

**CHARACTERIZATION OF THE IMPACT OF REARING DENSITY
ON THE RESPONSES OF YELLOW PERCH, *PERCA FLAVESCENS*,
TO SUBSEQUENT INFLAMMATORY CHALLENGES**

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EXTENDED ABSTRACT ONLY - DO NOT CITE

Yellow perch (*Perca flavescens*) aquaculture in the United States is characterized by wide variation in intensity, ranging from extensive pond culture to intensive rearing systems. Increasingly, high-density intensive aquaculture operations are being used to rear yellow perch but little information is available on the impact of chronic rearing density stressors on their responses to subsequent challenges. The objective of these studies was to determine the impact of rearing density on the responses of yellow perch to an acute inflammatory challenge.

In our first experiment we injected yellow perch with bacterial lipopolysaccharide (LPS; 3 mg/kg) to induce an acute inflammatory response and sampled plasma from these fish at 1.5, 3, 6, and 22 h after injection. Plasma was assayed for cortisol to examine the glucocorticoid response associated with the inflammatory challenge over time. The responses of LPS-injected fish were compared with those of saline-injected fish and fish that were handled but not injected. At 6 h following injection LPS-injected fish had

significantly larger amounts of cortisol in the plasma than both groups of control fish (Figure 1); the 6-h interval was then used for subsequent tests as representative of a phenomena unique to LPS injections rather than handling.

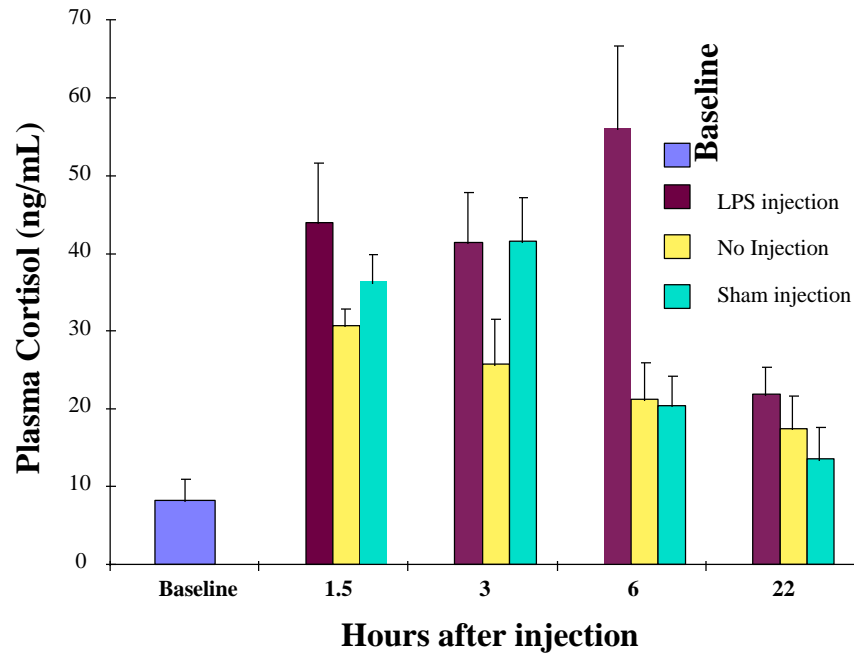


Figure 1. Concentrations of cortisol in the plasma from yellow perch at intervals after injection with 3 mg LPS/kg fish weight, a sham injection with saline, and by handling alone.

In our second experiment we held groups of yellow perch at two rearing densities (8 kg/m³ or 16 kg/m³) for 3, 7, or 14 d. Two groups of high density fish were maintained; fish held at high density for the assigned duration and immediately injected with LPS (HD) and fish held at high density for the assigned duration but allowed to recover at reduced density for 24 h before injection (HDR). At each duration we sampled fish and collected plasma before injection and 6 h after an intraperitoneal injection of LPS (3 mg/kg fish weight).

Rearing density treatments altered the responses of these fish to LPS injection. After 3 and 7 d of rearing at the different densities, fish from the HDR group appeared the most responsive to LPS injections (Figure 2). After 3 d of rearing the mean concentration of cortisol in the plasma from fish in the low density group (LD) was 94.7 ng/mL which was significantly smaller than that observed in the HDR fish, 166 ng/mL (Figure 2). After 7 d of rearing, HD fish had significantly smaller concentrations of cortisol in the plasma than HDR fish, 125 ng/mL versus 165 ng/mL (Figure 2). After 14 d of rearing, fish reared at the lowest density appeared most sensitive to the LPS injection and had significantly larger amounts of cortisol in the plasma than high density fish, 77.5 versus 127 ng/mL (Figure 2).

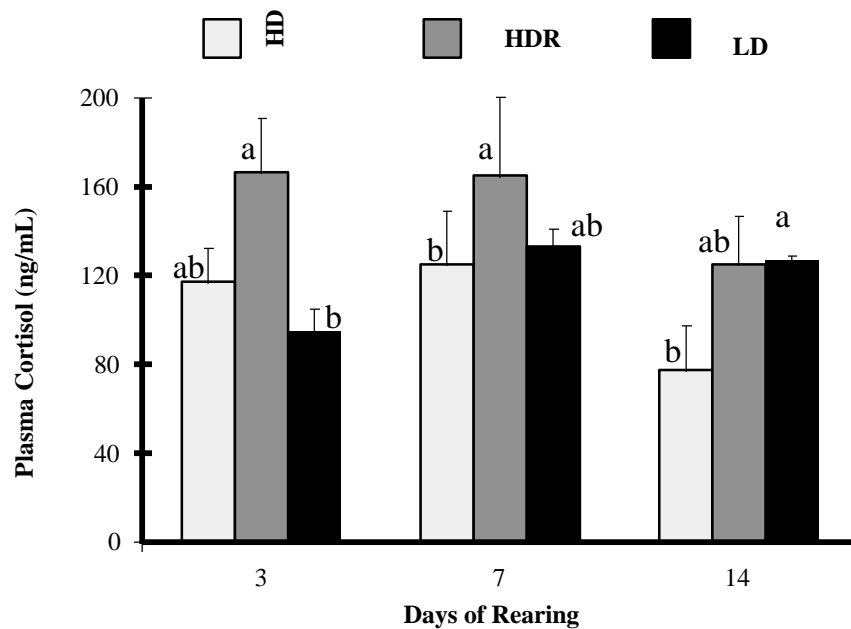


Figure 2. Concentrations of cortisol 6 h after injection with 3 mg LPS/kg fish weight for groups of yellow perch reared at 8 and 16 kg/m³: low density (LD), high density (HD), and high density followed by 24 h recovery at reduced density before injection of inflammatory challenge

(HDR). Within each of the intervals, bars shown with similar letters did not differ significantly ($P < 0.05$)

These data demonstrate that fish reared at different densities differ in their response to an acute inflammatory challenge. In other evaluations conducted in our laboratory, walleye (*Stizostedion vitreum*), showed a similar pattern by responding with a reduced response to an inflammatory challenge when reared at high density for 14 d. Presently, we are assaying neurotransmitters in the brains of the yellow perch described above to determine if there is a correlation between monoaminergic activity and changes observed in the glucocorticoid response following an inflammatory challenge.

Acknowledgments

We thank students Justin Sipiorski, Dan James, and Catherine Sykes for their technical assistance throughout the course of these experiments.

