquer, A., 2010. Regulation of the LEE-pathogenicity island in attaching and effacing bacteria. *Current Research, Technology and Education Topics in Applied Microbiology and Microbial Biotechnology*. Badajoz: Formatec Research Center, 635-645.
- Laskowski, R.A., MacArthur, M.W., Moss, D.S., Thornton, J.M., 1993. PROCHECK: a program to check the stereo chemical quality of protein structures. *Journal of Applied Crystallography*, 26, 283-291.
- Leal, N.C., Da Silva, S.C., Cavalcanti, V.O., Figueiroa, Â.C.D.A., Nunes, V.V.F., Miralles, I.S. and Hofer, E., 2008. *Vibrio parahaemolyticus* serovar O3: K6 gastroenteritis in northeast Brazil. *Journal of Applied Microbiology*, 105(3), 691-697.
- Lee, C.Y., Cheng, M.F., Yu, M.S. and Pan, M.J., 2002. Purification and characterization of a putative virulence factor, serine protease, from *Vibrio parahaemolyticus*. *FEMS Microbiology Letters*, 209(1), 31-37.
- Lee, J.H., Han, K.H., Choi, S.Y., Lucas, M.E., Mondlane, C., Ansaruzzaman, M., Nair, G.B., Sack, D.A., Von Seidlein, L., Clemens, J.D. and Song, M., 2006. Multilocus sequence typing (MLST) analysis of *Vibrio cholerae* O1 El Tor isolates from Mozambique that harbour the classical CTX prophage. *Journal of Medical Microbiology*, 55(2), 165-170.
- Lehr, S., Hartwig, S. and Sell, H., 2012. Adipokines: a treasure trove for the discovery of biomarkers for metabolic disorders. *PROTEOMICS–Clinical Applications*, 6(1-2), 91-101.
- Levine, W.C. and Griffin, P.M., 1993. Vibrio infections on the Gulf Coast: results of first year of regional surveillance. *The Journal of Infectious Diseases*, 167, 479-483.

- Li, Y., Xie, X., Shi, X. and Lin, Y., 2014. *Vibrio parahaemolyticus*, southern coastal region of China, 2007–2012. Emerging Infectious Diseases, 20(4), 685.
- Lin, S.J., Hsu, K.C. and Wang, H.C., 2017. Structural insights into the cytotoxic mechanism of *Vibrio parahaemolyticus*PirA^{vp} and PirB^{vp} toxins. Marine Drugs, 15(12), 373.
- Lin, Z., Kumagai, K., Baba, K., Mekalanos, J.J. and Nishibuchi, M., 1993. *Vibrio parahaemolyticus* has a homolog of the *Vibrio cholerae* *toxRS* operon that mediates environmentally induced regulation of the thermostable direct hemolysin gene. Journal of Bacteriology, 175(12), 3844-3855.
- Liu Ellingsen, A.B., Jørgensen, H., Wagley, S., Monshaugen, M. and Rørvik, L.M., 2008. Genetic diversity among Norwegian *Vibrio parahaemolyticus*. Journal of Applied Microbiology, 105(6), 2195-2202.
- Liu, F., Guan, W., Alam, M.J., Shen, Z., Zhang, S., Li, L., Shinoda, S. and Shi, L., 2009. Pulsed-field gel electrophoresis typing of multidrug-resistant *Vibrio parahaemolyticus* isolated from various sources of seafood. Journal of Health Science, 55(5), 783-789.
- Liu, M. and Chen, S., 2015. A novel adhesive factor contributing to the virulence of *Vibrio parahaemolyticus*. Scientific Reports, 5, 14449.
- Liu, Y., Lai, Q. and Shao, Z., 2017. A multilocus sequence analysis scheme for phylogeny of Thioclava bacteria and proposal of two novel species. Frontiers in Microbiology, 8, 1321.
- Liu, Y., Li, M., Fan, S., Lin, Y., Lin, B., Luo, F., Zhang, C., Chen, S., Li, Y. and Xu, A., 2010. A unique feature of Toll/IL-1 receptor domain-containing adaptor protein is partially responsible for lipopolysaccharide insensitivity in zebrafish with a highly conserved function of MyD88. The Journal of Immunology, 185(6), 3391-3400.
- Liu, Z., 2003. A review of catfish genomics: progress and perspectives. International Journal of Genomics, 4(2), 259-265.

- Lo, C.L.H., Leung, P.H.M., Yip, S.P., To, T.S.S., Ng, T.K. and Kam, K.M., 2008. Rapid detection of pathogenic *Vibrio parahaemolyticus* by a sensitive and specific duplex PCR-hybridization probes assay using Light Cycler. Journal of Applied Microbiology, 105(2), 575-584.
- Lobanov, M.Y., Bogatyreva, N.S. and Galzitskaya, O.V., 2008. Radius of gyration as an indicator of protein structure compactness. Molecular Biology, 42, 623-628.
- Lomolino, M.V., Riddle, B.R. and Brown, J.H., 2006. Biogeography. Sunderland, Massachusetts: Sinauer Associates, Inc.
- Lopatek, M., Wieczorek, K. and Osek, J., 2015. Prevalence and antimicrobial resistance of *Vibrio parahaemolyticus* isolated from raw shellfish in Poland. Journal of Food Protection, 78(5), 1029-1033.
- Löwer, M., Weydig, C., Metzler, D., Reuter, A., Starzinski-Powitz, A., Wessler, S. and Schneider, G., 2008. Prediction of extracellular proteases of the human pathogen *Helicobacter pylori* reveals proteolytic activity of the Hp1018/19 protein HtrA. PLoS One, 3(10), e3510.
- Lozano-Leon, A., Torres, J., Osorio, C.R. and Martinez-Urtaza, J., 2003. Identification of *tdh*-positive *Vibrio parahaemolyticus* from an outbreak associated with raw oyster consumption in Spain. FEMS Microbiology Letters, 226(2), 281-284.
- Lu, S., Liu, B., Cao, J., Zhou, B. and Levin, R.E., 2006. Incidence and enumeration of *Vibrio parahaemolyticus* in shellfish from two retail sources and the genetic diversity of isolates as determined by RAPD-PCR analysis. Food Biotechnology, 20(2), 193-209.
- Luan, X., Chen, J., Zhang, X.H., Li, Y. and Hu, G., 2007. Expression and characterization of a metalloprotease from a *Vibrio parahaemolyticus* isolate. Canadian Journal of Microbiology, 53(10), 1168-1173.
- Luna, L.G., 1968. Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology; third ed. McGraw-Hill, New York, pp. 111-112.
- Lv, Y., Xiang, X., Jiang, Y., Tang, L., Zhou, Y., Zhong, H., Xiao, J. and Yan, J., 2017. Identification and Characterization of Lipopolysaccharide Induced TNF α Factor

- from Blunt Snout Bream, *Megalobrama amblycephala*. International Journal of Molecular Sciences, 18(2), 233.
- Ma, L., Zhang, Y., Yan, X., Guo, L., Wang, L., Qiu, J., Yang, R. and Zhou, D., 2012. Expression of the type VI secretion system 1 component Hcp1 is indirectly repressed by OpaR in *Vibrio parahaemolyticus*. The Scientific World Journal, 2012, 982140
- MacFaddin J. F., 1985, Media for Isolation-Cultivation-Identification-Maintenance of Medical Bacteria, Vol. 1, Williams & Wilkins, Baltimore, Md. Cruickshank, R. 1968. Medical Microbiology. 11th ed. Livingstone LTD, London, UK
- Magnadóttir, B., 2006. Innate immunity of fish (overview). Fish and Shellfish Immunology, 20(2), 137-151.
- Mahdavi, A., Szychowski, J., Ngo, J.T., Sweredoski, M.J., Graham, R.L., Hess, S., Schneewind, O., Mazmanian, S.K. and Tirrell, D.A., 2014. Identification of secreted bacterial proteins by noncanonical amino acid tagging. Proceedings of the National Academy of Sciences, 111(1), 433-438.
- Mahmud, Z.H., Kassu, A., Mohammad, A., Yamato, M., Bhuiyan, N.A., Nair, G.B. and Ota, F., 2006. Isolation and molecular characterization of toxigenic *Vibrio parahaemolyticus* from the Kii Channel, Japan. Microbiological Research, 161(1), 25-37.
- Mahoney J.C., Gerding M.J., Jones S.H. and Whistler C.A., 2010. Comparison of the pathogenic potentials of environmental and clinical *Vibrio parahaemolyticus* strains indicates a role for temperature regulation in virulence. Applied and Environmental Microbiology, 76, 7459–7465.
- Maiden, M.C., Bygraves, J.A., Feil, E., Morelli, G., Russell, J.E., Urwin, R., Zhang, Q., Zhou, J., Zurth, K., Caugant, D.A. and Feavers, I.M., 1998. Multilocus sequence typing: a portable approach to the identification of clones within populations of pathogenic microorganisms. Proceedings of the National Academy of Sciences, 95(6), 3140-3145.

- Makino, K., Oshima, K., Kurokawa, K., Yokoyama, K., Uda, T., Tagomori, K., Iijima, Y., Najima, M., Nakano, M., Yamashita, A., Kubota, Y., Kimura, S., Yasunaga, T., Honda, T., Shinagawa, H., Hattori, M., and Iida, T. 2003. Genome sequence of *Vibrio parahaemolyticus*: a pathogenic mechanism distinct from that of *V. cholerae*. *Lancet*, 361, 743-749
- Markus, W. and Sippl, M.J., 2007. ProSA-web: interactive web service for the recognition of errors in three-dimensional structures of proteins. *Nucleic Acids Research*, 35, W407-410.
- Marshall, S., Clark, C.G., Wang, G., Mulvey, M., Kelly, M.T. and Johnson, W.M., 1999. Comparison of Molecular Methods for Typing *Vibrio parahaemolyticus*. *Journal of Clinical Microbiology*, 37(8), 2473-2478.
- Martinez-Urtaza, J., Bowers, J.C., Trinanes, J. and DePaola, A., 2010. Climate anomalies and the increasing risk of *Vibrio parahaemolyticus* and *Vibrio vulnificus* illnesses. *Food Research International*, 43(7), 1780-1790.
- Martinez-Urtaza, J., Huapaya, B., Gavilan, R.G., Blanco-Abad, V., Ansede-Bermejo, J., Cadarso-Suarez, C., Figueiras, A. and Trinanes, J., 2008. Emergence of asiatic Vibrio diseases in South America in phase with El Niño. *Epidemiology*, 19(6), 829-837.
- Martinez-Urtaza, J., Lozano-Leon, A., DePaola, A., Ishibashi, M., Shimada, K., Nishibuchi, M. and Liebana, E., 2004. Characterization of pathogenic *Vibrio parahaemolyticus* isolates from clinical sources in Spain and comparison with Asian and North American pandemic isolates. *Journal of Clinical Microbiology*, 42(10), 4672-4678.
- Martinez-Urtaza, J., Simental, L., Velasco, D., DePaola, A., Ishibashi, M., Nakaguchi, Y., Nishibuchi, M., Carrera-Flores, D., Rey-Alvarez, C. and Pousa, A., 2005. Pandemic *Vibrio parahaemolyticus* O3: K6, Europe. *Emerging Infectious Diseases*, 11(8), 1319.
- Matlawska-Wasowska, K., Finn, R., Mustel, A., O'Byrne, C.P., Baird, A.W., Coffey, E.T. and Boyd, A., 2010. The *Vibrio parahaemolyticus* Type III Secretion

- Systems manipulate host cell MAPK for critical steps in pathogenesis.BMC Microbiology, 10(1), 329.
- McCarthy, S.A., DePaola, A., Cook, D.W., Kaysner, C.A. and Hill, W.E., 1999. Evaluation of alkaline phosphatase-and digoxigenin-labelled probes for detection of the thermolabile hemolysin (*tlh*) gene of *Vibrio parahaemolyticus*. Letters in Applied Microbiology, 28(1), 66-70.
- McLaughlin, J.B., DePaola, A., Bopp, C.A., Martinek, K.A., Napolilli, N.P., Allison, C.G., Murray, S.L., Thompson, E.C., Bird, M.M. and Middaugh, J.P., 2005. Outbreak of *Vibrio parahaemolyticus* gastroenteritis associated with Alaskan oysters. New England Journal of Medicine, 353(14), 1463-1470.
- Michel, G.P. and Voulhoux, R., 2009. The type II secretory system (T2SS) in Gram-negative bacteria: a molecular nanomachine for secretion of Sec and Tat-dependent extracellular proteins. Bacterial Secreted Proteins: Secretory Mechanisms and Role in Pathogenesis, 67-92.
- Ming, X., Yamamoto, K. and Honda, T., 1994. Construction and characterization of an isogenic mutant of *Vibrio parahaemolyticus* having a deletion in the thermostable direct hemolysin-related hemolysin gene (*trh*). Journal of Bacteriology, 176, 4757-4760.
- Mione, M.C. and Trede, N.S., 2010. The zebrafish as a model for cancer. Disease Models and Mechanisms, 3(9-10), 517-523.
- Mishra, S.S., Brahmane, M.P., Maurye, P., Mali, P., Dutta, C. and Das, M.K., 2006. Detection of WSSV and *Vibrio parahaemolyticus* In *Penaeus monodon* (Fabricius) Using DNA Dot-Blot Hybridization Technique. Journal of Inland Fisheries Society of India, 38(1), 15-22.
- Miyoshi, S.I., 2013. Extracellular proteolytic enzymes produced by human pathogenic *Vibrio* species. Frontiers in Microbiology, 4, 339.
- Miyoshi, S.I., Nitanda, Y., Fujii, K., Kawahara, K., Li, T., Maehara, Y., Ramamurthy, T., Takeda, Y. and Shinoda, S., 2008. Differential gene expression and

- extracellular secretion of the collagenolytic enzymes by the pathogen *Vibrio parahaemolyticus*. FEMS Microbiology Letters, 283(2), 176-181.
- Miyoshi, S.I., Wang, J., Katoh, K., Senoh, M., Mizuno, T. and Maehara, Y., 2012. An extracellular serine protease produced by *Vibrio vulnificus* NCIMB 2137, a metalloprotease-gene negative strain isolated from a diseased eel. World Journal of Microbiology and Biotechnology, 28(4), 1633-1639.
- Mohan, R. and Venugopal, S., 2013. In silico Molecular Interaction Studies of Gamma-hemolysin of *Staphylococcus aureus* vvith Flavonoid Compounds. Trends in Bioinformatics, 6(3), 91-100.
- Molenda, J.R., Johnson, W.G., Fishbein, M., Wentz, B., Mehlman, I.J. and Dadisman, T.A., 1972. *Vibrio parahaemolyticus* gastroenteritis in Maryland: laboratory aspects. Applied and Environmental Microbiology, 24(3), 444-448.
- Mota, L.J., Sorg, I. and Cornelis, G.R., 2005. Type III secretion: the bacteria-eukaryotic cell express. FEMS Microbiology Letters, 252(1), 1-10.
- Mueller-Ortiz, S.L., Morales, J.E. and Wetsel, R.A., 2014. The Receptor for the Complement C3a Anaphylatoxin (C3aR) Provides Host Protection against *Listeria monocytogenes*-induced apoptosis. The Journal of Immunology, 193(3), 1278-1289.
- Naim, R., Yanagihara, I., Iida, T. and Honda, T., 2001. *Vibrio parahaemolyticus* thermostable direct hemolysin can induce an apoptotic cell death in Rat-1 cells from inside and ouside of the cells. FEMS Microbiology Letters, 195(2), 237-244.
- Nair, G.B., Ramamurthy, T., Bhattacharya, S.K., Dutta, B., Takeda, Y. and Sack, D.A., 2007. Global dissemination of *Vibrio parahaemolyticus* serotype O3: K6 and its serovariants. Clinical Microbiology Reviews, 20(1), 39-48.
- Nauseef W., 2014. Myeloperoxidase in human neutrophil host defense. Cellular Microbiology. 16, 1146-1155.
- Nei, M. and Kumar, S., 2000. Molecular Evolution and Phylogenetics. Oxford University

- Neyt, C. and Cornelis, G.R., 1999. Insertion of a Yop translocation pore into the macrophage plasma membrane by *Yersinia enterocolitica*: requirement for translocators YopB and YopD, but not LcrG. *Molecular microbiology*, 33(5), 971-981.
- Nguyen, G.T., Green, E.R. and Mecsas, J., 2017. Neutrophils to the ROScue: mechanisms of NADPH oxidase activation and bacterial resistance. *Frontiers in Cellular and Infection Microbiology*, 7, 373.
- Nilsson, W.B. and Turner, J.W., 2016. The thermostable direct hemolysin-related hemolysin (*trh*) gene of *Vibrio parahaemolyticus*: sequence variation and implications for detection and function. *Journal of Microbiological Methods*, 126, 1-7.
- Nishibuchi, M., Kumagai, K. and Kaper, J.B., 1991. Contribution of the *tdh 1* gene of Kanagawa phenomenon-positive *Vibrio parahaemolyticus* to production of extracellular thermostable direct hemolysin. *Microbial Pathogenesis*, 11(6), 453-460.
- Nishibuchi, M., Taniguchi, T., Misawa, T., Khaeomanee-Iam, V., Honda, T. and Miwatani, T., 1989. Cloning and nucleotide sequence of the gene (*trh*) encoding the hemolysin related to the thermostable direct hemolysin of *Vibrio parahaemolyticus*. *Infection and Immunity*, 57(9), 2691-2697.
- Nishiyama, A., Nariya, H. and Kamio, Y., 1998. Phosphorylation of LukS by protein kinase A is crucial for the LukS-specific function of the staphylococcal leukocidin on human polymorphonuclear leukocytes. *Bioscience, Biotechnology, and Biochemistry*, 62(9), 1834-1838.
- Nolan, C.M., Ballard, J., Kaysner, C.A., Lilja, J.L., Williams, L.PJr. and Tenover, F.C., 1984. *Vibrio parahaemolyticus* gastroenteritis an outbreak associated with raw oysters in the Pacific Northwest. *Diagnostic Microbiology and Infectious Disease*, 2, 119-128.

- Nordahl, E.A., Rydengård, V., Nyberg, P., Nitsche, D.P., Mörgelin, M., Malmsten, M., Björck, L. and Schmidtchen, A., 2004. Activation of the complement system generates antibacterial peptides. *Proceedings of the National Academy of Sciences of the United States of America*, 101(48), 16879-16884.
- Noriea III, N.F., Johnson, C.N., Griffitt, K.J. and Grimes, D.J., 2010. Distribution of type III secretion systems in *Vibrio parahaemolyticus* from the northern Gulf of Mexico. *Journal of Applied Microbiology*, 109(3), 953-962.
- O'Farrell PH (1975) High-resolution two-dimensional electrophoresis of proteins. *Journal of Biological Chemistry*, 250: 4007-4027
- O'Boyle, N., Houeix, B., Kilcoyne, M., Joshi, L. and Boyd, A., 2013. The MSHA pilus of *Vibrio parahaemolyticus* has lectin functionality and enables TTSS-mediated pathogenicity. *International Journal of Medical Microbiology*, 303(8), 563-573.
- Odeyemi, O.A. and Stratev, D., 2016. Occurrence of antimicrobial resistant or pathogenic *Vibrio parahaemolyticus* in seafood. A mini review. *Revue de Médecine Vétérinaire*, 67(3-4), 93-98.
- Ohnishi, K., Nakahira, K., Unzai, S., Mayanagi, K., Hashimoto, H., Shiraki, K., Honda, T. and Yanagihara, I., 2011. Relationship between heat-induced fibrillogenicity and hemolytic activity of thermostable direct hemolysin and a related hemolysin of *Vibrio parahaemolyticus*. *FEMS Microbiology Letters*, 318(1), 10-17.
- Okuda, J. and Nishibuchi, M., 1998. Manifestation of the Kanagawa phenomenon, the virulence-associated phenotype, of *Vibrio parahaemolyticus* depends on a particular single base change in the promoter of the thermostable direct haemolysin gene. *Molecular Microbiology*, 30(3), 499-511.
- Okuda, J., Ishibashi, M.A.S.A.N.O.R.I., Hayakawa, E., Nishino, T., Takeda, Y., Mukhopadhyay, A.K., Garg, S., Bhattacharya, S.K., Nair, G.B. and Nishibuchi, M., 1997. Emergence of a unique O3: K6 clone of *Vibrio parahaemolyticus* in Calcutta, India, and isolation of strains from the same clonal group from Southeast Asian travelers arriving in Japan. *Journal of Clinical Microbiology*, 35(12), 3150-3155.

- Oliveira, S.C. and Splitter, G.A., 1996. Immunization of mice with recombinant L7L12 ribosomal protein confers protection against *Brucella abortus* infection. *Vaccine*, 14(10), 959-962.
- Ono, T., Park, K.S., Ueta, M., Iida, T. and Honda, T., 2006. Identification of proteins secreted via *Vibrio parahaemolyticus* type III secretion system 1. *Infection and Immunity*, 74(2), 1032-1042.
- Osaki, T., Okuda, M., Ueda, J., Konno, M., Yonezawa, H., Hojo, F., Yagyu, K., Lin, Y., Fukuda, Y., Kikuchi, S. and Kamiya, S., 2013. Multilocus sequence typing of DNA from faecal specimens for the analysis of intra-familial transmission of *Helicobacter pylori*. *Journal of Medical Microbiology*, 62(5), 761-765.
- Osei-Adjei, G., Huang, X. and Zhang, Y., 2018. The extracellular proteases produced by *Vibrio parahaemolyticus*. *World Journal of Microbiology and Biotechnology*, 34(5), 68.
- Ottaviani, D., Masini, L. and Bacchiocchi, S., 2003. A biochemical protocol for the isolation and identification of current species of *Vibrio* in seafood. *Journal of Applied Microbiology*, 95(6), 1277-1284.
- Pal M. 2014. Impact of emerging foodborne pathogens on public health. Ph.D. Lecture Notes, Addis Ababa University, College of Veterinary Medicine. Debre Zeit, 3(3), 1-21.
- Pal M., 2014. Impact of emerging foodborne pathogens on public health. Ph.D. Lecture Notes, Addis Ababa University, College of Veterinary Medicine. Debre Zeit, 3(3), 1-21.
- Pan, T.M., Wang, T.K., Lee, C.L., Chien, S.W. and Horng, C.B., 1997. Food-borne disease outbreaks due to bacteria in Taiwan, 1986 to 1995. *Journal of Clinical Microbiology*, 35(5), 1260-1262.
- Pan, T.M., Wang, T.K., Lee, C.L., Chien, S.W. and Horng, C.B., 1997. Food-borne disease outbreaks due to bacteria in Taiwan, 1986 to 1995. *Journal of Clinical Microbiology*, 35(5), 1260-1262.

- Paranjpye, R.N., Myers, M.S., Yount, E.C. and Thompson, J.L., 2013. Zebrafish as a model for *Vibrio parahaemolyticus* virulence. *Microbiology*, 159(12), 2605-2615.
- Park, K.S., Ono, T., Rokuda, M., Jang, M.H., Okada, K., Iida, T. and Honda, T., 2004. Functional characterization of two type III secretion systems of *Vibrio parahaemolyticus*. *Infection and Immunity*, 72(11), 6659-6665.
- Parsons, M.B., Cooper, K.L.F., Kubota, K.A., Puhr, N., Simington, S., Calimlim, P.S., Schoonmaker-Bopp, D., Bopp, C., Swaminathan, B., Gerner-Smidt, P. and Ribot, E.M., 2007. PulseNet USA standardized pulsed-field gel electrophoresis protocol for subtyping of *Vibrio parahaemolyticus*. *Foodborne Pathogens and Disease*, 4(3), 285-292.
- Parvathi, A., Kumar, H.S., Bhanumathi, A., Ishibashi, M., Nishibuchi, M., Karunasagar, I. and Karunasagar, I., 2006. Molecular characterization of thermostable direct haemolysin-related haemolysin (TRH)-positive *Vibrio parahaemolyticus* from oysters in Mangalore, India. *Environmental Microbiology*, 8(6), 997-1004.
- Parveen, S., DaSilva, L., DePaola, A., Bowers, J., White, C., Munasinghe, K.A., Brohawn, K., Mudoh, M. and Tamplin, M., 2013. Development and validation of a predictive model for the growth of *Vibrio parahaemolyticus* in post-harvest shellstock oysters. *International Journal of Food Microbiology*, 161(1), 1-6.
- Patel, J.B., 2001. 16S rRNA gene sequencing for bacterial pathogen identification in the clinical laboratory. *Molecular Diagnosis*, 6(4), 313-321.
- Pazhani, G.P., Bhowmik, S.K., Ghosh, S., Guin, S., Dutta, S., Rajendran, K., Saha, D.R., Nandy, R.K., Bhattacharya, M.K., Mukhopadhyay, A.K. and Ramamurthy, T., 2014. Trends in the epidemiology of pandemic and non-pandemic strains of *Vibrio parahaemolyticus* isolated from diarrheal patients in Kolkata, India. *PLoS Neglected Tropical Diseases*, 8(5), e2815.
- Peng, W., Shi, Y., Li, G.F., He, L.G., Liang, Y.S., Zhang, Y., Zhou, L.B., Lin, H.R. and Lu, D.Q., 2016. *Tetraodon nigroviridis*: A model of *Vibrio parahaemolyticus* infection. *Fish and Shellfish Immunology*, 56, 388-396.

- Peterson J.W., 1996. Bacterial Pathogenesis. In: Baron S, editor. Medical Microbiology. 4th edition. Galveston (TX): University of Texas Medical Branch at Galveston; Chapter 7. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK8526/>
- Pletzer, D., Mansour, S.C., Wuerth, K., Rahanjam, N. and Hancock, R.E., 2017. New mouse model for chronic infections by Gram-negative bacteria enabling the study of anti-infective efficacy and host-microbe interactions. *MBio*, 8(1), e00140-17.
- Praveen, K., Evans, D.L. and Jaso-Friedmann, L., 2006. Constitutive expression of tumor necrosis factor-alpha in cytotoxic cells of teleosts and its role in regulation of cell-mediated cytotoxicity. *Molecular Immunology*, 43(3), 279-291.
- Press, New York.
- Pushpa, K., Gireesh-Babu, P., Rajendran, K.V., Purushothaman, C.S., Dasgupta, S. and Makesh, M., 2014. Molecular cloning, sequencing and tissue-level expression of complement C3 of *Labeo rohita* (Hamilton, 1822). *Fish and Shellfish Immunology*, 40(1), 319-330.
- Quade, M.J. and Roth, J.A., 1997 A rapid, direct assay to measure degranulation of bovine neutrophil primary granules. *Veterinary Immunology and Immunopathology*, 58, 239e48.
- Raghunath, P., 2015. Roles of thermo stable direct hemolysin (TDH) and TDH related hemolysin (TRH) in *Vibrio parahaemolyticus*. *Frontiers in Microbiology*, 5, 805.
- Raghunath, P., Acharya, S., Bhanumathi, A., Karunasagar, I. and Karunasagar, I., 2008. Detection and molecular characterization of *Vibrio parahaemolyticus* isolated from seafood harvested along the southwest coast of India. *Food Microbiology*, 25(6), 824-830.
- Raghunath, P., Karunasagar, I. and Karunasagar, I., 2009. Improved isolation and detection of pathogenic *Vibrio parahaemolyticus* from seafood using a new enrichment broth. *International Journal of Food Microbiology*, 129(2), 200-203.
- Rahman, M.S., Carraro, R., Cardazzo, B., Carraro, L., Meneguolo, D.B., Martino, M.E., Andreani, N.A., Bordin, P., Mioni, R., Barco, L. and Novelli, E., 2017. Molecular

- typing of *Vibrio parahaemolyticus* strains isolated from mollusks in the North Adriatic Sea. *Foodborne Pathogens and Disease*, 14(8), 454-464.
- Raimondi, F., Kao, J.P., Fiorentini, C., Fabbri, A., Donelli, G., Gasparini, N., Rubino, A. and Fasano, A., 2000. Enterotoxicity and cytotoxicity of *Vibrio parahaemolyticus* thermostable direct hemolysin in vitro systems. *Infection and Immunity*, 68(6), 3180-3185.
- Rajkumar, H.R.V., Devaki, R. and Kandi, V., 2016. Comparison of hemagglutination and hemolytic activity of various bacterial clinical isolates against different human blood groups. *Cureus*, 8(2).
- Ramos-Onsins, S.E. and Rozas, J., 2002. Statistical properties of new neutrality tests against population growth. *Molecular Biology and Evolution*, 19(12), 2092-2100.
- Rani, N., Saravanan, V., Lakshmi, P.T.V. and Annamalai, A., 2014. Inhibition of pore formation by blocking the assembly of *Staphylococcus aureus* α -Hemolysin through a novel peptide inhibitor: an in Silico approach. *International Journal of Peptide Research and Therapeutics*, 20(4), 575-583.
- Rathore, G., Swaminathan, T.R., Sood, N., Mishra, B.N. and Kapoor, D., 2006. Affinity purification and partial characterization of serum immunoglobulin of *Clarias gariepinus*. *Indian Journal of Experimental Biology*, 44, 1018-1021.
- Rauta, P.R., Nayak, B. and Das, S., 2012. Immune system and immune responses in fish and their role in comparative immunity study: a model for higher organisms. *Immunology Letters*, 148(1), 23-33.
- Ray, A., Kinch, L.N., de Souza Santos, M., Grishin, N.V., Orth, K. and Salomon, D., 2016. Proteomics analysis reveals previously uncharacterized virulence factors in *Vibrio proteolyticus*. *MBio*, 7(4), e01077-16.
- Ray, A., Schwartz, N., de Souza Santos, M., Zhang, J., Orth, K. and Salomon, D., 2017. Type VI secretion system MIX-effectors carry both antibacterial and antieukaryotic activities. *EMBO Reports*, 18(11), 1978-1990.
- Reed, L.J. and Muench, H., 1938. A simple method of estimating fifty percent endpoints. *American Journal of Hygiene*, 27, 493-497.

- Ribeiro, L.A., Azevedo, V., Le Loir, Y., Oliveira, S.C., Dieye, Y., Piard, J.C., Gruss, A. and Langella, P., 2002. Production and targeting of the *Brucella abortus* antigen L7/L12 in *Lactococcus lactis*: a first step towards food-grade live vaccines against brucellosis. *Applied and Environmental Microbiology* 68(2), 910-916.
- Rocha, E.P., Cornet, E. and Michel, B., 2005. Comparative and evolutionary analysis of the bacterial homologous recombination systems. *PLoS Genetics*, 1(2), e15.
- Roy, D., Liston, D.R., Idone, V.J., Di, A., Nelson, D.J., Pujol, C., Bliska, J.B., Chakrabarti, S. and Andrews, N.W., 2004. A process for controlling intracellular bacterial infections induced by membrane injury. *Science*, 304(5676), 1515-1518.
- Rozas, J., Sánchez-DelBarrio, J.C., Messeguer, X. and Rozas, R., 2003. DnaSP, DNA polymorphism analyses by the coalescent and other methods. *Bioinformatics*, 19(18), 2496-2497.
- Saeij, J.P., De Vries, B.J. and Wiegertjes, G.F., 2003. The immune response of carp to *Trypanoplasma borreli*: kinetics of immune gene expression and polyclonal lymphocyte activation. *Developmental and Comparative Immunology*, 27(10), 859-874.
- Sahilah, A.M., Laila, R.A.S., Sallehuddin, H.M., Osman, H., Aminah, A. and Azuhairi, A.A., 2014. Antibiotic resistance and molecular typing among cockle (*Anadaragranosa*) strains of *Vibrio parahaemolyticus* by polymerase chain reaction (PCR)-based analysis. *World Journal of Microbiology and Biotechnology*, 30(2), 649-659.
- Saitou, N. and Nei, M., 1987. The neighbor-joining method: a new method for reconstructing phylogenetic trees. *Molecular Biology and Evolution*, 4(4), 406-425.
- Salamone, M., Nicosia, A., Bennici, C., Quatrini, P., Catania, V., Mazzola, S., Ghersi, G. and Cuttitta, A., 2015. Comprehensive analysis of a *Vibrio parahaemolyticus* strain extracellular serine protease VpSP37. *PLoS One*, 10(7), p.e0126349.

- Salcedo, C., Arreaza, L., Alcala, B., De La Fuente, L. and Vazquez, J.A., 2003. Development of a multilocus sequence typing method for analysis of *Listeria monocytogenes* clones. *Journal of Clinical Microbiology*, 41(2), 757-762.
- Sali, A. and Blundell, T.L., 1993. Comparative protein modelling by satisfaction of spatial restraints. *Journal of Molecular Biology*, 234, 779-815.
- Salomon, D., Gonzalez, H., Updegraff, B.L. and Orth, K., 2013. *Vibrio parahaemolyticus* type VI secretion system 1 is activated in marine conditions to target bacteria, and is differentially regulated from system 2. *PloS One*, 8(4), e61086.
- Salomon, D., Kinch, L.N., Trudgian, D.C., Guo, X., Klimko, J.A., Grishin, N.V., Mirzaei, H. and Orth, K., 2014b. Marker for type VI secretion system effectors. *Proceedings of the National Academy of Sciences*, 111(25), 9271-9276.
- Salomon, D., Klimko, J.A. and Orth, K., 2014a. H-NS regulates the *Vibrio parahaemolyticus* type VI secretion system 1. *Microbiology*, 160(Pt 9), 1867.
- Sambrook, J. and Russel, D.W., 2001. Molecular cloning: A Laboratory Manual, 3rd edn. CSH Laboratory Press, Cold Spring Harbor, pp. 62.
- Saurabh, S. and Sahoo, P.K., 2008. Lysozyme: an important defence molecule of fish innate immune system. *Aquaculture Research*, 39(3), 223-239.
- Secombes, C.J., Wang, T. and Bird, S., 2011. The interleukins of fish. *Developmental and Comparative Immunology*, 35(12), 1336-1345.
- Sepulcre, M. P., G. Lo'pez-Castejo'n, J. Meseguer, and V. Mulero. 2007. The activation of gilthead seabream professional phagocytes by different PAMPs underlines the behavioural diversity of the main innate immune cells of bony fish. *Molecular Immunology*, 44, 2009-2016.
- Serichantalegs, O., Bhuiyan, N.A., Nair, G.B., Chivaratanond, O., Srijan, A., Bodhidatta, L., Anuras, S. and Mason, C.J., 2007. The dominance of pandemic serovars of *Vibrio parahaemolyticus* in expatriates and sporadic cases of diarrhoea in Thailand, and a new emergent serovar (O3: K46) with pandemic traits. *Journal of Medical Microbiology*, 56(5), 608-613.

- Shamsuddin, S., Shagufta, J.K. and Gayasuddin, M., 2011. Comparative study of serum proteins of man and four teleosts using polyacrylamide gel electrophoresis. *Advances in Biological Research*, 5(3), 170-173.
- Shimohata, T. and Takahashi, A., 2010. Diarrhea induced by infection of *Vibrio parahaemolyticus*. *The Journal of Medical Investigation*. 57, 179–182.
- Shimohata, T., Nakano, M., Lian, X., Shigeyama, T., Iba, H., Hamamoto, A., Yoshida, M., Harada, N., Yamamoto, H., Yamato, M. and Mawatari, K., 2010. *Vibrio parahaemolyticus* infection induces modulation of IL-8 secretion through dual pathway via VP1680 in Caco-2 cells. *Journal of Infectious Diseases*, 203(4), 537-544.
- Shinoda, S., Matsuoka, H., Tsuchie, T., Miyoshi, S. I., Yamamoto, S., Taniguchi, H. and Mizuguchi, Y., 1991. Purification and characterization of a lecithin-dependent haemolysin from *Escherichia coli* transformed by a *Vibrio parahaemolyticus* gene. *Microbiology*. 137(12), 2705-2711.
- Shugar, D., 1952. The measurement of lysozyme activity and the ultra-violet inactivation of lysozyme. *Biochimica et biophysica acta*, 8(C), 302-309.
- Shyne Anand, P.S., Sobhana, K.S., George, K.C. and Paulraj, R., 2008. Phenotypic characteristics and antibiotic sensitivity of *Vibrio parahaemolyticus* strains isolated from diseased groupers (*Epinephelus* spp.). *Journal of the Marine Biological Association of India*, 50(1), 1-6.
- Sigh, J., Lindenstrom, T. and Buchmann, K., 2004. The parasitic ciliate *Ichthyophthirius multifiliis* induces expression of immune relevant genes in rainbow trout, *Oncorhynchus mykiss* (Walbaum). *Journal of Fish Diseases*, 27, 409e17.
- Silvester, R., Alexander, D., Santha, S. and Hatha, M., 2016. RAPD PCR discloses high genetic heterogeneity among *Vibrio parahaemolyticus* from various environments along the southwest coast of India. *Annals of Microbiology*, 66(2), 925-929.
- Slauch, J.M., 2011. How does the oxidative burst of macrophages kill bacteria? Still an open question. *Molecular Microbiology*, 80(3), 580-583.

- Sobrinho Pde, S., Destro, M.T., Franco, B.D. and Landgraf, M., 2010. Correlation between environmental factors and prevalence of *Vibrio parahaemolyticus* in oysters harvested in the southern coastal area of Sao Paulo State, Brazil. Applied Environmental Microbiology 76(4), 1290-1293.
- SobrinhoPde, S., Destro, M.T., Franco, B.D. and Landgraf, M., 2011. Occurrence and distribution of *Vibrio parahaemolyticus* in retail oysters in Sao Paulo State, Brazil. Food Microbiology, 28, 137-140.
- Sood, N., Rathore, G., Swaminathan, T.R., Abidi, R., Mishra, B.N. and Lakra, W.S., 2007. Isolation and characterization of serum immunoglobulins of *Cyprinus carpio*. Indian Journal of Animal Science, 77, 127-130.
- Srikhanta, Y.N., Hocking, D.M., Wakefield, M.J., Higginson, E., Robins-Browne, R.M., Yang, J. and Tauschek, M., 2013. Control of bacterial virulence by the RalR regulator of the rabbit-specific enteropathogenic *Escherichia coli* strain E22. Infection and Immunity, 81(11), 4232-4243.
- Su, H.P., Chiu, S.I., Tsai, J.L., Lee, C.L. and Pan, T.M., 2005. Bacterial food-borne illness outbreaks in northern Taiwan, 1995–2001. Journal of Infection and Chemotherapy, 11, 146-151.
- Su, Y.C. and Liu, C., 2007. *Vibrio parahaemolyticus*: a concern of seafood safety. Food Microbiology, 24(6), 549-558.
- Subhashini, N., Krishnaiah, N. and Kiranmay, C. B., 2011. Detection of *Vibrio parahaemolyticus* in shellfish by Cultura land Polymerase Chain Reaction. International Journal of Pharma and Bio sciences, 2(4), B335-B341.
- Suffredini, E., Lopez-Joven, C., Maddalena, L., Croci, L. and Roque, A., 2011. Pulsed-field gel electrophoresis and PCR characterization of environmental *Vibrio parahaemolyticus* strains of different origins. Applied and Environmental Microbiology, 77(17), 6301-6304.
- Surdova, K., Gamba, P., Claessen, D., Siersma, T., Jonker, M.J., Errington, J. and Hamoen, L.W., 2013. The conserved DNA-binding protein WhiA is involved in cell division in *Bacillus subtilis*. Journal of Bacteriology, 195(24), 5450-5460

- Suthienkul, O., Iida, T., Park, K.S., Ishibashi, M., Supavej, S., Yamamoto, K. and Honda, T., 1996. Restriction fragment length polymorphism of the *tdh* and *trh* genes in clinical *Vibrio parahaemolyticus* strains. Journal of clinical microbiology, 34(5), 1293-1295.
- Swarenengen, J.R., 2018. Choosing the right animal model for infectious disease research. Animal Models and Experimental Medicine, 1(2), 100-108.
- Tajima, F., 1989. Statistical method for testing the neutral mutation hypothesis by DNA polymorphism. Genetics, 123 (3), 585-595.
- Takahashi, A., Kenjyo, N., Imura, K., Myonsun, Y. and Honda, T., 2000. Cl⁻ secretion in colonic epithelial cells induced by the *Vibrio parahaemolyticus* hemolytic toxin related to thermostable direct hemolysin. Infection and Immunity, 68(9), 5435-5438.
- Takahashi, A., Kenjyo, N., Imura, K., Myonsun, Y. and Honda, T., 2000. Cl⁻ secretion in colonic epithelial cells induced by the *Vibrio parahaemolyticus* hemolytic toxin related to thermostable direct hemolysin. Infection and Immunity, 68(9), 5435-5438.
- Takeuchi, O., Hoshino, K. and Akira, S., 2000. Cutting edge: TLR2-deficient and MyD88 deficient mice are highly susceptible to *Staphylococcus aureus* infection. The Journal of Immunology, 165(10), 5392-5396.
- Tamura, K. and Nei, M., 1993. Estimation of the number of nucleotide substitutions in the control region of mitochondrial DNA in humans and chimpanzees. Molecular Biology and Evolution, 10(3), 512-526.
- Tey, Y.H., Jong, K.J., Fen, S.Y. and Wong, H.C., 2015. Genetic variation in *Vibrio parahaemolyticus* isolated from the aquacultural environments. Letters in Applied Microbiology. 60(4), 321-327.
- Thakur, A.B., Vaidya, R.B. and Suryawanshi, S.A., 2003. Pathogenicity and antibiotic susceptibility of Vibrio species isolated from moribund shrimps. Indian Journal of Marine Science, 32(1), 71-75

- Theethakaew, C., Feil, E.J., Castillo-Ramí, S., Aanensen, D.M., Suthienkul, O., Neil, D.M. and Davies, R.L., 2013. Genetic relationships of *Vibrio parahaemolyticus* isolates from clinical, human carrier, and environmental sources in Thailand, determined by multilocus sequence analysis. *Applied and Environmental Microbiology*, 79(7), 2358-2370.
- Thompson, J.D., Higgins, D.G, Gibson, T.J., 1994. CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. *Nucleic Acids Research*, 22 (22), 4673-4680.
- Toyofuku, H., 2014. *Vibrio parahaemolyticus* Risk Management in Japan. In Molluscan Shellfish Safety, Springer, Dordrecht, 129-136.
- Tran, H.B., Lee, Y.H., Guo, J.J. and Cheng, T.C., 2018. De novo transcriptome analysis of immune response on cobia (*Rachycentron canadum*) infected with *Photobacterium damselaе* subsp. *piscicida* revealed inhibition of complement components and involvement of MyD88-independent pathway. *Fish and Shellfish Immunology*, 77, 120-130.
- Tran, L., Nunan, L., Redman, R.M., Mohney, L.L., Pantoja, C.R., Fitzsimmons, K. and Lightner, D.V., 2013. Determination of the infectious nature of the agent of acute hepatopancreatic necrosis syndrome affecting penaeid shrimp. *Diseases of Aquatic Organisms*, 105(1), 45-55.
- Tran, L., Nunan, L., Redman, R.M., Mohney, L.L., Pantoja, C.R., Fitzsimmons, K. and Lightner, D.V., 2013. Determination of the infectious nature of the agent of acute hepatopancreatic necrosis syndrome affecting penaeid shrimp. *Diseases of Aquatic Organisms*, 105(1), 45-55.
- Tran, L., Nunan, L., Redman, R.M., Mohney, L.L., Pantoja, C.R., Fitzsimmons, K. and Lightner, D.V., 2013. Determination of the infectious nature of the agent of acute hepatopancreatic necrosis syndrome affecting penaeid shrimp. *Diseases of Aquatic Organisms*, 105(1), 45-55.

- hepatopancreatic necrosis syndrome affecting penaeid shrimp. Diseases of aquatic organisms, 105(1), 45-55.
- Troisfontaines, P. and Cornelis, G.R., 2005. Type III secretion: more systems than you think. *Physiology*, 20(5), 326-339.
- Tunio, S.A., Oldfield, N.J., Ala'Aldeen, D.A., Wooldridge, K.G. and Turner, D.P., 2010. The role of glyceraldehyde 3-phosphate dehydrogenase (GapA-1) in *Neisseria meningitidis* adherence to human cells. *BMC Microbiology*, 10(1), 280.
- Turner, J.W., Paranjpye, R.N., Landis, E.D., Biryukov, S.V., González-Escalona, N., Nilsson, W.B. and Strom, M.S., 2013. Population structure of clinical and environmental *Vibrio parahaemolyticus* from the Pacific Northwest coast of the United States. *PLoS One*, 8(2), e55726.
- Urmersbach, S., Alter, T., Koralage, M.S.G., Sperling, L., Gerdts, G., Messelhäuser, U. and Huehn, S., 2014. Population analysis of *Vibrio parahaemolyticus* originating from different geographical regions demonstrates a high genetic diversity. *BMC Microbiology*, 14(1), 59
- Urwin, R. and Maiden, M.C., 2003. Multi-locus sequence typing: a tool for global epidemiology. *Trends in Microbiology*, 11(10), 479-487.
- Uzoma,C.C., 2016. Microbial identification and classification-from phenotypic evaluations to molecular characterization. *EC Microbiology*, 5.1, 01-03.
- van der Vaart, M., van Soest, J.J., Spaink, H.P. and Meijer, A.H., 2013. Functional analysis of a zebrafish myd88 mutant identifies key transcriptional components of the innate immune system. *Disease Models and Mechanisms*, 6, 841e54.
- Velazquez-Roman, J., León-Sicairos, N., Hernandez-Diaz, L.D.J. and Canizalez-Roman, A., 2014. Pandemic *Vibrio parahaemolyticus* O3: K6 on the American continent. *Frontiers in Cellular and Infection Microbiology*, 3, 110.
- Virdi, J.S. and Sachdeva, P., 2005. Genetic diversity of pathogenic microorganisms: Basic insights, public health implications and the Indian initiatives. *Current Science*, 113-123.

- Vos, M. and Velicer, G.J., 2006. Genetic population structure of the soil bacterium *Myxococcus xanthus* at the centimeter scale. *Applied and Environmental Microbiology*, 72(5), 3615-3625.
- Vuddhakul, V., Chowdhury, A., Loahaprertthisan, V., Pungrasamee, P., Patararungpong, N., Thianmontri, P., Ishibashi, M., Matsumoto, C. and Nishibuchi, M., 2000. Isolation of a pandemic O3 :K6 clone of a *Vibrio parahaemolyticus* strain from environmental and clinical sources in Thailand. *Applied and Environmental Microbiology*, 66, 2685-2689.
- Wagatsuma, S., 1968. On the medium for hemolytic reaction. *Media Circle*, 13, 159-162.
- Walker, P.J. and Mohan, C.V., 2009. Viral disease emergence in shrimp aquaculture: origins, impact and the effectiveness of health management strategies. *Reviews in Aquaculture*, 1(2), 125-154.
- Wang, H., Tang, X., Su, Y.C., Chen, J. and Yan, J., 2017. Characterization of clinical *Vibrio parahaemolyticus* strains in Zhoushan, China, from 2013 to 2014. *PloS One*, 12(7), e0180335.
- Wang, L., Zhou, D., Mao, P., Zhang, Y., Hou, J., Hu, Y., Li, J., Hou, S., Yang, R., Wang, R. and Qiu, J., 2013. Cell density-and quorum sensing-dependent expression of type VI secretion system 2 in *Vibrio parahaemolyticus*. *PloS One*, 8(8), e73363.
- Wang, N., MacKenzie, L., De Souza, A.G., Zhong, H., Goss, G. and Li, L., 2007. Proteome Profile of Cytosolic Component of Zebrafish Liver Generated by LC-ESI MS/MS Combined with Trypsin Digestion and Microwave-Assisted Acid Hydrolysis. *Journal of Proteome Research*, 6(1), 263-272.
- Wang, R., Fang, S., Wu, D., Lian, J., Fan, J., Zhang, Y., Wang, S. and Lin, W., 2012. Screening for a single-chain variable-fragment antibody that can effectively neutralize the cytotoxicity of the *Vibrio parahaemolyticus* thermolabile hemolysin. *Applied and Environmental Microbiology*, 78(14), 4967-4975.

- Wang, R., Xiang, S., Feng, Y., Srinivas, S., Zhang, Y., Lin, M. and Wang, S., 2013. Engineering production of functional scFv antibody in *E. coli* by co-expressing the molecule chaperone Skp. *Frontiers in Cellular and Infection Microbiology*, 3, 72.
- Wang, T., Bird, S., Koussounadis, A., Holland, J.W., Carrington, A., Zou, J. and Secombes, C.J., 2009. Identification of a novel IL-1 cytokine family member in teleost fish. *The Journal of Immunology*, 183(2), 962-974.
- Wang, Y.K., Huang, S.C., Wu, Y.F., Chen, Y.C., Lin, Y.L., Nayak, M., Lin, Y.R., Chen, W.H., Chiu, Y.R., Li, T.T.H. and Yeh, B.S., 2011. Site-directed mutations of thermostable direct hemolysin from *Grimontia hollisae* alter its arrhenius effect and biophysical properties. *International Journal of Biological Sciences*, 7(3), 333.
- Wang, Y.W., Chern, L.L., Cam, P.D. and Chiou, C.S., 2008. Evaluation of restriction enzymes for standardizing pulsed-field gel electrophoresis protocol for rapid subtyping of *Vibrio parahaemolyticus*. *Diagnostic Microbiology and Infectious Disease*, 61(3), 251-255.
- Wei, X., Cao, S., Zhang, L., Wen, X., Wen, Y., Wu, R., Huang, X., Huang, Y. and Yan, Q., 2014. Comparative proteome analysis of the extracellular proteins of two *Haemophilus parasuis* strains Nagasaki and SW114. *Biochemical and Biophysical Research Communications*, 446(4), 997-1001.
- Weighardt, H. and Holzmann, B., 2008. Role of Toll-like receptor response for sepsis pathogenesis. *Immunobiology* 212(9-10), 715-722.
- Whitmore, S.E. and Lamont, R.J., 2012. Tyrosine phosphorylation and bacterial virulence. *International Journal of Oral Science*, 4(1), 1.
- Wirth, T., Falush, D., Lan, R., Colles, F., Mensa, P., Wieler, L.H., Karch, H., Reeves, P.R., Maiden, M.C., Ochman, H. and Achtman, M., 2006. Sex and virulence in *Escherichia coli*: an evolutionary perspective. *Molecular Microbiology*, 60(5), 1136-1151.

- Wong, H.C., Chen, C.H., Chung, Y.J., Liu, S.H., Wang, T.K., Lee, C.L., Chiou, C.S., Nishibuchi, M. and Lee, B.K., 2005. Characterization of new O3: K6 strains and phylogenetically related strains of *Vibrio parahaemolyticus* isolated in Taiwan and other countries. *Journal of Applied Microbiology*, 98(3), 572-580.
- Wong, H.C., Liu, C.C., Pan, T.M., Wang, T.K., Lee, C.L. and Shih, D.Y.C., 1999. Molecular typing of *Vibrio parahaemolyticus* isolates, obtained from patients involved in food poisoning outbreaks in Taiwan, by random amplified polymorphic DNA analysis. *Journal of Clinical Microbiology*, 37(6), 1809-1812.
- Wong, H.C., Liu, S.H., Chiou, C.S., Nishibuchi, M., Lee, B.K., Suthienkul, O., Nair, G.B., Kaysner, C.A. and Taniguchi, H., 2007. A pulsed-field gel electrophoresis typing scheme for *Vibrio parahaemolyticus* isolates from fifteen countries. *International Journal of Food Microbiology*, 114(3), 280-287.
- Wong, H.C., Liu, S.H., Wang, T.K., Lee, C.L., Chiou, C.S., Liu, D.P., Nishibuchi, M. and Lee, B.K., 2000. Characteristics of *Vibrio parahaemolyticus* O3: K6 from Asia. *Applied and Environmental Microbiology*, 66(9), 3981-3986.
- Wong, H.C., Lu, K.T., Pan, T.M., Lee, C.L. and Shih, D.Y., 1996. Subspecies typing of *Vibrio parahaemolyticus* by pulsed-field gel electrophoresis. *Journal of Clinical Microbiology*, 34(6), 1535-1539.
- Wootipoom, N., Bhoopong, P., Pomwised, R., Nishibuchi, M., Ishibashi, M. and Vuddhakul, V., 2007. A decrease in the proportion of infections by pandemic *Vibrio parahaemolyticus* in Hat Yai Hospital, southern Thailand. *Journal of Medical Microbiology*, 56(12), 1630-1638.
- Wu, Z., Zhang, W. and Lu, C., 2008. Comparative proteome analysis of secreted proteins of *Streptococcus suis* serotype 9 isolates from diseased and healthy pigs. *Microbial Pathogenesis*, 45(3), 159-166.
- Xiao, J.; Zhou, Z.C.; Chen, C.; Huo, W.L.; Yin, Z.X.; Weng, S.P.; Chan, S.M.; Yu, X.Q. and He, J.G., 2007. Tumor necrosis factor-alpha gene from mandarin fish,

- Siniperca chuatsi*: Molecular cloning, cytotoxicity analysis and expression profile. Molecular Immunology, 44, 3615-3622.
- Xie, Z.Y., Hu, C.Q., Chen, C., Zhang, L.P. and Ren, C.H., 2005. Investigation of seven *Vibrio* virulence genes among *Vibrio alginolyticus* and *Vibrio parahaemolyticus* strains from the coastal mariculture systems in Guangdong, China. Letters in Applied Microbiology, 41(2), 202-207.
- Xu, M., Yamamoto, K., and Honda, T., 1994. Construction and characterization of an isogenic mutant of *Vibrio parahaemolyticus* having a deletion in the thermostable direct hemolysin-related hemolysin gene (*trh*). Journal of Bacteriology, 176(15), 4757-4760.
- Yan, Y., Cui, Y., Han, H., Xiao, X., Wong, H.C., Tan, Y., Guo, Z., Liu, X., Yang, R. and Zhou, D., 2011. Extended MLST-based population genetics and phylogeny of *Vibrio parahaemolyticus* with high levels of recombination. International Journal of Food Microbiology, 145(1), 106-112.
- Yanagihara, I., Nakahira, K., Yamane, T., Kaijeda, S., Mayanagi, K., Hamada, D., Fukui, T., Ohnishi, K., Kajiyama, S.I., Shimizu, T. and Sato, M., 2010. Structure and functional characterization of *Vibrio parahaemolyticus* thermostable direct hemolysin. Journal of Biological Chemistry, 285(21), 16267-16274.
- Yang, J., Hart, E., Tauschek, M., Price, G.D., Hartland, E.L., Strugnell, R.A. and Robins-Browne, R.M., 2008. Bicarbonate-mediated transcriptional activation of divergent operons by the virulence regulatory protein, RegA, from *Citrobacter rodentium*. Molecular Microbiology, 68(2), 314-327.
- Yang, Z.Q., Jiao, X.A., Zhou, X.H., Cao, G.X., Fang, W.M. and Gu, R.X., 2008. Isolation and molecular characterization of *Vibrio parahaemolyticus* from fresh, low-temperature preserved, dried, and salted seafood products in two coastal areas of eastern China. International Journal of Food Microbiology, 125(3), 279-285.
- Yano, Y., Hamano, K., Satomi, M., Tsutsui, I., Ban, M. and Aue-umneoy, D., 2014. Prevalence and antimicrobial susceptibility of *Vibrio* species related to food safety

- isolated from shrimp cultured at inland ponds in Thailand. *Food Control*, 38, 30-45.
- Yeung, P.M. and Boor, K.J., 2004. Epidemiology, pathogenesis, and prevention of foodborne *Vibrio parahaemolyticus* infections. *Foodborne Pathogens and Disease*, 1(2), 74-88.
- Yeung, P.M., Hayes, M.C., DePaola, A., Kaysner, C.A., Kornstein, L. and Boor, K.J., 2002. Comparative phenotypic, molecular, and virulence characterization of *Vibrio parahaemolyticus* O3: K6 isolates. *Applied Environmental Microbiology*, 68(6), 2901-2909.
- Yoh, M., Miwatani, T. and Honda, T., 1992. Comparison of *Vibrio parahaemolyticus* hemolysin (Vp-TRH) produced by environmental and clinical isolates. *FEMS Microbiology Letters*, 92(2), 157-161.
- Yoon, Y.J., Im, K.H., Koh, Y.H., Kim, S.K. and Kim, J.W., 2003. Genotyping of six pathogenic Vibrio species based on RFLP of 16S rDNAs for rapid identification. *The Journal of Microbiology*, 41(4), 312-319.
- Yu, Y., Fang, L., Zhang, Y., Sheng, H. and Fang, W., 2015. VgrG2 of type VI secretion system 2 of *Vibrio parahaemolyticus* induces autophagy in macrophages. *Frontiers in Microbiology*, 6, 168.
- Yu, Y., Yang, H., Li, J., Zhang, P., Wu, B., Zhu, B., Zhang, Y. and Fang, W., 2012. Putative type VI secretion systems of *Vibrio parahaemolyticus* contribute to adhesion to cultured cell monolayers. *Archives of Microbiology*, 194(10), 827-835.
- Zak O. and Sande M.A., 1999. *Handbook of animal models of infection: experimental models in antimicrobial chemotherapy*. Academic Press, San Diego, CA
- Zamudio, M.L., Meza, A., Bailon, H., Martinez-Urtaza, J. and Campos, J., 2011. Experiences in the epidemiological surveillance of foodborne pathogens by pulsed field gel electrophoresis (PFGE) in Peru. *Revista peruana de medicina experimental y salud publica*, 28(1), 128-135.

- Zhang, L., Krachler, A.M., Broberg, C.A., Li, Y., Mirzaei, H., Gilpin, C.J. and Orth, K., 2012. Type III effector VopC mediates invasion for *Vibrio* species. *Cell Reports*, 1(5), 453-460.
- Zhang, X.H. and Austin, B., 2005. Haemolysins in *Vibrio* species. *Journal of Applied Microbiology*, 98(5), 1011-1019.
- Zhang, Y., Gao, H., Osei-Adjei, G., Zhang, Y., Yang, W., Yang, H., Yin, Z., Huang, X. and Zhou, D., 2017. Transcriptional regulation of the type VI secretion system 1 genes by quorum sensing and ToxR in *Vibrio parahaemolyticus*. *Frontiers in Microbiology*, 8, 2005.
- Zhong, M.C., Mor, A. and Avtalion, R.R., 1999. One-step procedure for the purification of goldfish (*Carrasius auratus*) and carp (*Cyprinus carpio*, L.) serum immunoglobulin by precipitation with 9% polyethylene glycol 6000. *Israeli Journal of Aquaculture Bamidgeh*, 51, 3-9.
- Zhou, M. and Wu, H., 2009. Glycosylation and biogenesis of a family of serine-rich bacterial adhesins. *Microbiology*, 155(2), 317-327.
- Zhou, X., Gewurz, B.E., Ritchie, J.M., Takasaki, K., Greenfeld, H., Kieff, E., Davis, B.M. and Waldor, M.K., 2013. A *Vibrio parahaemolyticus* T3SS effector mediates pathogenesis by independently enabling intestinal colonization and inhibiting TAK1 activation. *Cell Reports*, 3(5), 1690-1702.
- Zhou, X., Konkel, M.E. and Call, D.R., 2010a. Vp1659 is a *Vibrio parahaemolyticus* type III secretion system 1 protein that contributes to translocation of effector proteins needed to induce cytolysis, autophagy, and disruption of actin structure in HeLa cells. *Journal of Bacteriology*, 192(13), 3491-3502.
- Zhou, X., Konkel, M.E. and Call, D.R., 2010b. Regulation of type III secretion system 1 gene expression in *Vibrio parahaemolyticus* is dependent on interactions between ExsA, ExsC, and ExsD. *Virulence*, 1(4), 260-272.
- Zhou, X., Shah, D.H., Konkel, M.E. and Call, D.R., 2008. Type III secretion system 1 genes in *Vibrio parahaemolyticus* are positively regulated by ExsA and negatively regulated by ExsD. *Molecular Microbiology*, 69(3), 747-764.

- Zimmerman, L.M., Bowden, R.M. and Vogel, L.A., 2014. A vertebrate cytokine primer for eco-immunologists. *Functional Ecology*, 28(5), 1061-1073.
- Zou, J., Secombes, C.J., Long, S., Miller, N., Clem, L.W. and Chinchar, V.G., 2003. Molecular identification and expression analysis of tumor necrosis factor in channel catfish (*Ictalurus punctatus*). *Developmental and Comparative Immunology*, 27(10), 845-858.
- Zuo, X. and Woo, P.T.K., 1997. Natural anti-proteases in rainbow trout, *Oncorhynchus mykiss* and brook charr, *Salvelinus fontinalis* and the in vitro neutralization of fish α 2-macroglobulin by the metalloprotease from the pathogenic haemoflagellate, *Cryptobia salmositica*. *Parasitology*, 114(4), 375-382.