

The effect of amphetamine on glucose uptake into the rat isolated hemidiaphragm

While it is generally assumed that the anti-obesity action of the amphetamine group of drugs depends largely on their anorexic effect, a peripheral action on glucose uptake has been described by Butterfield & Whichelow (1968) and Turtle & Burgess (1973) who found fenfluramine to produce a significant increase in glucose uptake into the human forearm. However, Garrow, Belton & Daniels (1972) were unable to demonstrate this effect. Fenfluramine and norfenfluramine cause an increase in glucose uptake by the rat isolated hemidiaphragm preparation (Kirby & Turner, 1974), but we have now found that this does not occur with the racemate or other isomer of amphetamine which suggests that there is a different mode of action between fenfluramine and amphetamine in this preparation.

Wistar rats of either sex, initially weighing 100–130 g were fasted for 24 h before death. The diaphragms were prepared according to Frayn & Adnitt (1972). They were incubated at 37° for 90 min in Krebs-bicarbonate buffer, containing 100 μ U ml⁻¹ insulin, 2 mg ml⁻¹ bovine serum albumin (to prevent absorption of insulin onto the glass) and 3 mg ml⁻¹ glucose. In addition, the medium for one half of the diaphragm contained (\pm)-, (+)- or (-)-amphetamine (10, 100 or 1000 ng ml⁻¹). At the end of each incubation, the residual glucose in the medium was estimated using a glucose oxidase method; the glycogen content of the tissue was also determined (Frayn & Adnitt, 1972). Uptakes of glucose by the tissue expressed as mg taken up per fresh weight of tissue in 90 min were then compared on a within rat basis and the percentage change between the treated and the untreated hemidiaphragm calculated.

The glucose uptake as mg g⁻¹ fresh weight of tissue in the presence of the amphetamines did not differ significantly from the control values (8–10 mg g⁻¹ tissue; n = 10 for each form of drug). This differs markedly from the results with fenfluramine where 100 ng caused a 40% increase in glucose uptake (Kirby & Turner, 1974). There was no significant effect on glycogen content with any isomer at any dose. These results suggest that the anti-obesity action of amphetamine and fenfluramine may be different, particularly in this peripheral effect.

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