Recognition of very low concentrations of ATP by *Glossina tachinoides* Westwood

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Summary. Like many other blood feeders, *Glossina tachinoides* is stimulated to gorge by the presence of ATP in its diet. A concentration of 1.3×10^{-8} M ATP induces 50% feeding. The ability of *G. tachinoides* to detect ATP is the highest recorded so far among insects.
Key words. Tsetse flies; sensitivity to ATP; diet for mass-rearing.

A successful colony of *Glossina tachinoides* was recently established in the International Atomic Energy Agency's laboratories at Seibersdorf, Austria. The flies are maintained solely on fresh-frozen, thawed blood fed through a silicon membrane in a system previously described for *Glossina palpalis palpalis*[1]. As a standard procedure 10^{-3} M ATP is added to the thawed blood to secure a high percentage of engorgement by the flies. ATP is the most expensive component of the diet and attempts to reduce the price of the diet have been directed at optimizing the economy of its use. The significance of these efforts has received added emphasis because of the need to mass-rear *G. tachinoides* for use in tsetse control employing the sterile male technique.

Materials and methods. Teneral flies, 24–48-h old, were offered a series of concentrations of ATP, ADP or AMP, dissolved in water containing 0.15 M NaCl and 0.001 M $NaHCO_3$ and presented at 37 °C through a silicon membrane. After 15 min, percentage engorgement was determined and doses inducing 50% (ED_{50}) and 85% (ED_{85}) were calculated, using the log probit computerized procedure. The ED_{50} was used to compare gustatory sensitivity of *G. tachinoides* to that of other insects, while the ED_{85} is the dose which secures an effective level of feeding required to sustain satisfactory mass-rearing dynamics. As can be seen from the table, the ED_{50} of ATP for *G. tachinoides* females is 1.3×10^{-8} M while for the male it is 1.4×10^{-7} M. This level of sensitivity of detecting ATP is the highest recorded so far for any insect. It is about 40-fold higher than that of *Glossina palpalis palpalis*, and many orders of magnitude higher than that of *Rhodnius* or mosquitoes[2].

Part of the much higher sensitivity of *G. tachinoides* as compared to earlier data on *G. austeni*[3] and *G. morsitans*[4] can probably be attributed to the more suitable membrane used, as well as to the use of sodium bicarbonate which was found recently to have a very strong synergistic effect on the gorging response to ATP by mosquitoes[5,6].

Gorging response of *Glossina tachinoides* to adenine nucleotides*

Compound	No. flies	ED_{50} (μM)	ED_{85} (μM)
Females			
ATP	240	0.013 (0.007–0.024)	0.20 (0.10–0.42)
ADP	210	0.063 (0.034–0.15)	1.30 (0.50–3.8)
AMP	135	69.5 (36.4–133)	1060 (308–3640)
None	105	27% fed	
Males			
ATP	180	0.14 (0.12–0.19)	0.56 (0.31–1.02)
None	30	7% fed	

* Figures in parentheses are 95% confidence limits.

Of the three nucleotides tested with females ATP was by far the most effective. AMP is a cheaper compound but 5000-fold higher concentration is required to replace ATP, thus the use of this compound is surely not economic.

The ED_{85} of ATP is 2×10^{-7} M for females or 3.5×10^{-7} M for both sexes; an addition of 10^{-6} M ATP to the standard diet can secure 100% feeding, and would save more than 99% of the ATP used in the current diet regime.

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Symbioramide, a novel Ca^{2+}-ATPase activator from the cultured dinoflagellate *Symbiodinium* sp.

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Summary. A novel sphingosine derivative, symbioramide, has been isolated from the laboratory-cultured dinoflagellate *Symbiodinium* sp. as a sarcoplasmic reticulum (SR) Ca^{2+}-ATPase activator, and its structure elucidated to be **1** on the basis of spectral and chemical means.
Key words. Dinoflagellate; symbioramide; *Symbiodinium* sp.; ceramide; Ca^{2+}-ATPase activator.

Recently, ceramides, already known as constituents of nerve tissue hydrolysates of mammalians[2], were isolated from extracts of some marine organisms such as sponges[3] or green[4] or red[5] algae. During our studies on bioactive substances from marine sources[6–9], we investigated extracts of the cultured dinoflagellate *Symbiodinium* sp. isolated from the