Selection of Probiotic Bacteria for Use in Aquaculture

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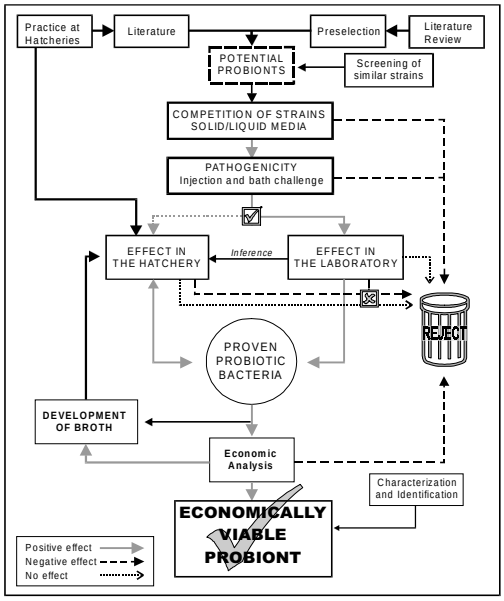
ABSTRACT: Selection of probiotic bacteria has usually been an empirical process based on limited scientific evidence. Many of the failures in probiotic research could be attributed to the selection of inappropriate microorganisms. Selection steps have been defined, but they need to be adapted for different host species and environments. General selection criteria are determined mainly by biosafety aspects, methods of production and processing, the method of administration of the probiotic and the location in the body where the microorganisms are expected to be active. 1. Background information. The first two steps for the selection of potential probiotic bacteria are a critical review of the literature available and the practice at hatcheries. 2. Acquisition of potential probiotic bacteria. For practical purposes the identification of the potential probiotic bacteria is not a primary objective; although proper identification is required for production quality control and patenting to protect commercial interests. Important aspects are viability of the strain, resistance to antibiotics and ability to outcompete other strains. 3. Evaluating the ability of potential probiotic bacteria to out-compete pathogenic strains. The crucial step in selecting a probiotic bacterium may be its ability to out-compete potentially pathogenic strains. This involves viability of the probiotic strain within larvae or in their environment, adherence to host surfaces, ability to colonise and to prevent the establishment of potentially pathogenic bacteria. If any of these features are absent it is difficult for a potentially probiotic strain to benefit the host for a reasonable period. Observing the growth of a selected potential probiont in a similar medium as the larval rearing environment can serve to predict its viability. 4. Evaluating the pathogenicity of selected strains. The next step would be to evaluate the pathogenicity of the strain for larvae. A bath challenge with larvae would be preferable, but such challenges are not yet reproducible. Alternative methods that can provide acceptable results are injection challenge of juvenile shrimp or bath challenge of disinfected *Artemia* nauplii. If reliable results can be obtained from a larval challenge and if a highly positive correlation is established between mortalities observed in *Artemia* nauplii trials and results with shrimp larvae, then the *Artemia* nauplii challenge might be used as a practical method to assess the pathogenicity of candidate strains. Nevertheless, one has to be aware that nothing can replace the actual challenge with the desired target organisms. 5. Evaluating potentially probiotic bacteria with larvae. A selected probiont must be tested with shrimp larvae. Tests can be carried out in an actual hatchery environment, but it is advisable first to perform laboratory trials. Positive results might be not only higher survival but an improvement in larval performance such as more rapid development, higher weight gains, improved resistance to stress and lower incidence of potentially pathogenic bacteria. 6. Economic evaluation. Finally it is necessary to perform an economic analysis to ascertain whethr implementation of the probiotic treatment would be worth the investment.

Figure 1. Flow diagram proposed to select probiotic microorganisms for use in the larval rearing of aquatic organisms.



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