Prophylactic effect of levamisole on rainbow trout (Oncorhynchus mykiss) against Yersinia ruckeri

Unal Ispir

ABSTRACT.- Ispir U. 2009. Prophylactic effect of levamisole on rainbow trout (Oncorhynchus mykiss) against Yersinia ruckeri. Pesquisa Veterinária Brasileira 29(9):700-702. Faculty of Agriculture, Department of Fisheries, Bingol University, 23119 Bingol, Turkey. E-mail: uispir@yahoo.com

Alteration in the relative percentage of survival (RPS) rate of rainbow trout (Oncorhynchus mykiss) exposed to 5, 10 and 25 μg ml⁻¹ levamisole for 2 h against Yersinia ruckeri was investigated. The average weight of the 120 fish used in this study was 6.3 g. Upon challenge with a virulent strain, the relative survival percentage of respectively 83.3%, 86.7% and 76.6% was recorded. The results suggest that the application of levamisole in fish farms could increase resistance to infection of fish and offer economic benefits.

INDEX TERMS: Levamisole, rainbow trout, Oncorhynchus mykiss, Yersinia ruckeri, immunity, protection.

INTRODUCTION

Antibiotics, drugs and chemicals have been used for treating fish disease caused by environmental stress and other factors for years. However, these are often effective for only a short time and may accumulate in the environment. In the past, the immunological approach to preventing fish disease has been by vaccination against specific pathogens, where vaccines were used for treating a particular disease (Siwicki et al. 1994).

Immunostimulants is important to health as provides the building block of defence mechanisms and protection against disease several promising adjuvants, natural and synthetic drugs and biological modifiers have been tested in fish in vivo and in vitro. The substance are effective in stimulating or modulating non-specific defence mechanism, and offer protection against viral and bacterial diseases fish (Kodama et al. 1993, Siwicki et al. 1994, Mulero et al. 1998, Cuesta et al. 2002a).

Levamisole is a levo-isomer of tetramisole [6]. Previous studies have suggested that levamisole treatment leads to an enhanced state of resistance to various kinds of infections (Jeney et al. 1994, Mulero et al. 1998, Findlay & Mundlay 2000). Levamisole is a registered and accepted drug for the European Community and the United States Food and Drug Administration, its metabolism is not well known. Toxicity and tissue residues have been reported after its use in some animals but not for fish (Cuesta et al. 2002b). The purpose of this study was to determine the influence of bath the levamisole on prophylactic effect Yersinia ruckeri in the intensive culture of rainbow trout (Oncorhynchus mykiss).

MATERIALS AND METHODS

Healty Oncorhynchus mykiss avarage weighing 6.3 g, were obtained from local fish farming, Elazig, Turkey. The fish were kept in 90 L tanks, with water recirculation. The water was maintained at 14±2°C, pH 7.3±0.1, and dissolved O₂ 9.2±0.4 mg ml⁻¹. The fish were red twice daily, 7 days a week. The fish were divided into 4 groups, with 30 fish in each group. After a 2 week acclimation period, the experimental groups were bathed for 2 hours with 5, 10 and 25 μg ml⁻¹ levamisole. Control fish were immersed in tap water on the same schedule. Afterwards, all fish were immersed with 9.8x10⁶ cell ml⁻¹ of live Yersinia ruckeri for 2 minutes. Resulting deaths in the challenged fish were monitored for 21 days. Dead fish were removed and subjected to bacteriological examination. For each treatment, three replicates and control groups were used. The relative percentage of survival (RPS) (Amend, 1981) was calculated to evaluate the efficacy of vaccination as:

RPS: \[1 - \left(\frac{\%{\text{mortality in vaccinated fish}}}{{\%}{\text{mortality in control}}}\right)\] x 100

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1 Received on August 18, 2008. Accepted for publication on May 14, 2009.
2 Faculty of Agriculture, Department of Fisheries, Bingol University, 23119 Bingol, Turkey. E-mail: uispir@yahoo.com
The mortality percentages and RPS obtained in the vaccination study was analysed using t-student test.

RESULTS

After challenge with cohabitants that were inoculated with Yersinia ruckeri, the relative percentage of survival (RPS) in all treatment groups was 83.3%, 86.7% and 74.6%, respectively. However, fish that took bath without levamisole (control group) showed 100% mortality (Table 1, Fig.1). The survival levels in the levamisole-bathed groups were significantly different (p<0.05).

Table 1. Mortality rates of rainbow trout after challenged

<table>
<thead>
<tr>
<th>Groups</th>
<th>Infected fish</th>
<th>Dead fish</th>
<th>Mortality rates (%)</th>
<th>Protection rates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental I</td>
<td>30</td>
<td>5</td>
<td>16.66</td>
<td>83.3±d</td>
</tr>
<tr>
<td>Experimental II</td>
<td>30</td>
<td>4</td>
<td>13.33</td>
<td>86.7±a,b,d</td>
</tr>
<tr>
<td>Experimental III</td>
<td>30</td>
<td>7</td>
<td>23.34</td>
<td>74.6a</td>
</tr>
<tr>
<td>Control</td>
<td>30</td>
<td>30</td>
<td>100.00</td>
<td>-</td>
</tr>
</tbody>
</table>

Fig. 1. Percentage cumulative mortality after the inoculation with Yersinia ruckeri on control and experiment groups.

DISCUSSION

A variety of immunomodulatory effects of levamisole has been established in higer vertebrates. Among the most widespread effect seems to be enhancement of non-specific and specific immunity. The patterns of assays for the non-specific defence factors, the specific immune response and challenge tests all correlated with one another, strongly suggesting some relationship (Jeney & Anderson 1993). The results presented in this paper show that Rainbow trout can be successfully vaccinated against infection of Yersinia ruckeri by bath of different doses of levamisole. A significantly lower mortality was achieved in all vaccinated groups than control, the fish were challenged with dose containing 9.6x10⁶ cells ml⁻¹ of Y. ruckeri.

After treatment with levamisole several fish species showed enhanced resistance to on experimental challenge with pathogenic bacteria. The use of levamisole with vaccines to increase the efficacy of the immune response against pathogenic microorganisms (Anderson & Jeney 1992, Jeney & Anderson 1993, Mulero et al. 1998, Sahoo & Mukherjee 2002).

In this study all groups of fish given a bath treatment of levamisole had increased response against Y. ruckeri infection when compared to control fish. In those circumstances where the capacity to mouth an immune response may be adequate to ensure improved protection.

REFERENCES
