Table 1. *$\bar{M}_w$ and $\bar{M}_n$ of cetomacrogol micelles in aqueous solution*

Temperature °C	Weight average micellar weight (light scattering)	Number average micellar weight (osmometry)
18	101,000*	
25	108,000	103,000
36	110,000	106,000

* Elworthy (1960).

The differences between the two sets of values do not exceed 5%, indicating no significant discrepancy within the error of experimental technique. Thus the micelles are monodisperse or have a very narrow range of sizes.

We thank the Science Research Council for the award of a Research Studentship to S. B. K.

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Effect of tyramine and octopamine on lipolysis in isolated fat cells of the rat

Injection of tyramine increases plasma free fatty acid (FFA) levels in man (Mueller & Horwitz, 1962), in rats (Stock & Westermann, 1965) and in guinea-pigs (Maier, Maitre & Staehelin, 1967). The present study shows that tyramine and its metabolite, octopamine (Musacchio & Goldstein, 1963), has little direct lipolytic action, and in high concentration reduces noradrenaline-induced lipolysis in isolated rat fat cells.

Male Holtzman rats, 180–220 g, were fasted overnight and killed. Immediately after the epididymal fat pads were removed, and the fat cells prepared by a slight modification (Nakano, Ishii & others, 1968) of the method described by Rodbell (1964). The isolated fat cells, suspended in Krebs-Ringer-bicarbonate buffer (pH 7·4) containing 3% bovine albumin (gassed with 5% carbon dioxide in oxygen), were incubated in a temperature-controlled bath shaker (37°) with noradrenaline, tyramine or octopamine for 1 h. Then the FFA concentration of an aliquot of the mixture was determined (Duncombe, 1963). Triglyceride content of fat cells was measured by van Handel & Zilversmit's method (1957).

Table 1. *Effect of noradrenaline, tyramine and octopamine on free fatty acid release from isolated rat fat cells*

	Free fatty acid release (μmol/h g^{-1} triglyceride) at concentration (M):				
	0	$5{\cdot}9 \times 10^{-9}$	$5{\cdot}9 \times 10^{-8}$	$5{\cdot}9 \times 10^{-7}$	$5{\cdot}9 \times 10^{-6}$
Noradrenaline	$3{\cdot}6 \pm 0{\cdot}2$	$4{\cdot}8 \pm 0{\cdot}3$*	$14{\cdot}5 \pm 0{\cdot}5$*	$48{\cdot}5 \pm 0{\cdot}7$*	—
Tyramine	$4{\cdot}9 \pm 0{\cdot}3$	$4{\cdot}8 \pm 0{\cdot}5$	$5{\cdot}0 \pm 0{\cdot}6$	$6{\cdot}1 \pm 0{\cdot}4$*	$13{\cdot}2 \pm 0{\cdot}6$*
Octopamine	$4{\cdot}5 \pm 0{\cdot}5$	$4{\cdot}3 \pm 0{\cdot}3$	$4{\cdot}9 \pm 0{\cdot}7$	$6{\cdot}8 \pm 0{\cdot}6$*	$15{\cdot}1 \pm 0{\cdot}7$*

The numerical values in each column represent mean ± s.e.
* $P < 0{\cdot}05$.

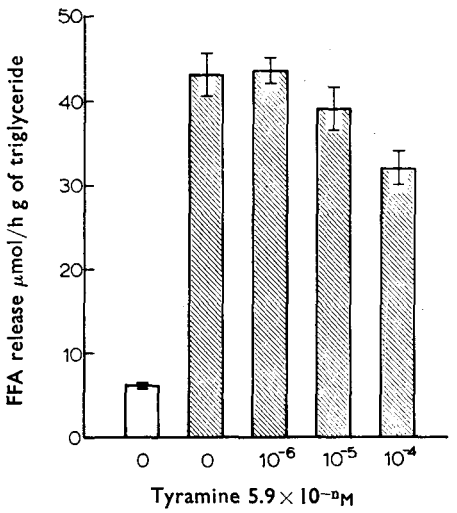

FIG. 1. Effect of tyramine on pyrolysis induced by noradrenaline, $5{\cdot}9 \times 10^{-7}$M in rat isolated fat cells. Bars represent the mean ± s.e.

Data in Table 1 show that $5{\cdot}9 \times 10^{-9}$ to 10^{-7} M noradrenaline increased markedly the FFA release from the fat cells. On the other hand, $5{\cdot}9 \times 10^{-9}$ to $5{\cdot}9 \times 10^{-8}$ M tyramine and octopamine did not produce lipolysis although higher concentrations ($5{\cdot}9 \times 10^{-7}$ to 10^{-6} M) increased FFA release slightly but significantly ($P < 0{\cdot}05$). Fig. 1 shows that the effect of $5{\cdot}9 \times 10^{-6}$ to 10^{-4} M tyramine on noradrenaline (10^{-7} M)-induced FFA release from the fat cells. Concentrations less than $5{\cdot}9 \times 10^{-5}$ M of tyramine did not influence significantly the noradrenaline-induced FFA release from the isolated rat fat cells. However, tyramine, 1×10^{-4} M, decreased significantly the noradrenaline-induced lipolysis.

Stock & Westermann (1965) showed that the subcutaneous injection of 5 mg/kg of tyramine increased plasma FFA concentrations in rats. They ascribed tyramine-induced lipolysis *in vivo* to the release of noradrenaline from the adrenergic nerve endings (Burn & Rand, 1958), since the blockade of noradrenaline release from the storage sites with cocaine or its depletion by pretreatment with syrosingopine reduced markedly or blocked completely the lipolytic action of tyramine. The present study shows that only concentrations greater than 1×10^{-7} M of tyramine or octopamine directly increased FFA release from the isolated rat fat cells. In addition, only concentrations of 10^{-4} M of tyramine significantly reduced noradrenaline-induced lipolysis. The magnitude of the direct lipolytic action of tyramine and octopamine is approximately 1/100 of that of noradrenaline. The present observations do not appear to be in disagreement with those made previously. *In vivo*, the doses of

tyramine given by other workers would not have interfered with the lipolytic action of the endogenous noradrenaline it released, because the lipolytic action of tyramine caused by it releasing noradrenaline is apparent at concentrations lower than those at which tyramine modifies its response to added noradrenaline.

This work was supported by Research Grant from U.S. Public Health Service (HE 11848).

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Effect of capsaicin on the guinea-pig isolated atrium

Capsaicin (decanoic acid vanillylamide), the pungent principle present in various species of capsicum, is recognized as one of the most active substances in causing excitation of sensory nerve endings. In the cat or dog, circulatory and respiratory effects like hypotension, bradycardia and apnoea are especially pronounced. Since these symptoms occur when capsaicin is injected intravenously but are abolished by vagotomy, the mechanism of these effects is generally believed to be the result of stimulation of the chemo- or stretch receptors in the lung or coronary regions. Additional experiments are needed to fully elucidate this mechanism (Pórszász, György & Pórszász-Gibiszer, 1955; Coleridge, Coleridge & Luck, 1965; Mitchell, Dwarka & Stephen, 1967; Molnár & György, 1967; Molnár, Makara & György, 1967).

In studying the effects of thiamine derivatives on the guinea-pig atrium, Fujiwara & Fukuda (1969) discovered that the extract of *Capsicum annuum* caused a marked increase in the heart rate and enhanced the contraction of the atrium in a manner similar to adrenaline and that this action is due to capsaicin, an ingredient of *Capsicum annuum*.

Guinea-pigs, either male or female, 250 to 300 g were bled out by cutting the common carotid arteries without severing the vagi. The heart was quickly removed and immersed in oxygen saturated Locke-Ringer solution of the following composition (mM): NaCl 154, KCl 56, $CaCl_2$ 2·2, $NaHCO_3$ 2·4, and glucose 5·6 in 1 litre of distilled water. After the extraneous tissues were removed the atrium was suspended in a 50 ml bath containing Locke-Ringer solution aerated with oxygen at 30° and spontaneous contractions of the atrium recorded with an isotonic lever. After the beat of the atrium reached equilibrium, each drug was administrated into the bath. Pure crystalline capsaicin (Kusuge, Inagaki & Uehara, 1958) from the fresh fruits of *C. annuum* var *parvo-acuiminatum* Makino, was used in the experiment. As capsaicin was not readily soluble in water, the reagent was prepared as follows: capsaicin