

## Incorporation of [ $^{14}\text{C}$ ] amino acid precursors into adipose-tissue protein: An insulin stimulation not involving glucose or amino acid transport

Insulin has been found to stimulate incorporation of  $^{14}\text{C}$  of [ $3\text{-}^{14}\text{C}$ ]pyruvate or [ $1\text{-}^{14}\text{C}$ ]-acetate into adipose-tissue protein (Table I). This effect is not concerned with the rate of glucose transport<sup>1</sup>, as no glucose was added to the incubation medium, nor with amino acid transport from medium to intracellular phase<sup>2</sup>, as the [ $^{14}\text{C}$ ]amino acid was formed intracellularly; the effect was to some degree specific for amino acid metabolism since incorporation of  $^{14}\text{C}$  from pyruvate into the lipid was not significantly increased under these conditions. In concurrent experiments with rat diaphragm muscle<sup>3</sup> similar results have been obtained. These findings are consistent with a general concept of insulin action which includes enhancement of amino incorporation into protein and facilitation of glucose and amino acid transport as separate special cases<sup>4</sup>.

TABLE I

INCORPORATION OF  $^{14}\text{C}$  FROM [ $3\text{-}^{14}\text{C}$ ]PYRUVATE OR [ $1\text{-}^{14}\text{C}$ ]ACETATE INTO  
PROTEIN AND LIPID OF RAT EPIDIDYMAL ADIPOSE TISSUE.

The two fat pads (300–400 mg) from a non-fasting Holtzman rat were incubated with shaking for 2 h at  $37^\circ$  in 1 ml Krebs-Henseleit bicarbonate buffer containing sodium pyruvate (1.5 mg/ml) without or with 0.01 unit insulin/ml. In the [ $1\text{-}^{14}\text{C}$ ]acetate experiments, acetate was also added to a total concentration of 3 mg/ml. The protein was isolated<sup>5</sup>, using 20 mg bovine albumin as carrier, from the residue of the lipid<sup>6</sup> extraction. The results are expressed as  $10^3$  counts/min incorporated/g wet adipose tissue.

Radioactive amino acid precursor* added	$10^3$ counts/ min/ml medium	Protein		Lipid	
		No insulin	With insulin	No insulin	With insulin
[ $3\text{-}^{14}\text{C}$ ]pyruvate	$4.4 \cdot 10^2$	$13.2 \pm 0.5$ (9) **	$17.2 \pm 0.5$ (9)	$252 \pm 9$ (9)	$222 \pm 9$ (9)
[ $1\text{-}^{14}\text{C}$ ]acetate	$1.6 \cdot 10^3$	$2.0 \pm 0.1$ (12)	$2.7 \pm 0.1$ (12)	$74 \pm 6$ (12)	$89 \pm 4$ (12)

\* The final protein samples were hydrolysed and the amino acids separated chromatographically<sup>7</sup>; the  $^{14}\text{C}$  of [ $3\text{-}^{14}\text{C}$ ]pyruvate was found chiefly in alanine.

\*\* S.E., no. of samples in parentheses. The difference between protein samples from control and insulin-treated tissues was in each case significant to  $P < 0.001$ .

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