

## Stress-Induced Changes in Cell Titer of Crayfish Hemolymph

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Cell titer in peripheral hemolymph of crayfishes rises in less than one hour after administration of stress. The stress may be wounding or handling of the animals.

It is a well known fact, that the hemocyte titer in crustacean hemolymph varies greatly according to the moulting stage, feeding, temperature and other factors<sup>1,2</sup>. We observed, that there is also a short-range regulation of hemocyte titer in peripheral hemolymph of crayfishes.

The cell titer in hemolymph samples, taken by incision of the thin cuticle at the coxal joints, rises upon administration of stress. This stress may be a first withdrawal of hemolymph or simply removal and gathering of the crayfishes from water (Fig. 1). The degree of titer increase is obviously dependent on the state of the animal (feeding, date of capture etc.), since it is not consistent in all animals.

This rise in the cell titer is quicker than one would expect if it was caused by production of new cells and it seems that there is a release of cells from a reservoir. The result in group D shows that the increase in cell number can not be explained only as a reaction to a direct chemical stimulus resulting from damaged tissue or coagulating blood

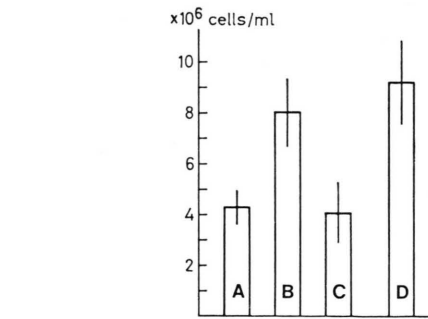


Fig. 1. Cell titer in the hemolymph of the crayfish *Orconectes limosus* R. before and after administration of stress. Shown is the mean value with the standard error. A. Control group ( $n=13$ ); B. 40 min after a first withdrawal of blood ( $n=10$ ); C. Same group after one day ( $n=9$ ); D. Group of animals stressed for 1.5 hours by putting together in a dry basin ( $n=10$ ). Differences between (A) and (B) or (A) and (D) are significant; with a  $p=0.02$  and  $p < 0.01$  respectively.

cells. So the participation of the central nervous system is very likely. The question arises whether the reaction is hormone-mediated and if this is related to the stress-induced hyperglycemia in crustaceans, for which a contribution of the neurosecretory complex in the eyestalk could be shown<sup>3</sup>.

The biological significance of the reaction may lie in there being a greater probability of being wounded in "dangerous" situations and therefore a need for a good functioning hemolymph coagulation system. It is known that there exists a relation between hemocyte titer and ability of the hemolymph to coagulate (lit. 2, and unpublished observations by the author).

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<sup>1</sup> N. Schulz, Handbuch der vergleichenden Physiologie (H. Winterstein, ed.), Vol. I, pp. 669–746, 1925.

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<sup>3</sup> L. H. Kleinholz, V. J. Havel, and R. Reichart, Biol. Bull. **99**, 454 [1950].

