

# Allatostatin Inhibits Vitellogenin Release in a Cockroach<sup>a</sup>

DAVID MARTIN, MARIA-DOLORES PULACHS, AND XAVIER BELLES

*Centro de Investigación y Desarrollo (CSIC), Jordi Girona 18, 08034 Barcelona, SPAIN*

In the cockroach *Blattella germanica* (L.) (Diptera, Blattellidae), vitellogenin is synthesized in the fat body under the influence of juvenile hormone. In our laboratory, the first vitellogenic cycle of *B. germanica* lasts 8 days, but whereas the juvenile hormone cycle peaks on day 6<sup>1</sup> that of vitellogenin peaks on day 4.<sup>2</sup> This indicates that the production of juvenile hormone does not modulate the cycle of vitellogenin, and that other effectors are involved in terminating vitellogenesis.<sup>3</sup> The present communication deals with a particular family of peptides that may contribute to this process.

## ALLATOSTATINS AND VITELLOGENESIS

Allatostatins with a typical YXFGI-amide C-terminus constitute a neuropeptide family that inhibits juvenile hormone production as well as gut motility.<sup>4</sup> However, the ubiquity of these peptides in the central and peripheral insect nervous system suggests that they may have other functions.

Recently, we isolated four allatostatins in *B. germanica*,<sup>5</sup> and we showed that at least one of them (Blast-2: DRL YSFGI-amide), in addition to inhibiting juvenile hormone production,<sup>5</sup> impairs vitellogenin release in the fat body.<sup>6</sup> Blast-2 inhibited vitellogenin release *in vitro* by fat bodies from 4-day-old females, and this effect appeared to be mediated by the inhibition of vitellogenin glycosylation.<sup>6</sup> These results suggest that allatostatins contribute to the termination of the vitellogenic cycle in *B. germanica*.

## NON-AMIDATED ALLATOSTATINS

Allatostatin deamidation at the C-terminus abolishes the inhibition of juvenile hormone production.<sup>4</sup> However, in a recent study of structure-activity relationships, we have tested the effect of non-amidated analogs on vitellogenin release and we have found that they are at least as active as the amidated allatostatins. TABLE 1 shows the case of Blast-2.

The cDNA that specifies the preproallatostatin precursor in the cockroaches *Diploptera punctata* and *Periplaneta americana*<sup>4</sup> contains certain sequences that apparently code for non-amidated allatostatin-like peptides. The present results suggest that it would be worth testing these peptides as inhibitors of vitellogenin release.

TABLE 1. Inhibition (%) of Vitellogenin Release in Periovaric Fat Bodies from 4-Day-Old Females of *B. germanica* Incubated for 3 hours in the Presence of Blast-2 or Non-amidated Blast-2<sup>a</sup>

Concentration	Blast-2	Non-amidated Blast-2
10 <sup>-3</sup> M	28.5 ± 5.6 (n = 8)	48.4 ± 6.6 (n = 6)
10 <sup>-6</sup> M	32.6 ± 6.7 (n = 8)	52.6 ± 5.7 (n = 9)*
10 <sup>-7</sup> M	33.5 ± 5.2 (n = 8)	33.6 ± 4.7 (n = 8)

<sup>a</sup>Values are expressed as the mean ± SEM. Asterisk indicates a significant difference (t test,  $p = 0.03$ ) between treatments. Methods were described elsewhere.<sup>6</sup>

## REFERENCES

- BELLÉS X., CASAS J., MESSEGUER A. & PULACHS M.D. 1987. *In vitro* biosynthesis of JH III by the corpora allata of adult females of *Blattella germanica* (L.). Insect Biochem. 17: 1007-1010.
- MARTÍN D., PULACHS M.D. & BELLÉS X. 1995. Patterns of haemolymph vitellogenin and ovarian vitellin in the German cockroach, and the role of juvenile hormone. Physiol. Entomol. 20: 59-65.
- BELLÉS X. Endocrine effectors in insect vitellogenesis. In Recent Advances in Arthropod Endocrinology. Coast G.M. & Webster S.G., Eds. Cambridge University Press, Cambridge, United Kingdom. In press.
- STAY B., TOBE S.S. & BENDENA W.G. 1994. Allatostatins: Identification, primary structures, functions and distribution. Adv. Insect Physiol. 25: 267-337.
- BELLÉS X., MAESTRO J.L., PULACHS M.D., JOHNSON A., DUVE H. & THORPE A. 1994. Allatostatin neuropeptides from the cockroach *Blattella germanica* (L.) (Diptera, Blattellidae). Identification, immunolocalization and activity. Reg. Pept. 53: 237-247.
- MARTÍN D., PULACHS M.D. & BELLÉS X. 1996. Inhibition of vitellogenin production by allatostatin in the German cockroach. Mol. Cell. Endocrinol. 121: 191-196.

<sup>a</sup>Financial support was received from the DGICYT, Spain (project No PB95-0067).