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CONCENTRATION OF GONADOTROPIN-RELEASING HORMONES IN BRAIN OF LARVAL AND METAMORPHOSING LAMPREYS OF TWO SPECIES WITH DIFFERENT ADULT LIFE HISTORIES

J.H. Youson,[1] M. Docker,[2] and S.A. Sower.[3]

[1]Division of Life Sciences, Scarborough Campus, University of Toronto, Scarborough, Ontario M1C 1A4; [2] Pacific Biological Station, Department of Fisheries and Oceans, Nanaimo, B. C. V9R 5K6; [3]Department of Biochemistry and Molecular Biology, University of New Hampshire, Durham, NH 03824.

Summary

GnRH-I and -III were found at all periods of the life cycle of L. richardsoni) and P.marinus but the values are much lower in the nonparasitic species. There is a higher GnRH-III: GnRH-I ratio during larval life and throughout early metamorphosis in both species but this situation is reversed during postmetamorphic intervals. An earlier increase in GnRH-I in L. richardsoni during metamorphosis might reflect the time of a major stimulus to the final development of the gonad and be a key event in dictating its nonparasitic adult life history.

Introduction

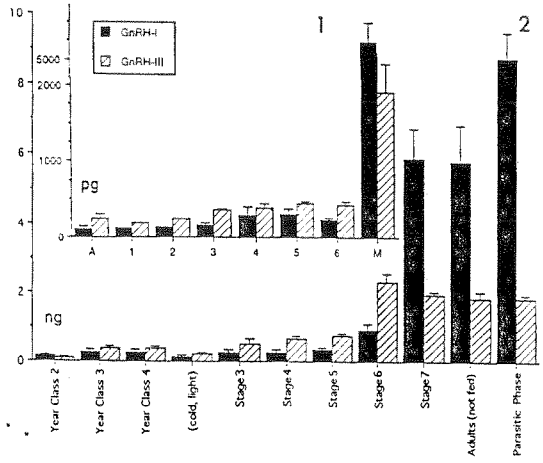
There are two adult life history types among lampreys, parasitic and nonparasitic, following metamorphosis. Whereas juveniles of parasitic species commence an interval of feeding and somatic growth with little gonadal maturation for 1-2 years, postmetamorphic individuals in nonparasitic species immediately begin sexual maturation without feeding. We wish to test the hypothesis that metamorphosis is the time when a variable stimulus to the reproductive system occurs which ultimately directs the adult life history type. We measured the concentrations of two forms of lamprey gonadotropin-releasing hormones (GnRH-I, Sherwood et al., 1986; GnRH-III, Sower et al., 1993) during larval life and metamorphosis of a nonparasitic (Lampetra richardsoni) and a parasitic (Petromyzon marinus) species.

Materials and Methods

Entire brains were extirpated, rapidly frozen on dry ice, extracted, and fractions from HPLC were assayed for the two GnRHs according to the method described in Fahien and Sower ('90) with modifications as in Youson and Sower (1991). The sensitivity of the RIA was 9.8 pg/tube and the range of binding was 36-43%. Data for hormone concentrations are presented as mean pg or ng/brain ± 1SE.

Results

Lamprey GnRH-I and -III were detected in all brain samples of both species (Figs. 1 and 2) but levels of these hormones were lower in the nonparasitic species. Particularly noteworthy were the detection of the GnRHs in all year classes of larval P. marinus. GnRH-III is the predominate GnRH in larvae and early metamorphosing individuals with GnRH-I concentration increasing during metamorphosis. The apparent equivalence in levels of GnRH-I and -III appears earlier (stage 4) in L. richardsoni than P. marinus (stage 6) but by the end of metamorphosis GnRH-I dominates in both species.



Figs. 1 and 2. Concentrations (mean pg or ng/brain±SE) of two GnRHs (I and III) in the brain at various stages in the life cycle of L. richardsoni (1) and P. marinus (2).

Discussion

In a previous study on anadromous P. marinus we showed that there were low levels of GnRH-I and an additional form of GnRH (now -III) in brains of larvae and early metamorphosing individuals (Youson and Sower, 1991). The relative values we provided indicate that GnRH-III is the dominant form of GnRH throughout larval life and at least in early metamorphosis. GnRH-I is the dominant adult form. The present investigation is the first to report GnRH concentrations in the brains of nonparasitic species but values are low when compared to similar-sized premetamorphic and nonfeeding adult P. marinus. Despite this difference, interspecific comparisons can be made on the timing of the onset of the adult-type profile of GnRH. Equivalent values of the GNRHs are reached and essentially maintained much earlier in L. richardsoni and this may be an indication of some earlier reproductive stimulus in the latter species.

References

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