Identification and Antimicrobial Resistance of Bacteria Isolated from Probiotic Products Used in Shrimp Culture - DTU Orbit (16/01/2019)

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Probiotics are increasingly used in aquaculture to control diseases and improve feed digestion and pond water quality; however, little is known about the antimicrobial resistance properties of such probiotic bacteria and to what extent they may contribute to the development of bacterial resistance in aquaculture ponds. Concerns have been raised that the declared information on probiotic product labels are incorrect and information on bacterial composition are often missing. We therefore evaluated seven probiotics commonly used in Vietnamese shrimp culture for their bacterial species content, phenotypic antimicrobial resistance and associated transferable resistance genes. The bacterial species was established by 16S rRNA sequence analysis of 125 representative bacterial isolates. MIC testing was done for a range of antimicrobials and whole genome sequencing of six multiple antimicrobial resistant Bacillus spp. used to identify resistance genes and genetic elements associated with horizontal gene transfer. Thirteen bacterial species declared on the probiotic products could not be identified and 11 non-declared Bacillus spp. were identified. Although our culture-based isolation and identification may have missed a few bacterial species present in the tested products this would represent minor bias, but future studies may apply culture independent identification methods like pyro sequencing. Only 6/60 isolates were resistant to more than four antimicrobials and whole genome sequencing showed that they contained macrolide (ermD), tetracycline (tetL), phenicol (fexA) and trimethoprim (dfrD, dfrG and dfrK) resistance genes, but not known structures associated with horizontal gene transfer. Probiotic bacterial strains used in Vietnamese shrimp culture seem to contribute with very limited types and numbers of resistance genes compared to the naturally occurring bacterial species in aquaculture environments. Approval procedures of probiotic products must be strengthened through scientific-based efficacy trials and product labels should allow identification of individual bacterial strains and inform the farmer on specific purpose, dosage and correct application measures.

General information
State: Published
Organisations: National Food Institute, Research group for Genomic Epidemiology, University of Copenhagen
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Number of pages: 21
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: P L o S One
Volume: 10
Issue number: 7
Article number: e0132338
ISSN (Print): 1932-6203
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2017): CiteScore 3.01 SJR 1.164 SNIP 1.111
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 3.11 SJR 1.236 SNIP 1.101
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 3.32 SJR 1.427 SNIP 1.136
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 3.54 SJR 1.559 SNIP 1.148
Web of Science (2014): Indexed yes
Scopus rating (2013): CiteScore 3.94 SJR 1.772 SNIP 1.153
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 4.15 SJR 1.982 SNIP 1.156