

How do different periods of administration of dietary prebiotic supplements affect the immune cell activity of vimba bream juveniles?

Barbara Kazuń¹, Joanna Małaczewska², Krzysztof Kazuń¹, Rafał Kamiński^{1*}, Justyna Sikorska¹, Jacek Wolnicki¹

¹ National Inland Fisheries Research Institute (NIFRI), Olsztyn, Poland; r.kaminski@infish.com.pl

² University of Warmia and Mazury in Olsztyn, Poland

Feeding fish with diets supplemented with polysaccharides is increasingly important part of routine preventive procedures in aquaculture. However, there are few publications addressing the issue of side effects caused by long-term use of immunostimulants, and the results obtained are often contradictory. In our study, we determined the effects of three commercial prebiotics dedicated to fish (Leiber® Beta-S, Biolex® MB40 (Leiber), CeFi® Pro (Leiber)) and Orafti GR inulin (Beneo-Orafti SA, Hortimex) on the immune response of juvenile vimba bream (*Vimba vimba*) when administered for 55 days. Our study showed that such long-term administration of all prebiotics tested weakened innate cellular immunity, as evidenced by a significant decrease in respiratory burst activity of head kidney phagocytes (RBA).

In another study, we used Leiber® Beta-S to determine after what period of administration immunosuppression occurs. Vimba bream juveniles received feed supplemented with this prebiotic (BS group) for 2, 4 or 8 weeks. Two-week treatment had a beneficial effect on the activity of fish head kidney phagocytes (PKA). Longer administration of glucans resulted in a gradual decrease in cell activity as compared to the control group (Table 1). After 4 weeks, RBA and PKA in the BS group reached levels similar to those in the control group, while pinocytic activity was significantly lower. After 8 weeks of treatment, RBA and pinocytic activity were significantly lower in the BS group compared to the control group, and T-lymphocyte proliferative activity was also significantly lower, which was not affected by short-term administration of glucan-supplemented feed.

Our results confirm that short-term oral administration of glucans to fish has the expected immunostimulating effect, but its excessive prolongation may have the opposite effect. This is finding seems important in animal nutrition, where glucans are increasingly used as a permanent component of the diet.

Table 1. The head kidney immune cells activity in juvenile vimba bream fed commercial dry diet (Control) or the same diet supplemented with Leiber® Beta-S (BS)

Parameter	Control	BS
After 2 weeks		
Pinocytic activity	100.0 ± 8.1	120.7 ± 6.8*
RBA	1.269 ± 0.065	1.566 ± 0.129*
PKA	1.310 ± 0.105	1.570 ± 0.107*
MTT ConA	1.485 ± 0.05	1.486 ± 0.118
MTT LPS	1.006 ± 0.037	1.045 ± 0.146
After 4 weeks		
Pinocytic activity	100.0 ± 14.2	71.1 ± 5.0*
RBA	1.516 ± 0.153	1.527 ± 0.429
PKA	1.500 ± 0.115	1.431 ± 0.316
MTT ConA	2.161 ± 0.223	1.952 ± 0.110
MTT LPS	1.645 ± 0.144	1.521 ± 0.171
After 8 weeks		
Pinocytic activity	100.0 ± 8.0	71.7 ± 14.9*
RBA	1.803 ± 0.149	1.482 ± 0.091*
PKA	1.434 ± 0.093	1.293 ± 0.166
MTT ConA	2.165 ± 0.229	1.358 ± 0.314*
MTT LPS	1.345 ± 0.319	1.221 ± 0.264

* $p < 0,05$; pinocytic activity of the head kidney phagocytes (% of ingested NR); RBA - respiratory burst activity of head kidney phagocytes (SI); PKA - potential killing activity of head kidney phagocytes (SI); MTT ConA - proliferative response of head kidney lymphocytes stimulated by ConA (SI); MTT LPS - proliferative response of head kidney lymphocytes stimulated by LPS (SI)

