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DAFTAR PUSTAKA

Abbott S., Seli, L.S., Catino, M., Hartley, M.A., and Janda, J.M. 1998. Misidentification of unusual *Aeromonas* species as members of the genus *Vibrio*: a continuing problem. *Journal of Clinical Microbiology* 36: 1103-1104.

Abbott, S.L., Cheung, W.K.W., and Janda, J.M. 2003. The genus Aeromonas: biochemical characteristics, atypical reactions, and phenotypic identifcation schemes. *Journal of Clinical Microbiology* 41(6): 2348-2357.

Abd-El-Malek, A.M. 2017. Incidence and virulence characteristics of *Aeromonas* spp. in fish. *Veterinary World* 10: 34-37.

Abdelhamed, H., Ibrahim, I., Baumgartner, W., Lawrence, M.L., and Karsi, A. 2017. Characterization of histopathological and ultrastructural changes in channel catfish experimentally infected with virulent *Aeromonas hydrophila*. *Frontiers in Microbiology* 8: 1519.

Abdelhamed, H., Nho, S. W., Turaga, G., Banes, M. M., Karsi, A., and Lawrence, M.L. 2016. Protective efficacy of four recombinant fimbrial proteins of virulent *Aeromonas hydrophila* strain ML09-119 in channel catfish. *Veterinary Microbiology* 197: 8–14.

Abd El-Salam, S.S., Ghaly, M.F., Baraka, D.M., Mahmoud, S.H. and El-Makhzangy, A.A. 2017. Histopathological changes in diseased catfish (*Clarias gariepinus*) and treated by ciprofloxacin and clove extracts. *Journal Veterinary Medicine* and *Allied. Science* 1(1): 42-49.

Aboyadak, I. M. 2015. Molecular detection of *Aeromonas hydrophila* as the main cause of outbreak in tilapia farms in Egypt. *Journal of Aquaculture & Marine Biology* 2(6): 2–5.

Abreu, R.E.F., Magalhães, T.C., Souza, R.C., Oliveira, S.T., Ibelli, A.M., Demarqui, F.N., Gouveia, J.J., Costa, M.M., and Gouveia, G.V. 2018. Environmental factors on virulence of *Aeromonas hydrophila*. *Aquaculture International* 26(2): 495–507.

Abu-Elala, N., Abdelsalam, M., Marouf, Sh., and Setta A. 2015. Comparative analysis of virulence genes, antibiotic resistance and *gyrB*-based phylogeny of motile *Aeromonas* species isolates from nile tilapia and domestic fowl. *Letters in Applied Microbiology* 61(5): 429–436.

Aguilera-Arreola, M.G., Hernandez-Rodriguez, C., Zúñiga, G, Figueras, M.J., and Castro-Escarpulli, G. 2005. *Aeromonas hydrophila* clinical and environmental acotypes as revealed by genetic diversity and virulence genes. *FEMS Microbiology Letters* 242: 231-240.

Aguilera-Arreola, M.G., Hernándezrodríguez, C., Zúñiga, G., Figueras, M.J., Garduño, R.A., and Castro-Escarpulli, G. 2007. Virulence potential and genetic diversity of *Aeromonas caviae*, *A. veronii* and *A. hydrophila* clinical isolates from Mexico and Spain: A comparative study. *Canadian Journal of Microbiology* 53: 877-887.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
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Aguilera-Arreola, M.G., Hernández-Rodríguez, C.H., and Castro-Escarpulli, G. 2009. Molecular and phenotypic characterization of *A. hydrophila* -like HG3 strain isolated of an infant with diarrhea in Mexico. *Bioquimia* 34: 183–189.

Agustin, L. P., Kusdarwati, R., dan Mahasri, G. 2016. Pengaruh pemberian vaksin *whole cell Aeromonas hydrophila* dengan dosis yang berbeda terhadap kelulushidupan dan total leukosit ikan gurami (*Osphronemus gouramy*). *Journal of Aquaculture and Fish Health* 6(1): 16–23.

Albert, M.J., Ansaruzzaman, M., Talukder, K.A., Chopra, A.K., Kuhn, I., Rahman, M., Faruque, A.S.G., Islam, M.S., Sack, R.B., and Mollby, R., 2000. Prevalence of enterotoxin genes in *Aeromonas* spp. Isolated from children with diarrhea, healthy controls, and the environment. *Journal of Clinical Microbiology* 38: 3785–3790.

Altwegg, M., Steigerwalt, A. G., Altwegg-Bissig, R., Luthy-Hottenstein, J., and Brenner, D. J. 1990. Biochemical identification of *Aeromonas* genospecies isolated from humans. *Journal of Clinical Microbiology* 28(2): 258–264.

AlYahya, S.A., Ameen, F., Al-Niaeem, K.S., Al-Sa'adi, B.A., Hadi, S., and Mostafa, A.A. 2018. Histopathological studies of experimental *Aeromonas hydrophila* infection in blue tilapia, *Oreochromis aureus*. *Saudi Journal of Biological Sciences* 25: 182-185.

Amanu, S., Kurniasih, dan Indaryulianto, S. 2014. Identifikasi Penyakit Aeromonad pada Budidaya Ikan Air Tawar di Bali. *Jurnal Veteriner* 15(4): 474-486.

Ambadiang, M.M.M., Atontsa, B.C.K., Tankeo, S.B., Nayim, P., Wamba, B.E.N., Bitchagno, G.T.M., Mpetga, J.D.S., Penlap, V.B., and Kuete, V., 2020. Bark extract of *Cassia sieberiana* DC. (Caesalpiniaceae) displayed good antibacterial activity against MDR gram-negative phenotypes in the presence of phenylalanine-arginine β-naphthylamide. *BMC Complementary Medicine and Therapies* 20(342): 1–11.

Anggraini, R., Aliza, D., dan Mellisa, S. 2016. Identifikasi bakteri *Aeromonas hydrophila* dengan uji mikrobiologi pada ikan lele dumbo (*Clarias gariepinus*) yang dibudidayakan di Kecamatan Baitussalam Kabupaten Aceh Besar. *Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiah* 1(2): 270-286.

Angka, S.L. 2001. Studi karakterisasi dan patologi *Aeromonas hydrophila* pada ikan lele dumbo (*Clarias gariepinus*). *Makalah Falsafah Sains*. Program Pascasarjana, Insitut Pertanian Bogor. 1-2 hal.

Angka, S.L., Pramono, S.U., Pasaribu, F.H., dan Alifuddin, M. 1982. Isolasi dan identifikasi jasad renik penyebab epidemi penyakit bercak merah ikan di Jawa Barat. *Bulletin Info Perikanan* I(1): 1- 14.

Anonim. 2018. *Lele*. https://id.wikipedia.org/wiki/Lele. Diakses pada tanggal 5 Agustus 2018.

Anyanwu, M.U., Chah, K.F., and Shoyinka, S. 2015. Evaluation of pathogenicity of motile *Aeromonas* species in African catfish. *International Journal of Fisheries and Aquatic Studies* 2(3): 93–98.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
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Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Aoki, T. 1999. Motile Aeromonads (*Aeromonas hydrophila*). *In*: Woo, P.T.K. and Bruno, D.W. (eds.). *Fish Diseases and Disorders Volume 3: Viral, Bacterial, and Fungal Infections*. Cab International. 427-444 pp.

Aprilyanto, V. dan Sembiring, L. 2016. *Filogenetika Molekuler : Teori dan Aplikasi*. Yogyakarta: Innosain. 212 hal.

Asniatih, Idris, M., dan Sabilu, K. 2013. Studi histopatologi pada ikan lele dumbo (*Clarias gariepinus*) yang terinfeksi bakteri *Aeromonas hydrophila*. *Jurnal Mina Laut Indonesia*. 3(12): 13-21.

Aravena-Roman, M., Chang, B.J., Riley, T.V., and Inglis, T.J.J. 2011. Phenotypic characteristics of human clinical and environmental *Aeromonas* in Western Australia. *Pathology* 43: 350-356.

Aravena-Román, M., Inglis, T.J.J., Riley, T.V., and Chang, B.J. 2014. Distribution of 13 virulence genes among clinical and environmental *Aeromonas* spp. in Western Australia. *European Journal of Clinical Microbiology & Infectious Diseases* 33: 1889-1895.

Arwin, M., Ijong, F.G., dan Tumbol, R. 2016. Karakteristik *Aeromonas hydrophila* yang diisolasi dari ikan nila (*Odeochromis niloticus*). *Aquatic Science & Management* 4(2): 52-55.

Austin, B. and D.A. Austin 2016. *Bacterial Fish Pathogens*. Sixth Edition. Springer International Publishing. Switzerland.

Avery, J.L. 2020. *Biology of catfish*. Mississippi State University. http://extension.msstate.edu/content/biology-catfish. Diakses pada tanggal 5 Maret 2020.

Babaahmady, E. and Khosravi, A. 2011. Toxicology of baytril (enrofloxacin). *African Journal of Pharmacy and Pharmacology* 5(18): 2042-2045.

Badan Pusat Statistik. 2020. *Statistik Indonesia 2020*. Jakarta: BPS-Statistics Indonesia.746 hal.

Baloda, S.B., Krovacek, K., Eriksson, L., Linne, T., and Mansson, I. 1995. Detection of aerolysin gene in *Aeromonas* strains isolated from drinking water, fish and foods by the polymerase chain reaction. *Comparative Immunology, Microbiology and Infectious Diseases* 18(1): 17–26.

Baron, S., Granier, S.A., Larvor, E., Jouy, E., Cineux, M., Wilhelm, A., Gassilloud, B., Le Bouquin, S., Kempf, I., and Chauvin, C. 2017. *Aeromonas* diversity and antimicrobial susceptibility in freshwater-an attempt to set generic epidemiological cut-off values. *Frontiers in Microbiology* 8: 1-9.

Barrow, G.I. and Feltham, R.K.A. 2004. *Cowan and Steel's Manual For The Identification of Medical Bacteria*. 3rd Edition. UK: Cambridge Univesity Press. 331 p.

Bartkova, S., P. Leekitcharoenphon, F. M. Aarestrup, and I. Dalsgaard. 2017. Epidemiology of Danish *Aeromonas salmonicida* subsp. *salmonicida* in Fish Farms Using Whole Genome Sequencing. *Frontiers in Microbiology* 8 (December).

Baum, D. 2008. Reading a phylogenetic tree: the meaning of monophyletic groups. *Nature Education* 1(1): 190.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Baumgartner, W.A., Ford, L., and Hanson, L. 2017. Lesions caused by virulent *Aeromonas hydrophila* in farmed catfish (*Ictalurus punctatus* and *I. punctatus* × *I. furcatus*) in Mississippi. *Journal of Veterinary Diagnostic Investigation* 29: 747-751.

Beaz-Hidalgo, R., Alperi, A., Bujan, N., Romalde, J.L., and Figueras, M.J. 2010. Comparison of phenotypical and genetic identification of *Aeromonas* strains isolated from diseased fish. *Systematic and Applied Microbiology* (33): 149-153.

Beaz-Hidalgo, R. and Figueras, M.J. 2013. *Aeromonas* spp. whole genomes and virulence factors implicated in fish disease. *Journal of Fish Diseases* 36: 371-388.

Beaz-Hidalgo, R., Latif-Eugenin, F., and Figueras, M.J. 2013. The improved PCR of the *fstA* (ferric siderophore receptor) gene differentiates the fish pathogen *Aeromonas salmonicida* from other *Aeromonas* species. *Veterinary Microbiology* 166: 659-663.

Beaz-Hidalgo, R., Magi, G.E., Balboa, S., Barja J.L., and Romalde J.L. 2008. Development of a PCR protocol for the detection of *Aeromonas salmonicida* in fish by amplification of the *fstA* (ferric siderophore receptor) gene. *Veterinary Microbiology* 34: 386-394.

Behbahani, M.M., Akhlaghi, S.M.M., and Sharifiyazdi, H. 2014. Phenotypic and genetic diversity of motile aeromonads isolated from diseased fish and fish farms. *Iranian Journal of Veterinary Research* 15(3): 238–243.

Benson, D.A., Cavanaugh, M., Clark, K., Karsch-Mizrachi, I., Lipman, D.J., Ostell, J., and Sayers, E.W. 2013. GenBank. *Nucleic Acids Research* 41: D36–D42.

Borrell, N., Figueras, M. J., and Guarro, J. 1998. Phenotypic identification of *Aeromonas* genomospecies from clinical and environmental sources. *Canadian Journal of Microbiology* 44: 103–108.

Boyd, C.E. 1992. *Water Quality Management for Pond Fish Culture*. Amsterdam: Elsevier Science Publisher.

Brenner, D.J., Krieg, N.R., and Staley, J.T. 2005. *Bergey's Manual of Systematic Bacteriology.* Second Edition. Volume Two : The Proteobacteria. USA: Springer.

Brown, T. A. 1992. *Genetics: Molecular Approach*. Second Edition London: Chapman & Hall.

Burnham, C.D., Leeds, J., Nordmann, P., O'Grady, J., and Patel, J. 2017. Diagnosing antimicrobial resistance. *Nature Reviews : Microbiology* 15: 697-703.

Cai, H., Archambault, M., and Prescott, J.F. 2003. 16S Ribosomal RNA Sequence-based identification of veterinary clinical bacterial. *Journal of Veterinary Diagnostic Investigation* 15: 465-469.

Cai, S.-H., Wu, Z.-H., Jian, J.-C., Lu, Y.-S., and Tang, J.-F. 2012. Characterization of pathogenic *Aeromonas veronii* bv. *veronii* associated with ulcerative syndrome from Chinese longsnout catfish (*Leiocassis longirostris* günther). *Brazilian Journal of Microbiology* 43: 382–388.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
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Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Caliskan, M. 2012. *Genetic Diversity in Microorganisms*. Janeza Trdine 9, 51000 Rijeka, Croatia.

Canova, R., Kirsten, K.S., Soveral, L.D.F., Frandoloso, R., and Kreutz, L.C. 2017. Oligodeoxynucleotides CpGs increase silver catfish (*Rhamdiaquelen*) resistance to *Aeromonas hydrophila* challenge. *Aquaculture* 473: 278-282.

Cappuccino, J.G. and N. Sherman. 2005. *Microbiology : A Laboratory Manual*. California: The Benjamin/Cummings Publishing Company.

Carriero, M.M., Maia, A.A.M., Sousa, R.L.M., and Henrique-Silva, F. 2016. Characterization of a new strain of *Aeromonas dhakensis* isolated from diseased pacu fish (*Piaractus mesopotamicus*) in Brazil. *Journal of Fish Diseases* 1-11.

Carvalho, M. J., Martínez-Murcia, A., Esteves, A.C. Correia, A., and Saavedra, M.J. 2012. Phylogenetic diversity, antibiotic resistance and virulence traits of *Aeromonas* spp. from untreated waters for human consumption. *International Journal of Food Microbiology* 159(3): 230–239.

Chacón, M.R., Figueras, M.J., Castro-Escarpulli, G., Soler, L., and Guarro, J. 2003. Distribution of virulence genes in clinical and environmental isolates of *Aeromonas* spp. *Antonie van Leeuwenhoek* 84: 269–278.

Chao, C.M., Lai, C.C., Tsai, H.Y., Wu, C.J., and Tang, H.J. 2013a Pneumonia caused by *Aeromona*s species in Taiwan. *European Journal of Clinical Microbiology & Infectious Diseases* 32: 1069–75.

Chao, C.M., Lai, C.C., Tang, H.J., Ko, W.C., and Hsueh, P.R. 2013b. Skin and soft-tissue infections tract infections caused by *Aeromonas* species. *European Journal of Clinical Microbiology & Infectious Diseases* 32: 543-547.

Chen, P.L., Lamy, B., and Ko, W.C. 2016. *Aeromonas dhakensis*, an increasingly recognized human pathogen. *Frontiers in Microbiology* 7: 1-8.

Chen, P.L., Wu, C.J., Chen, C.S., Tsai, P.J., Tang, H.J., and Ko, W.C.. 2014. A comparative study of clinical *Aeromonas dhakensis* and *Aeromonas hydrophila* isolates in Southern Taiwan: *A. dhakensis* is more predominant and virulent. *Clinical Microbiology and Infection* 20: O428-O434.

Chenia, H.Y. 2016. Prevalence and characterization of plasmid-mediated quinolone resistance genes in *Aeromonas* spp. Isolated from South African freshwater fish. *Intenational Journal of Food Microbiology*. 231: 26-32.

Choi, J., Lee, S., Kwon, H., Kwak, Y.G., Choi, S., Lim, S.K., Kim, M.N., Jeong, J., Choi, S., Woo, J.H., and Kim, Y.S. 2008. Clinical significance of spontaneous *Aeromonas* bacterial peritonitis in cirrhotic patients: a matched case-control study . *Clinical Infectious Diseases* 47: 66–72.

Chopra, A.K., Xu, X., Ribardo, D., Gonzalez, M., Kuhl, K., Peterson, W., and Houston, C.W. 2000. The cytotoxic enterotoxin of *Aeromonas hydrophila* induces proinflammatory cytokine production and activates arachidonic acid metabolism in macrophages. *Infection and Immunity* 68(5): 2808-2818.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
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Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Chopra, I. and Roberts, M. 2001. Tetracycline antibiotics: mode of action, applications, molecular biology, and epidemiology of bacterial resistance. *Microbiology and Molecular Biology Reviews* 65: 232–260.

Chu, W. and Lu, C. 2008. In vivo fish models for visualizing *Aeromonas hydrophila* invasion pathway using GFP as a biomarker. *Aquaculture* 277: 152-155.

Clarridge, J.E. 2004. Impact of 16S rRNA gene sequence analysis for identification of bacteria on clinical microbiology and infectious diseases. *Clinical Microbiology Reviews* 17(4): 840-862.

Crouch, E., Dickes, L., and Kahle, A. 2015. Review on antibiotic resistance. *Advances in Pharmacoepidemiology & Drug Safety* 4(3): 1-3.

Da Silva, L.C.A., Leal-Balbino, T.C., de Melo, B.S.T., Mendes-Marques, C.L., Rezende, A.M., de Almeida, A.M.P., and Leal, N.C. 2017. Genetic diversity and virulence potential of clinical and environmental *Aeromonas* spp. isolates from a diarrhea outbreak. *BMC Microbiology* 17(179): 1-9.

Dahanayake, P. S., Hossain, S., Wickramanayake, M. V. K. S., and Heo, G. J. 2019. Antibiotic and heavy metal resistance genes in *Aeromonas* spp. isolated from marketed Manila Clam (*Ruditapes philippinarum*) in Korea. *Journal of Applied Microbiology* 127: 941–952.

Dang, H., Zhang, X., Song, L., Chang, Y., and Yang, G. 2007. Molecular determination of oxytetracycline-resistant bacteria and their resistance genes from mariculture environments of China. *Journal of Applied Microbiology* 103: 2580–2592.

De Silva, B. C. J., Hossain, S., Dahanayake, P. S., Lee, D., Wickramanayake, M. V. K. S., and Heo, G.. 2020. Multi-drug resistant mesophilic aeromonads isolated from marketed scallops (*Patinopecten yessoensis*) harboring resistance genes. *Fisheries & Aquatic Life* 28: 1–10.

Deng, Y., Wu, Y., Tan, A., Huang, Y., Jiang, L., Xue, H., Wang, W., Luo, L., and Zhao, F. 2014. Analysis of antimicrobial resistance genes in *Aeromonas* spp. isolated from cultured freshwater animals in China. *Microbial Drug Resistance* 20(4): 350-356.

DePaola, A., Flynn, P.A., McPhearson, R.M., and Levy, S.B. 1988. Phenotypic and genotypic characterization of tetracycline- and oxytetracycline-resistant *Aeromonas hydrophila* from cultured channel catfish (*Ictalurus punctatus*) and their environments. *Applied Environmental Microbiology* 54(7): 1861–1863.

Departemen Farmakologi dan Terapeutik. 2007. *Farmakologi dan Terapi*. Edisi 5. Departemen Farmakologi dan Terapeutik, Fakultas Kedokteran, Universitas Indonesia. Jakarta: Balai Penerbit FKUI.

Dias, M.K.R., Sampaio, L.S., Proietti-Junior, A.A., Yoshioka, E.T.O., Rodrigues, D.P., Rodriguez, A.F.R., Ribeiro, R.A., Faria, F.S.E.D.V., Ozorio, R.O.A., and Tavares-Dias, M. 2016. Lethal dose and clinical signs of *Aeromonas hydrophila* in *Arapaima gigas* (Arapaimidae), the giant fish from Amazon. *Veterinary Microbiology* 188: 12-15.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Didugu, H., Krishnaiah, N., Rao, M. T., and Ramanipushpa, R. N. 2016. Antibiogram of *Aeromonas* Species Isolated From Livestock Products. *International Journal of Science, Environment* 5(2): 475–478.

Direktorat Jenderal Perikanan dan Budidaya. 2018. *Produksi Perikanan Budidaya 2013*. Direktorat Jenderal Perikanan dan Budidaya. Jakarta. https://www.djpb.kkp.go.id. Diakses pada tanggal 26 Mei 2018.

Doan, H.V., Doolgindachbaporn, S., and Suksri, A. 2013. The LD_{50} of asian catfish (*Pangasius bocourti*, Sauvage 1870) challenge to pathogen *Aeromonas hydrophila* FW52 strain. *Pensee Journal* 75(10): 287–293.

Dong, H.T., Techatanakitarnan, C., Jindakittikul, P., Thaiprayoon, A., Taengphu, S., Charoensapsri, W., Khunrae, P., Rattanarojpong, T., and Senapin, S., 2017. *Aeromonas jandaei* and *Aeromonas veronii* caused disease and mortality in Nile tilapia, *Oreochromis niloticus* (L.). *Journal of Fish Diseases* 1-9.

Emeish, W, Mohamed, H., and Eikamel, A. 2018. *Aeromonas* infections in african sharptooth catfish. *Journal of Aquaculture* 9(9): 1–6.

Erdem, B., Kariptaş, E., Çil, E., and Işik, K. 2011. Biochemical identification and numerical taxonomy of *Aeromonas* spp. isolated from food samples in Turkey. *Turkish Journal of Biology* 35: 463–472.

Esteve, C. and Alcaide, E. 2009. Influence of diseases on the wild eel stock: the case of Albufera Lake. *Aquaculture* 289: 143-149.

Eyler, R.F. and Shvets, K. 2019. Clinical pharmacology of antibiotics. *Clinical Journal of the American Society of Nephrology* 14: 1080-1090.

Fakhrudin, Md. and Mannan, K.S.B. 2013. Methods for analyzing diversity of microbial communities in natural environments. Review Paper. *Ceylon Journal of Science (Bio.Sci.)* 42(1): 19-33.

Fernández-Bravo, A. and Figueras, M.J. 2020. An update on the genus Aeromonas: taxonomy, epidemiology, and pathogenicity. *Microorganisms* 8(12): 1-39.

Figueira, V., Vaz-Moreira, I., Silva, M., and Manaia, C.M. 2011. Diversity and antibiotic resistance of *Aeromonas* spp. in drinking and waste water treatmentplants. *Water Research* 45: 5599-5611.

Figueras, M.J. 2005. Clinical relevance of *Aeromonas*. *Reviews in Medical Microbiology* 16: 145-153.

Fishbase. 2018. *Clarias gariepinus, Burchell 1822*. http://www.fishbase.org/Summary/SpeciesSummary.php?ID=1934&AT=North+African+catfish. Diakses pada tanggal 27 Februari 2018.

Furmanek-Blaszk B. 2014. Phenotypic and molecular characteristics of an *Aeromonas hydrophila* strain isolated from the River Nile. *Microbiological Research* 169: 547-552.

Gardenia, L., Koesharyani, I., Supriyadi, H., dan Mufidah, T. 2010. Aplikasi deteksi *Aeromonas hydrophila* penghasil aerolisin dengan menggunakan *polymerase chain reaction* (PCR). *Prosiding Forum Inovasi Teknologi Akuakultur*. 877-883.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
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Gavín, R., Merino, S., Altarriba, M., Canals, R., Shaw, J.G., and Tomás, J.M. 2003. Lateral flagella are required for increased cell adherence, invasion and biofilm formation by *Aeromonas* spp. *FEMS Microbiology Letters* 224: 77-83.

Ghenghesh, K.S., Ahmed, S.F., Cappuccinelli, P., and Klena, J.D. 2014. Genospecies and virulence factors of *Aeromonas* species in different sources in a North African country. *Libyan Journal of Medicine* 9: 1–5.

Ghenghesh, K.S., Rahouma, A., Zorgani, A., Tawil, K., Tomi, A.A., and Franka, E. 2015. *Aeromonas* in Arab countries: 1995-2014. *Comparative Immunology, Microbiology, and Infectious Diseases* 42: 8-14.

Guardabassi, L. Dijkshoorn, L., Collard, J.M., Olsen, J.E., and Dalsgaard, A. 2000. Distribution and in-vitro transfer of tetracycline resistance determinants in clinical and aquatic *Acinetobacter* strains. *Journal of Medical Microbiology* 49: 929-936.

Guillaume, G., Verbrugge, D., Chasseur-Libotte, M. L., Moens, W., and Collard, J. M. 2000. PCR typing of tetracycline resistance determinants (*Tet A-E*) in Salmonella enterica serotype Hadar and in the microbial community of activated sludges from hospital and urban wastewater treatment facilities in Belgium. *FEMS Microbiology Ecology* 32: 77-85.

Guo, P., Wang, N., Liu, Y., and Lu, C. 2014. Antimicrobial susceptibility and characterization of outer membrane proteins of *Aeromonas hydrophila* isolated in China. *Journal of Integrative Agriculture* 13(4): 911-917.

Guo, S.L., Yang, Q.H., Feng, J.J., Duan, L.H., and Zhao, J.P. 2016. Phylogenetic analysis of the pathogenic genus *Aeromonas* spp. Isolated from diseased eels in China. *Microbial Pathogenesis* 101: 12-23.

Hamid, N.H., Hassan, M.D., Sabri, M.Y.M., Hasliza, A.H., Hamdan, R.H., Afifah, M.N.F., Raina, M.S., Nadia, A.B.S., and Fuad, M.M., 2017. Studies on pathogenicity effect of *Aeromonas hydrophila* infection in juvenile red hybrid tilapia *Oreochromis* sp. In: *Proceedings of International Seminar on Livestock Production and Veterinary Technology* pp. 532–539.

Han, H.S., Loh, Y.J., Hur, J., and Jung, J.S. 2004. Occurrence of the *strA-strB* streptomycin resistance genes in *Pseudomonas* species isolated from kiwifruit plants. *The Journal of Microbiology* 42(4): 265-268.

Hanan, S. 2019. *Ratusan Ikan Mendadak Mati Diduga Karena Bakteri*. Pikiran Rakyat. https://www.pikiran-rakyat.com/jawa-barat/pr-01323394/ratusan-ikan-mendadak-mati-diduga-karena-bakteri?page=3. Diakses pada tanggal 2 November 2020.

Hardi, E.H. dan Pebrianto, C.B. 2012. Isolasi dan uji postulat koch *Aeromonas* sp. dan *Pseudomonas* sp. pada ikan nila (*Oreochromis niloticus*) di sentra budidaya Loa Kulu Kutai Kartanegara Kalimantan Timur. *Jurnal Ilmu Perikanan Tropis* 16(2): 35-39.

Hardi, E.H., Pebrianto, C.B., Hidayanti, T., dan Handayani, R.T. 2014. Infeksi *Aeromonas hydrophila* melalui jalur yang berbeda pada ikan nila (*Oreochromis niloticus*) di Loa Kulu Kutai Kartanegara Kalimantan Timur *Jurnal Kedokteran Hewan* 8(2): 130-133.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Harikrishnan, R. and C. Balasundaram. 2005. Modern trens in *Aeromonas hydrophila* disease management with fish. Review. *Fisheries Science* 13: 281-320.

Harnisz, M. and Korzeniewska, E. 2018. The prevalence of multidrug-resistant *Aeromonas* spp. in the municipal wastewater system and their dissemination in the environment. *Science of the Total Environment* 626: 377-383.

Hassan, M.A., Noureldin, E.A., Mahmoud, M.A, and Fita, N.A. 2017. Molecular identification and epizootiology of *Aeromonas veronii* infection among farmed *Oreochromis niloticus* in Eastern Province, KSA. *Egyptian Journal of Aquatic Research* 34: 161-167.

Henriques, I. S., Fonseca, F., Alves, A., Saavedra, M. J., and Correia, A. 2008. Tetracycline-resistance genes in Gram-negative isolates from estuarine waters. *Letters in Applied Microbiology* 47: 526-533.

Herawati, N.M., Mahatmi, H., dan Besung, I.N.K. 2013. Resistensi bakteri *Aeromonas* sp. isolat ikan piranha (*Pygosentrus nattereri*) Bali Safari dan Marine Park terhadap Antibiotik. *Jurnal Ilmu dan Kesehatan Hewan* 1(2): 52-56.

Hernandez-Rodriguez, P. and Ramirez, A.G. 2012. Polymerase Chain Reaction: Types, Utilities and Limitations *In*: Hernandez-Rodriguez, P. (eds) *Polymerase Chain Reaction*. Croatia: In Tech. pp: 157-172.

Hossain, S., De Silva, B.C.J., Wimalasena, S.H.M.P., Pathirana, H.N.K.S., Dahanayake, P.S., and Heo, G.J. 2019. Characterization of virulence determinants and multiple antimicrobial resistance profiles in motile *Aeromonas* spp. isolated from ornamental goldfish (*Carassius Auratus*). *Journal of Exotic Pet Medicine* 29: 51–62.

Huys. G., Kämpfer, P., Albert, M.J., Kühn, I., Denys, R., and Swings, J. 2015. *Aeromonas hydrophila* subsp. *dhakensis* subsp. nov., isolated from children with diarrhoea in Bangladesh, and extended description of *Aeromonas hydrophila* subsp. *hydrophila* (Chester 1901) Stanier 1943 (approved lists 1980). *International Journal of Systematic and Evolutionary Microbiology* 52: 705–712.

Igbinosa, I.H., Beshiru, A., Odjadjare, E.E., Ateba, C.N., and Igbinosa, E.O. 2017. Pathogenic potentials of *Aeromonas* species isolated from aquaculture and abattoir environments. *Microbial Pathogenesis* 107: 185-192.

Igbinosa, I.H. and Okoh, A.I. 2012. Antibiotic susceptibility profile of *Aeromonas* species isolated from wastewater treatment plant. *The Scientific World Journal* ID 764563: 1-6.

Irianto, K. 2012. *Mikrobiologi Menguak Dunia Mikroorganisme Jilid I.* Bandung: Yrama Widya.

Ishida, Y., Ahmed, A.M., Mahfouz, N.B., Kimura, T., El-Khodery, S.A., Moawad, A.A., and Shimamoto, T. 2010. Molecular analysis of antimicrobial resistance in Gram-negative bacteria isolated from fish farms in Egypt. *Journal of Veterinary Medical Science* 72(6): 727-734.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Isnansetyo, A. and Kamei, Y. 2003. *Pseudoalteromonas phenolica* sp. nov., a novel marine bacterium that produces phenolic anti-methicillin-resistant *Staphylococcus aureus* substances. *International Journal of Systematic and Evolutionary Microbiology* 53: 583–588.

Isnansetyo, A. and Kamei, Y. 2009. Anti-methicillin-resistant *Staphylococcus aureus* (MRSA) activity of MC21-B, an antibacterial compound produced by the marine bacterium *Pseudoalteromonas phenolica* O-BC30^{T}. *International Journal of Antimicrobial Agents* 34: 131-135.

Jacobs, L. and Chenia, H.Y., 2007 Characterization of integrons and tetracycline resistance determinants in *Aeromonas* spp. isolated from south african aquaculture systems. *International Journal of Food Microbiology* 114: 295–306.

Jagoda, S.S.S.de S., Wijewardana, T.G., Arulkanthan, A., Igarashi, Y., Tan, E., Kinoshita, S., Watabe, S., and Asakawa, S. 2014. Characterization and antimicrobial susceptibility of motile Aeromonads isolated from freshwater ornamental fish showing signs of septicaemia. *Diseases of Aquatic Organisms* (109): 127-137.

Jalal, A., Chowdhury, K., Ashaari, M. M., John, A., and Yunus, K. 2010. Antibiotic resistance microbes in tropical mangrove sediments in east coast peninsular, Malaysia. *African Journal of Microbiology Research* 4(8): 640–645.

Janda, J.M. 2001. *Aeromonas* and *Plesiomonas*. *In*: Sussman M. (eds.) *Molecular medical microbiology*. San Diego, USA: Academic Press.

Janda, J.M. and Abbott, S.L. 2007. 16S rRNA gene sequencing for bacterial identification in the diagnostic laboratory: pluses, perils, and pitfalls. *Journal of Clinical Microbiology* 45(9): 352761-2764.

Janda, J.M. and Abbott, S.L. 2010. The genus *Aeromonas*: taxonomy, pathogenicity, and infection. *Clinical Microbiology Reviews* 23: 35-73.

Janda, J.M., Abbott, S.L., Khashe, S., Kellogg, G.H., and Shimada, T. 1996. Further studies on biochemical characteristics and serologic properties of the genus *Aeromonas*. *Journal of Clinical Microbiology* 34: 1930-1933.

Joseph, A.V., Sasidharan, R.S., Nair, H.P., and Bhat, S.G. 2013. Occurence of potential pathogennic *Aeromonas* species in tropical seafood, aqaufarms, and mangroves of Cochin coast in South India. *Veterinary World* 6(6): 300-306.

Julinta, R.B., Abraham, T.J., Roy, A., Singha, J., Dash, G., Nagesh, T.S., and Patil, P.K. 2017. Histopathology and wound healing in oxytetracycline treated *Oreochromis niloticus* (L.) against *Aeromonas hydrophila* intramuscular challenge. *Journal of Aquaculture Research & Development* 8(4): 1-6.

Kamiso, H.N. 2004. Status penyakit ikan dan pengendaliannya di Indonesia. *Prosiding Seminar Nasional Penyakit Ikan dan Udang IV*, Purwokerto, 18-19 Mei 2004.

Kamiso, K.H., Triyanto, dan Hartati, S. 1997. Uji antigenisitas dan efikasi *Aeromonas hydrophila* pada lele dumbo (*Clarias gariepinus*). *Jurnal Perikanan UGM (GMU J. Fish. Sci)* I(2): 9-16.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Kaskhedikar, M. and Chhabra, D. 2009. Multiple drug resistance of *Aeromonas hydrophila* isolates from chicken samples collected from Mhow and Indore city of Madhyapradesh. *Veterinary World* 2(1): 31–32.

Katzung, B.G. 2010. *Basic & Clinical Pharmacology*. Rev 10th ed. San Fransisco: Mc Graw Hill.

Kementerian Kesehatan RI. 2011. *Pedoman Umum Penggunaan Antibiotik*. Jakarta: Departemen Kesehatan RI. 63 hal.

Kepmen-KP. 2014. *Keputusan Menteri Kelautan dan Perikanan R.I. No.52/KEPMEN-KP/2014 tentang Klasifikasi Obat Ikan*. Menteri Kelautan dan Perikanan RI. Jakarta.

Khajanchi, B.K., Fadl, A.A., Borchardt, M.A., Berg, R.L., Horneman, A.J., Stemper, M.E., Joseph, S.W., Moyer, N.P., Sha, J., and Chopra, A.K. 2010. Distribution of virulence factors and molecular fingerprinting of *Aeromonas* species isolates from water and clinical samples: Suggestive evidence of water-to-human transmission. *Applied and Environmental Microbiology* 76(7): 2313–2325

Khor, W.C., Puah, S.M., Tan, J.A.M.A., Puthucheary, S.D., and Chua, K.H. 2015. Phenotypic and genetic diversity of *Aeromonas* species isolated from fresh water lakes in Malaysia. *Plos One* 0145933: 1-13

Khor, W.C., Puah, S.M., Koh, T.H., Tan, J.A.M.A., Puthucheary, S.D., and Chua, K.H. 2018. Comparison of clinical isolates of *Aeromonas* from Singapore and Malaysia with regard to molecular identification, virulence, and antimicrobial profiles. *Microbial Drug Resistance* 00(00): 1-10

Khumaidi, A. dan Hidayat, A. 2018. Identifikasi penyebab kematian massal ikan gurami (*Osphronemus gouramy*) di sentra budidaya ikan gurami, Desa Beji, Kecamatan Kedung Banteng, Kabupaten Banyumas, Jawa Tengah. *Journal of Aquaculture Science* 3(2): 145-153.

Kim, J.H., Hwang, S.Y., Son, J.S., Han, J.E., Jun, J.W., Shin, S.P., Choresca Jr., C., Choi, Y.J., Park, T.H., and Park, S.C., 2011. Molecular characterization of tetracycline and quinolone resistant *Aeromonas salmonicida* isolated in Korea. *Journal of Veterinary Science* 12(1): 41-48.

KKP. 2017. *Subsektor Perikanan Budidaya Sepanjang Tahun 2017 Menunjukkan Kinerja Positif*. Direktorat Jenderal Perikanan Budidaya, KKP. https://kkp.go.id/djpb/artikel/3113-subsektor-perikanan-budidaya-sepanjang-tahun-2017-Diakses pada tanggal 28 Mei 2018.

KKP. 2018. *Refleksi 2018 & Outlook 2019*. Kementerian Kelautan dan Perikanan. Jakarta. https://kkp.go.id/artikel/7962-materi-paparan-refleksi-2018-dan-outlook-2019-kkp. Diakses pada tanggal 1 November 2020.

Kosuge, T., Mashima, J., Kodama, Y., Fujisawa, T., Kaminuma, E., Ogasawara, O., Okubo, K., Takagi, T., and Nakamura, Y. 2014. DDBJ progress report: a new submission system for leading to a correct annotation. *Nucleic Acids Res.* 42: D44–D49.

Kozinska, A. 2007. Dominant pathogenic species of mesophilic aeromonads isolated from diseased and healthy fish cultured in Poland. *Journal Fish Diseases* 30: 293-301.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Králová, S., Staňková, E., and Sedláček, I. 2016. Classification of *Aeromonas* spp. Isolated from watercand clinica sources and distribution of virulence genes. *Folia Microbiologica* 61: 513-521.

Krebs, C. J. 1989. *Ecology The Experiment Analysis of Distribution and Abundance*. Harper and Row Publisher. New York.

Kuete, V. 2010. Potential of cameroonian plants and derived products against microbial infections: A Review. *Planta Medica* 76: 1479-1491.

Kumar, R., Pande, V., Singh, L., Sharma, L., and Saxena, N. 2016a. Pathological findings of experimental *Aeromonas hydrophila* infection in golden mahseer (*Tor putitora*). *Fish Aquaculture Journal* 7: 160.

Kumar, S., Stecher, G., Tamura, K., 2016b. MEGA7 : molecular evolutionary genetics analysis version 7.0 for bigger datasets. *Molecular Biology and Evolution* 33(7): 1870–1874.

Kusdarwati, R., Kismiyati, Sudarno, Kurniawan, H., and Prayogi. Y.T. 2017. Identification of *Aeromonas hydrophila* and *Saprolegnia* sp. on catfish (*Clarias gariepinus*) in floating cages in Bozem Moro Krembangan Surabaya. I*OP Conference Series: Earth Environmental Science* 55(012038): 1-6.

Kusumawaty, D., Pancoro, A., Aryantha, I.N.P., and Suhandono, S. 2016. Evaluation of identification techniques for the pathogen, *Aeromonas hydrophila* from Indonesia. *Malaysian Journal of Microbiology* 12(3): 191-198.

Lakshmi, R., Nusrin, K.S., Ann, G.S., and Sreelakshmi, K.S. 2014. Role of beta lactamases in antibiotic resistance: A Review. *International Research Journal of Pharmacy* 5(2): 37-40.

Lallier, R. and Daigneault, P. 1984. Antigenic differentiation of pili from non-virulent and fish-pathogenic strains of *Aeromonas hydrophila*. *Journal of Fish Diseases* 7: 509–512.

Lau, S.K.P., Woo, P.C.Y., Teng, J.L.L., Leung, K.W., and Yuen, K.Y. 2002. Identification by 16S ribosomal RNA gene sequencing of arcobacter butzleri bacteraemia in a patient with acute gangrenous appendicitis. *Journal Clinical Pathology*: *Molecular Pathology* 55: 182-185.

Leinonen, R., Akhtar, R., Birney, E., Bower, L., Cerdeno-Tarraga, A., Cheng, Y., Cleland, I., Faruque, N., Goodgame, N., and Gibson, R. 2010. The European Nucleotide Archive. *Nucleic Acids Research* 1-4.

Li, F., Wang, W., Zhu, Z., Chen, A., Du, P., Wang, R., Chen, H., Hu, Y., Li, J., Kan, B., and Wang, D. 2015. Distribution virulence-associated genes and antimicrobial resistance of *Aeromonas* isolates from diarrheal patients and water, China. *Journal of Infection* 70: 600-608.

Li, Y. and Cai, S. 2011. Identification and pathogenicity of *Aeromonas sobria* on tail-rot disease in juvenile tilapia *Oreochromis niloticus*. *Current Microbiology* 62: 623-627.

Lin, S. 2003. What is molecular diversity? *Molecular Diversity* 6: 1.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Lin, H., Shiu, Y., Chiu, C., Huang, S., and Liu, C. 2017. Screening probiotics candidates for a mixture of probiotics to enhance the growth performance, immunity, and disease resistance of Asian seabass, *Lates calcarifer* (Bloch), against *Aeromonas hydrophila*. *Fish & Shellfish Immunology* 60: 474-482.

Liu D. 2015. *Aeromonas*. *In*: Tang, Y. (eds) *Molecular Medical Microbiology*. Three-Volume Set. Elsevier Ltd. pp: 1099-1110.

Lukistyowati, I. dan Kurniasih. 2012. Pelacakan gen aerolysin dari *Aeromonas hydrophila* pada ikan mas yang diberi pakan ekstrak bawang putih. *Jurnal Veteriner* 13(1): 43-50.

Madigan, M.T., Martinko, J.M., Stahl, D.A., and Clark, D.P. 2012. *Brock Biology of Microorganisms*. 13th ed. San Francisco: Pearson Benjamin Cummings.

Magurran, A.E. 1988. *Ecological Diversity and Its Measurement*. London: Princeton University Press. 179 p.

Manik, V.T., Hidayat, T., dan Kusumawaty, D. 2014. Identifikasi dan filogenetika bakteri *Aeromonas* spp. isolat air kolam beberapa kota berdasarkan pada sikuen gen 16S rRNA. *Formica Online* 1(1).

Marnis, H. dan Iswanto, B. 2015. Isolasi, identifikasi, dan karakterisasi molekuler bakteri *Aeromonas hydrophila* yang menginfeksi ikan lele (*Clarias gariepinus*). *Prosiding Forum Inovasi Teknologi Akuakultur 2015*. 43-50 hal.

Martin-Carnahan, A., and Joseph, S. W. 2005. Family I. Aeromonadaceae Colwell, MacDonell and De Ley 1986. *In*: Brenner, D.J., Krieg, N.R., and Staley, J.T. (eds) *Bergeys Manual of Systematic Bacteriology*. Second Edition. USA: Springer. pp: 557–578.

Martinez-Murcia, A.J., Benlloch, S., and Collins, M.D. 1992. Phylogenetic interrelationships of members of the genera *Aeromonas* and *Plesiomonas* as determined by 16S ribosomal DNA sequencing: lack of congruence with results of DNA-DNA hybridizations. *International Journal of Systematic Bacteriology* 42: 412–421.

Martínez-Murcia, A. J., Saavedra, M. J., Mota, V. R., Maier, T., Stackebrandt, E., and Cousin, S. 2008. *Aeromonas aquariorum* sp. nov., isolated from aquaria of ornamental fish. *International Journal of Systematic and Evolutionary Microbiology* 58: 1169–1175.

Mc. Faddin, J.F. 1980. *Biochemical Tests for Identification of Medical Bacteria*. Second Edition. Baltimore: Williams dan Wilkins.

Meier, I., Wray, L. V., and Hillen, W. 1988. Differential regulation of the Tn10-encoded tetracycline resistance genes *tet*A and *tet*R by the tandem tet operators O1 and O2. *The EMBO Journal* 7: 567–572.

Miñana-Galbis, D., Farfán, M., Lorén, J. G., and Fusté, M. C. 2002. Biochemical identification and numerical taxonomy of *Aeromonas* spp. isolated from environmental and clinical samples in Spain. *Journal of Applied Microbiology* 93: 420–430.

Mittal, K.R. 1980. *Aeromonas hydrophila* in rainbow trout: relation between virulence and surface characteristics. *Canadian Journal of Microbiology* 26(12): 1501-1503.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Miyagi, K., Sanoi, K., and Hirai, I. 2017. Sanitary evaluation of domestic water supply facilities with storage tanks and detection of *Aeromonas*, enteric and related bacteria in domestic water facilities in Okinawa Prefecture of Japan. *Water Research* 171-177.

Morris, C.E., Bardin, M., Berge, O., Frey-Klett, P., Fromin, N., Girardin, H., Guinebretiere, M., Lebaron, P., Thiery, J.M., and Troussellier, M. 2002. Microbial biodiversity: approaches to experimental design and hypothesis testing in primary scientific literature from 1975 to 1999. *Microbiology and Molecular Biology Reviews* 66(4): 592-616.

Mulia, D.S. dan Purbomartono, C. 2007. Perbandingan efikasi vaksin produk intra- dan ekstraseluler *Aeromonas hydrophila* untuk menanggulangi penyakit *Motile Aeromonas Septicemia* (MAS) pada lele dumbo (*Clarias* sp.). *Jurnal Perikanan* IX(2): 173–181.

Mulia, D.S., Purbomartono, C., Isnansetyo, A., dan Murwantoko. 2007. Pengembangan vaksin untuk mencegah penyakit MAS (*Motile Aeromonas Septicemia*) pada gurami (*Osphronemus gouramy* Lac.). Laporan Penelitian Pekerti. UMP. Purwokerto.

Mulia, D.S. 2010. Isolasi, karakterisasi, dan identifikasi bakteri *Aeromonas* sp. penyebab penyakit *Motile Aeromonas Septicemia* (MAS) pada gurami. *Sains Akuatik* 13(2): 9-16.

Mulia, D.S. Maryanto, H., dan Purbomartono, C. 2011. Isolasi, karakterisasi, dan identifikasi bakteri pada lele dumbo yang terserang penyakit di Kabupaten Banyumas. *Sainteks* 7(1): 1-15.

Mutia, T.M. 2009. Biodiversity Conservation. *Short Course IV on Exploration for Geothermal Resources*. November 1-22, 2009. Kenya.

Muslikha, Pujiyanto, S., Jannah, S.N., dan Novita, H. 2016. Isolasi, karakterisasi *Aeromonas hydrophila* dan deteksi gen penyebab penyakit *Motile Aeromonas Septicemia* (MAS) dengan 16S rRNA dan *aerolysin* pada ikan lele (*Clarias* sp.). *Jurnal Biologi* 5(4): 1-7.

Nagar, V., Shashidhar, R., and Bandekar, J. R. 2011. Prevalence, characterization, and cntimicrobial Resistance of *Aeromonas* strains from various retail food products in Mumbai, India. *Journal of Food Science* 76(7): 486–492.

Nahar, S., Rahman, M.M., Ahmed, G.U., and Faruk, Md.A.R. 2016. Isolation, identification, and characterization of *Aeromonas hydrophila* from juvenile farmed pangasius (*Pangasianodon hypophthalmus*). *International Journal Fisheries and Aquatic Studies* 4(4): 52-60.

Nawaz, M., Khan, S.A., Tran, Q., Sung, K., Khan, A.A., Adamu, I., and Steele, R.S. 2012. Isolation and characterization of multidrug-resistant *Klebsiella* spp. isolated from shrimp imported from Thailand. *International Journal of Food Microbiology* 155: 179-184.

NCCLS. 1994. Performance standards for antimicrobial disk and dilution susceptibility tests for bacterial isolated from animals; proposed standard. *NCCLS Document M31-P* 14(20): 1-29.

Neu, H.C. and Gootz, T.D. 2001. Antimicrobial Chemotherapy. *In*: Baron, S. (eds) *Medical Microbiology* 5th ed. Galtestone: The University of Texas Medical Branch.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Nwaiwu, O. 2018. Data on evolutionay relationships of *Aeromonas hydrophila* and *Serratia proteamaculans* that attach to water tanks. *Data in Brief* 16: 10-14.

Odeyemi, O. A. and Ahmad, A. 2017a. Antibiotic resistance profiling and phenotyping of *Aeromonas* species isolated from aquatic sources. *Journal of Biological Sciences* 24(1): 65–70.

Odeyemi, O.A. and Ahmad, A. 2017b. Population dynamics, antibiotics resistance and biofilm formation of *Aeromonas* and *Vibrio* species isolated from aquatic sources in Northern Malaysia. *Microbial Pathogenesis* 103: 178-185.

Olaniran, A.O., Nzimande, S.B.T., and Mkize, N.G. 2015. Antimicrobial resistance and virulence signature of *Listeria* and *Aeromonas* species recovered from treated wastewater effluent and receiving surface water in Durba, South Africa. *BMC Microbiology* 15(234): 1-10.

Olga. 2012. Patogenisitas bakteri *Aeromonas hydrophila* ASB-01 pada ikan gabus (*Ophiocephalus striatus*). *Sains Akuatik* 14(1): 33-39.

Olga dan Fatmawaty. 2013. Efikasi rute vaksin ASB-01 pada ikan gabus (*Ophiocephalus striatus*). *Fish Scientiae* 4(6): 131-144.

Onuk, E. E., Findik, A., Turk, N., Altun, S., Korun, J., Ozer, S., Avsever, M.L., and Ciftci, A. 2013. Molecular identification and determination of some virulence genes of *Aeromonas* spp. in fish and water from Turkish coastal regions. *Revue Médicine Véterinary* 164(4): 200–206.

Orozova, P., Barker, M., Austin, D.A., and Austin, B. 2009. Identification and pathogenicity to rainbow trout, *Oncorhynchus mykiss* (Walbaum), of some aeromonads. *Journal of Fish Diseases* 32: 865–871.

Osman, K., Aly, M., Kheader, A., and Mabrok, K. 2012. Molecular detection of the *Aeromonas* virulence *aerolysin* gene in retail meats from different animal sources in Egypt. *World Journal of Microbiology and Biotechnology* 28: 1863–1870.

Ottaviani, D., Parlani, C., Citterio, B., Masini, L., Leoni, F., Canonino, C., Sabatini, L., Bruscolini, F., and Pianetti, A. 2011. Putative virulence propreties of *Aeromonas* strains isolated from food, environmental and clinical sources in Italy: A comparative study. *International Journal of Food Microbiology* 144: 538-545.

Pablos, M. Huys, G., Cnockaert, M., Rodriguez-Calleja, J.M., Otero, A., Santos, J.A., and Garcia-Lopez, M.I. 2011. Identification and epidemilogical relationships of *Aeromonas* isolates from patients with diarrhea, drinking water and foods. *International Journal of Food Microbiology* 147: 203-210.

Pagé, B., Pagé, M., and Noël, C. 1993. A new fluorometric assay for cytotoxicity measurements in vitro. International. *Journal of Oncology* 3: 473-476.

Parker, J.L. and Shaw, J.G. 2011. *Aeromonas* spp. clinical microbiology and disease. *Journal of Infection* 62: 109–118.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Peatman, E., Mohammed, H., Kirby, A., Shoemaker, C.A., Yildirim-Aksoy, M., and Beck, B.H. 2018. Mechanisms of pathogen virulence and host susceptibility in virulent *Aeromonas hydrophila* infections of channel catfish (*Ictalurus punctatus*). *Aquaculture* 482: 1-8.

Pelczar, M. J dan Chan, E.C.S. 2015. *Dasar-Dasar Mikrobiologi*. Jakarta: UI Press.

Penders, J. and Stobberingh, E.E. 2008. Antibiotic resistance of motile aeromonads in indoor catfish and eel farm in the southern part of The Netherlands. *International Journal of Antimicrobial Agents* 31: 261-265.

Percival, S. L., and Williams, D. W. 2014. *Aeromonas*. In: Percival, S.L., Williams, D.W., Gray, F.N., Yates, M.V., and Chalmers, R.M. (eds) *Microbiology of Waterborne Diseases: Microbiological Aspects and Risks*. Second Edition. London: Elsevier. pp: 49-64.

Pérez-Valdespino, A., Fernández-Rendón, E., and Curiel-Qesada, E. 2009. Detection and characterization of class 1 integrons in *Aeromonas* spp. isolated from human diarrheic stool in Mexico. *Journal of Basic Microbiology* 49: 572–578.

Pessoa, R.B.G., de Oliveira, W.F., Marques, D.S.C., dos Santos Correia, M.T., de Carvalho, E.V.MM., and Coelho, L.C.B.B. 2019. The genus *Aeromonas*: A general approach. *Microbial Pathogenesis* 130:81–94.

Plumb., J.A. 1994. *Health Maintenance of Cultured Fishes, Principal Microbial Diseases*. Amerika: CRC Press. 239 p.

Poppe, C., Martin, L., Muckle, A., Archambault, M., McEwen, S., and Weir, E. 2006. Characterization of antimicrobial resistance of *Salmonella* Newport isolated from animals, the environment, and animal food products in Canada. *The Canadian Journal of Veterinary Research* 70: 105–114.

Prasetya, R.R., Poetranto, E.D., dan Handijatno, D. 2017. Identifikasi gen *aerolysin* dan sensitivitas antibiotik *Aeromonas hydrophila* penyebab kematian tukik (*Lepidochelys olivacea*) di Pulau Serangan, Bali. *Jurnal Veteriner* 18(2): 201-206.

Pridgeon, J. W., Klesius, P. H., Song, L., Zhang, D., Kojima, K., and Mobley, J. A. 2013. Identification, virulence, and mass spectrometry of toxic ECP fractions of West Alabama isolates of *Aeromonas hydrophila* obtained from a 2010 disease outbreak. *Vetinary Microbiology* 164: 336–343.

Priyatna, R., Indaryulianto, S., and Kurniasih. 2011. Molecular identification and clonal relation of atypical isolate *Aeromonas salmonicida* using Restriction Fragment Length Polymorphism (RFLP). *Indonesian Aquaculture Journal* 6(2): 183-190.

Puthucheary, S.D., Puah, S.M., and Chua, K.H. 2012. Molecular characterization of clinical isolates of *Aeromonas* species from Malaysia. *PLoS One* 7: 1–7.

Raj, N. S., Swaminathan, T. R., Dharmaratnam, A., Raja, S. A., Ramraj, D., and Lal, K.K. 2019. *Aeromonas veronii* caused bilateral exophthalmia and mass mortality in cultured Nile tilapia, *Oreochromis niloticus* (L.) in India. *Aquaculture* 512: 1–8.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Rejeki, S., Triyanto, dan Murwantoko. 2016. Isolasi dan identifikasi bakteri *Aeromonas* spp. dari lele dumbo (*Clarias* sp.) sakit di Kabupaten Ngawi. *Jurnal Perikanan UGM* XVIII(2): 55-60.

Rinanda, T. 2011. Analisis sekuensing 16S rRNA di bidang mikrobiologi. *Jurnal Kedokteran Syiah Kuala* 11: 172-177.

Roberts, M. C. 2002. Resistance to tetracycline, macrolide-lincosamide-streptogramin, trimethoprim, and sulfonamide drug classes. *Molecular Biotechnology* 20(3): 261–283.

Rofiani, E.M., B.D. Madusari, dan H. Soeprapto. 2017. Identifikasi keberadaan bakteri *Aeromonas hydrophila* pada ikan nila (*Oreochromis niloticus*) yang dibudidayakan di kolam Balai Benih Ikan Karanganyar Kabupaten Pekalongan. *PENA Akuatika* 15(1): 61-71.

Rosenberg, M.S. 2009. Sequence alignment: concept and hystory. *In* Rosenberg, M.S. (eds) *Sequence Alignment: Methods, Models, Concept, and Strategies* USA: University California Press.

Sambrook, J., Fritschi, E.F., and Maniatis, T. 1989. *Molecular Cloning: A Laboratory Manual*. New York: Cold Spring Harbor Laboratory Press.

Saragih, F. S. D., Manoppo, H., Undap, S. L., Nangi, E. L. A., Longdong, S. N. J., dan Kusen, D. J. 2019. Aplikasi probiotik yang diisolasi dari usus ikan lele (*Clarias batrachus*) untuk meningkatkan performa pertumbuhan dan resistensi ikan mas (*Cyprinus carpio*) terhadap infeksi *Aeromonas hydrophila*. *Junal Ilmiah Platax* 7(2): 358–364.

Sarjito, Haditomo, A.H.C., Desrina, Ariyati, R.W., and Prayitno, S.B. 2018. The diversity of causative agent associated with bacterial diseases on catfish (*Clarias gariepinus*) with molecular based from Demak, Indonesia. *Omni-Akuatika* 14(2): 100–106.

Sarjito, Radjasa, O.K., Haditomo, A.H.C., dan Prayitno, S.B. 2013. Causative agent *motile aeromonas* pada ikan lele (*Clarias gariepinus*) di sentra produksi provinsi Jawa Tengah. *Konferensi Akuakultur Indonesia* 146-152.

Schmidt, A. S., Bruun, M. S., Dalsgaard, I., and Larsen, L. 2001. Incidence, distribution , and spread of tetracycline resistance determinants and integron-associated antibiotic resistance genes among motile aeromonads from a fish farming environment article a prendre comme exemple et comportant les amorces pour les in. *Applied and Environmental Microbiology* 67(12): 5675–5682.

Scoaris, D.D.O., Colacite, J, Nakamura, C.V., Ueda-Nakamura, T., Filho B.A.D.A., and Filho, B.P.D. 2008. Virulence and antibiotic susceptibility of *Aeromonas* spp. isolated from drinking water. *Antonie van Leeuwenhoek* 93: 111–122.

Sen, K. and Rodgers, M. 2004. Distribution of six virulence factors in *Aeromonas* species isolated from US drinking water utilities: a PCR identification. *Journal of Applied Microbiology* 97: 1077-1086.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Senderovich, Y., Ken-Dror, S., Vainblat, I., Blau, D., Izhaki, I., and Halpern, M. 2012. A molecular study on the prevalence and virulence potential of *Aeromonas* spp. recovered from patients suffering from diarrhea in Israel. *PLoS ONE* 7(2): 1–6.

Sha, J., Pillai, L., Fadl, A.A., Galindo, C.L., Erova, T.E., and Chopra, A.K. 2005. The type III secretion system and cytotoxic enterotoxin alter the virulence of *Aeromonas hydrophila*. *Infection and Immunity* 73(10): 6446–6457.

Shakil, S., Khan, R., Zarrilli, R., and Khan, A. U. 2008. Aminoglycosides versus bacteria - A description of the action, resistance mechanism, and nosocomial battleground. *Journal of Biomedical Science* 15: 5–14.

Shen, Y., Zhang, J., Xu, X., Fu, J., and Li, J. 2013. A new haplotype variability in complement C6 is marginally asociated with resistance to *Aeromonas hydrophila* in grass carp. *Fish & Shellfish Immunology* 34: 1360-1365.

Simon, S. S., Lalitha, K.V., and Joseph, T.C. 2016. Virulence properties of *Aeromonas* spp. from modified-atmosphere- and vacuum-packed milk fish (*Chanos chanos* Forsskal, 1775). *Annals of Microbiology* 66(3): 1109–1115.

Sinclair, A.H., Heney, C., Sidjabat, H.E., George, N.M., Bergh, H., Anuj, S.N., Nimmo, G.R., and Paterson, D.L. 2016. Genotypic and phenotypic identification of *Aeromonas* species and CphA-mediated carbapenem resistance in Queensland, Australia. *Diagnostic Microbiology and Infectious Disease* 85: 98-101.

Singh, V., Rathore, G., Kapoor, D., Mishra, B.N., and Lakra, W.S. 2008. Detection of aerolysin gene in *Aeromonas hydrophila* isolated from fish and pond water. *Indian Journal of Microbiology* 48: 453–458.

Sirimanapong, W., Thompson, K.D., Kledmanee, Thaijongrak, P., Collet, B., Ooi, E.L., and Adams, A. 2014. Optimisation and standardisation of functional immune assays for striped catfish (*Pangasianodon hypophthalmus*) to compare their immune response to live and heat killed *Aeromonas hydrophila* as models of infection and vaccination. *Fish & Shellfish Immunology* 40: 374-383.

SNI: 01-6484.3-2000. 2000. *Produksi induk ikan lele dumbo* (*C. gariepinus* x *C. fuscus*) *Kelas Induk Pokok (Parent Stock).*

Soares, G.M.S., Figueiredo, L.C., Faveri, M., Cortelli, S.C., Duarte, P.M., and Feres, M. 2012. Mechanisms of action of systemic antibiotics used in periodontal treatment and mechanisms of bacterial resistance to these drugs. *Journal of Applied Oral Science* 20(3): 295–309.

Soler, L., Figueras, M.J., Chacon, M.R., Vila, J., Marco, F., Martinez-Murcia, A., and Guarro, J. 2002. Potential virulence and antimicrobial susceptibility of *Aeromonas popoffi* recovered from freshwater and seawater. *FEMS Immunology and Medical Microbiology* 32: 243–247

Soto-Rodriguez, S.A., Cabanillas-Ramos, J., Alcaraz, U., Gomez-Gil, B., Romalde, J.L. 2013. Identification and virulence of *Aeromonas dhakensis*, *Pseudomonas mosselii* and *Microbacterium paraoxydans* isolated from Nile tilapia, *Oreochromis niloticus*, cultivated in Mexico. *Journal of Applied Microbiology* 115:654–662.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Sreedharan, K., Philip, R., and Singh, I.S.B. 2013. Characterization and virulence potential of phenotypically diverse *Aeromonas veronii* isolates recovered from moribund freshwater ornamental fishes of Kerala, India. *Antonie van Leeuwenhoek* 103: 53-67.

Stoll, C., Sidhu, J. P. S., Tiehm, A., and Toze, S. 2012. Prevalence of clinically relevant antibiotic resistance genes in surface water samples collected from Germany and Australia. *Environmental Science and Technology* 46: 9716-9726.

Stratev, D. and Odeyemi, O.A. 2016. Antimicrobial resistance of *Aeromonas hydrophila* isolated from different food source: A mini-review. *Journal of Infection and Public Health* 9: 535-544.

Stratev, D., Vashin, I., and Daskalov, H. 2013. Antimicrobial resistance of β-haemolytic *Aeromonas hydrophila* isolated from rainbow trouts (*Oncorhynchus mykiss*). *Bulgarian Journal of Veterinary Medicine* 16(4): 289-296.

Sumino, Supriyadi, A., dan Wardiyanto 2013. Efektivitas ekstrak daun ketapang (*Terminalia cattapa* L.) untuk pengobatan infeksi *Aeromonas salmonicida* pada ikan patin (*Pangasioniodon hypophthalmus*). *Jurnal Sain Veteriner* 31(1): 79–88.

Suprapto, H., Sumartiwi, L., Prawesthirini, S., Handiyatno, D., dan Azmijah, A. 2005. The isolation of *Aeromonas hydrophila* and *Escherichia coli* from lou han *Cichlasoma synspilum* and studies of their histopathology changes. *Berkala Penelitian Hayati*. 10: 139–141.

Suryati, L., Sasanti, A. D., dan Amin, M. 2017. Pengaruh lama waktu pemberian pakan yang mengandung buah mahkota dewa terhadap pertumbuhan dan imunitas ikan lele yang diinfeksi *Aeromonas hydrophila*. *Jurnal Akuakultur Rawa Indonesia* 5(2): 169–181.

Susandi, F., Mulyana, dan Rosmawati 2017. Peningkatan imunitas benih ikan gurame (*Osphronemus gouramy* Lac.) terhadap bakteri *Aeromonas hydrophila* menggunakan rosella (*Hibiscus sabdariffa* L.). *Jurnal Mina Sains* 3(2): 1–13.

Syafitrianto, I., Aqmal, A., dan Lande, M.N.H. 2016. Variasi *Aeromonas* pada ikan sidat (*Anguilla* sp.) yang dilalulintaskan melalui bandar udara Palu. *Biogenesis* 4(1): 10-15.

Syahroni. 2018. Diserang bakteri *Aeromonas*, ribuan gurami di Banyumas tewas. TrubusNews.https://news.trubus.id/baca/6537/diserang-bakteri-aeromonas-ribuan-gurami-di-banyumas-tewas. Diakses pada tanggal 2 November 2020.

Syue, L., Chen, P., Wu, C., Lee, N., Lee, C., Li, C., Li, M., Tang, H., Hsueh, P., and Ko, W. 2016. Monomicrobial *Aeromonas* and *Vibrio* bacteremia in cirrhotic adults in southern Taiwan: similarities and differences. *Journal of Microbiology, Immunology, and Infection* 49: 509-515.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Tahoun, A.B.M.B., Ahmed, H.A., Abou Elez, R.M.M.., El-Gedawy, A.A., Elsohaby, I., and Abd El-Ghafar, A.E. 2016. Molecular characterisation genotyping and survival of *Aeromonas hydrophila* isolated from milk, dairy products and humans in Egypt. *International Dairy Journal* (63): 52-58.

Tamura, K., Stecher, G., Peterson, D., Filipski, A., and Kumar, S. 2013 MEGA6: Molecular evolutionary genetics analysis version 6.0. *Molecular Biology and Evolution* 30(12): 2725–2729.

Tang, H., Lai, C., in, H., and Chao, C. 2014. Clinical manifestations of bacteremia caused by *Aeromonas* species in Southern Taiwan. *PLOS One* 9(3): 1-6.

Tanjung, L. R., Sadi, N. H., Maghfiroh, M., Dina, R., dan Said, D. 2013. Keanekaragaman bakteri *Aeromonas* dari KJA di Waduk Jatiluhur Jawa Barat dan kolam budidaya di Pulau Lombok dan Sumbawa. *Limnotek* 20(1): 100-110.

Taufik, P. dan Bastiawan, D. 2003. Kerentanan bakteri (*Aeromonas hydrophila*) hasil isolasi dari ikan baung (*Mystus nemurus*) sakit terhadap antimikroba. *Indonesian Journal of Chemistry* 3(30: 166-168.

Tipmongkolsilp, N., del Castillo, E.F.., Hikima, J., Jung, T., Kondo, H., Hirono, I., and Aoki, T. 2012. Multiple drug-resistant strains of *Aeromonas hydrophila* isolated from tilapia farms in Thailand. *Fish Pathology* 47(2): 56-63.

Tjay, T. H. dan Rahardja, K. 2015. *Obat-obat Penting: Khasiat, Penggunaan dan Efek-Efek Sampingnya.* Edisi Ke-7. Jakarta: PT. Elex Media Komputindo. 1037 hal.

Tomás JM. 2012. The main *Aeromonas* pathogenic factors. *ISRN Microbiology* 1–22.

Triyaningsih, Sarjito, dan Prayitno, S.B. 2014. Patogenisitas *Aeromonas hydrophila* yang diisolasi dari lele dumbo (*Clarias gariepinus*) yang berasal dari Boyolali. *Journal of Aquaculture Management and Technology* 3(2): 11-17.

Ulkhaq, M.F. and M. Lusiastuti. 2017. Resistance test *Aeromonas hydrophila* isolated from African Catfish (*Clarias gariepinus*) agains some antibiotics group. *Microbiology Indonesia* 11(2): 69-73.

Uma, A., Rebecca, G., Meena, S., and Saravanabava, K. 2010. PCR detection of putative *aerolysin* and *hemolysin* genes in an *Aeromonas hydrophila* isolate from infected koi carp (*Cyprinus carpio*). *Tamilnadu J. Veterinary & Animal Sciences* 6(1): 31–33.

Valera, L. and Esteve, C. 2002. Phenotypic study by numerical taxonomy of strains belonging to the genus Aeromonas. *Journal of Applied Microbiology* 93: 77–95.

Varela, A.R., Nunes, O.C., and Manaia, C.M., 2016. Quinolone resistant *Aeromonas* spp. as carriers and potential tracers of acquired antibiotic resistance in hospital and municipal wastewater. *Science of the Total Environment* 542: 665–671.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Vega-Sanchez, V., Acosta-Dibarrat, J., Vega-Castillo, F., Castro-Escarpulli, G., Aguilera-Arreola, M.G., and Soriano-Vargas, E. 2014. Phenotypical characteristics, genetic identification, and antimicrobial sensitivity of *Aeromonas* species isolated from farmed rainbow trout (*Onchorynchus mykiss*) in Mexico. *Acta Tropica* 130: 76-79.

Verma VK, Rani KV, Sehgal N, and Prakash O. 2016. Prevention of histopathological damages in the liver, spleen and kidney of *Channa punctata* infected with *Aeromonas hydrophila*. *DU Journal of Undergraduate Research and Innovation* 2(1): 227–232.

Wamala, S.P, Mugimba, K.K., Mutoloki, S., Evensen, O., Mdegela, R., Byarugaba, D.K., and Sørum, H. 2018. Occurrence and antibiotic susceptibility of fish bacteria isolated from *Oreochromis niloticus* (Nile tilapia) and *Clarias gariepinus* (African catfish) in Uganda. *Fisheries and Aquatic Sciences* 21(6): 1–10.

Wang, D., Dai, C., Li, Q., Li, Y., and Liu, Z. 2019. Complete mitochondrial genome and phylogenic analysis of *Rhinogobius cliffordpopei* (Perciformes, Gobiidae). *Mitochondrial DNA* Part B 4(2): 2473-2474.

Wang, L., Wei, Y., Yuan, G., Dai, M., and Chen, X. 2012. Molecular characterization and virulence genes of *Aeromonas hydrophila* isolated from the Chinese giant salamander (*Andrias davidianus*). *Asian Herpetological Research* 3(4): 303–309.

Wilhelms, M., Vilches, S., Molero, R., Shaw, J.G., Tomás, J.M., and Merino, S. 2009. Two redundant sodium-driven stator motor proteins are involved in *Aeromonas hydrophila* polar flagellum rotation. *Journal of Bacteriology* 191(7): 2206–2217.

Willey, J.M., Sherwood, L.M., and Woolverton, C.J. 2009. *Prescott's Pinciples of Microbiology*. Boston: McGraw-Hill Higher Education.

Wimalasena, S.H.M.P., de Silva, B.C.J., Hossain, S., Pathirana, H.N.K.S., and Heo, G. 2017. Prevalence and characterization of quinolone resistance genes in *Aeromonas* spp. isolated from pet turtles in South Korea. *Journal of Global Antimicrobial Resistance* 11: 34-38.

Wintoko, F., Setyawan, A., Hudaidah, S., dan Ali, M. 2013. Imunogenisitas heat killed vaksin inaktif *Aeromonas salmonicida* pada ikan mas (*Cyprinus carpio*). *Jurnal Rekayasa dan Teknologi Budidaya Perairan* 2(1): 205-210.

Wulandari, A., Prayitno, S.B., dan Sarjito. 2014. Patogenisitas isolat K14 yang diisolasi dari lele dumbo (*Clarias gariepinus*) yang berasal dari Demak. *Journal of Aquaculture Management and Technology* 3(2): 143-149.

Wulandari, T., Indrawati, A., dan Pasaribu, F. 2019. Isolasi dan identifikasi *Aeromonas hydrophila* pada ikan lele (*Clarias gariepinus*) Pertambakan Muara Jambi, Provinsi Jambi. *Jurnal Medik Veteriner* 2(2): 89-95.

Xia, C., Ma, Z.H., Rahman, M.H., and Wu, Z.G. 2004. PCR cloning and identification of the *β-haemolysin* gene of *Aeromonas hydrophila* from freshwater fishes in China. *Aquaculture* 229: 45–53.

UNIVERSITAS
GADJAH MADA
Keragaman Aeromonas spp. pada Lele (Clarias sp.) yang Dibudidayakan di Jawa, Indonesia
DINI SISWANI MULIA, Dr. Ir. Alim Isnansetyo, M.Sc.; Dr. Rarastoeti Pratiwi, M.Sc.; Prof. drh. Widya Asmara, S.U., P
Universitas Gadjah Mada, 2021 | Diunduh dari http://etd.repository.ugm.ac.id/

Yano, Y., Hamano, K., Tsutsui, I., Aue-umneoy, D., Ban, M., and Satomi, M. 2015. Occurence, molecular characterization, and antimicrobial susceptibility of *Aeromonas* spp. in marine species of shrimps cultures at inland low salinity ponds. *Food Microbiology* 47: 21-27.

Yi, S., You, M., Cho, H., Lee, C., Kwon, J., and Shin, G. 2013. Molecular characterization of *Aeromonas* species isolated from farmed eels (*Anguilla japonica*). *Veterinary Microbiology* 164: 195-200.

Yogananth, N., Bhakyaraj, R., Chanthuru, A., Anbalagan, T., and Nila, K.M. 2009. Detection of virulence gene in *Aeromonas hydrophila* isolated from fish samples using PCR technique. *Global Journal of Biotechnology & Biochemistry* 4(1): 51–53.

Yousr, A.H., Napis, S., Rusul, G.R.A., and Son, R. 2007. Detection of *aerolysin* and *hemolysin* genes in *Aeromonas* spp. isolated from environmental and shellfish sources by polymerase chain reaction. *International Food Research Journal* 14: 115–122.

Yu, H.B., Rao, P.S.S., Lee, H.C., Vilches, S., Merino,S., Tomas, J.M., and Leung, K.Y. 2004. A Type III secretion system Is required for *Aeromonas hydrophila* AH-1 pathogenesis. *Infection and Immunity* 72: 1248–1256.

Yu, H.B., Zang, Y.L., Lau, Y.L., Yao, F., Vilches, S., Merino, S., Tomas, J.M., Howard, S.P., and Leung, K.Y. 2005. Identification and characterization of putative virulence genes and gene clusters in *Aeromonas hydrophila* PPD134/91. *Applied Environmental Microbioogy*. 71: 4469-4477.

Yuliantoro, B., Helmizuryani, dan Elfachmi. 2017. Keragaman bakteri patogen pada ikan lele dumbo (*Clarias gariepinus*) di beberapa pembudidaya di kota Palembang. *Fiseries* VI(1): 1-6.

Zepeda-Velazquez, A.P., Vega-Sanchez, V., Ortega-Santana, C., Rubio-Godoy, M., de Oca-Mira, D.M., and Soriano-Vargas, E. 2017. Pathogenocity of Mexican isolates of *Aeromonas* sp. in immersion experimentally-infected rainbow trout (*Oncorhynchusmykiss*, Walbaum 1792). *Acta Tropica* 169: 122-124.

Zhang, D., Moreira, G.S.A., Shoemaker, C., Newton, J.C., and Xu, D.H. 2016. Detection and quantification of virulent *Aeromonas hydrophila* in channel catfish tissues following waterborne challenge. *FEMS Microbiology Letters* 363: 1-5.

Zhang, X, Zhang, T., and Fang, H. 2009. Antibiotic resistance genes in water environment. *Applied Microbiology and Biotechnology* 82: 397-414.

Zhou, Y., Yu, L., Nan, Z., Zhang, P., Kan, B., Yan, D., and Su, J. 2019. Taxonomy, virulence genes and antimicrobial resistance of *Aeromonas* isolated from extra-intestinal and intestinal infections. *BMC Infection Diseases.* 19(158): 1–9.

Zhu, D., Li, A., Wang, J., Li, M., Cai, T., and Hu, J. 2007. Correlation between the distribution pattern of virulence genes and virulence of *Aeromonas hydrophila* strains. *Frontiers of Biology in China* 2: 176–179.

Zonneveld, N. 1991. *Prinsip-Prinsip budidaya ikan*. Jakarta : PT Gramedia Pustaka Utama.