

HEPATIC FUTILE CYCLES IN LEAN AND OBESE ZUCKER RATS

D.G. CLARK* and M. BRINKMAN*

Although futile cycles have been demonstrated in liver, muscle and adipose tissue from a variety of animals it is still not known whether these reactions are primarily concerned with heat production, metabolic regulation or wastage of ATP. James & Trayhurn have suggested that reduced activity of these cycles, in particular the fructose 6-phosphate: fructose 1,6-diphosphate cycle in muscle and liver and the glucose: glucose 6-phosphate cycle in hepatic tissue, would render some animals more efficient metabolically and hence more likely to become obese.

In order to test part of this hypothesis hepatocytes from *ad libitum* fed lean and obese Zucker rats were incubated with glucose labelled uniformly with ^{14}C and specifically with tritium at positions -1, -2, -3, -5 and -6.

At the conclusion of the experiment the incorporation of ^{14}C and/or ^3H into lactic acid, pyruvic acid, amino acids, carbon dioxide and water was determined. The yield of water from [2- ^3H] glucose, in hepatocytes from the obese rats, was about 45% greater than that from [1- ^3H] and [6- ^3H] glucose (Table 1). This demonstrates that the obese animals have an active glucose:glucose 6-phosphate futile cycle but it is not significantly less than that of the lean animals (Table 1).

Table 1. The metabolism of [1,2,3,5 or 6- ^3H] glucose by hepatocytes from lean and obese Zucker rats

	†Yield of ^3H in $^3\text{H}_2\text{O}$ from				
	[1- ^3H] μg atom $^3\text{H}/100$ mg defatted dry wt. of cells/h.	[2- ^3H]	[3- ^3H]	[5- ^3H]	[6- ^3H]
Lean Zucker	17.4	28.7	19.8	24.1	18.1
Obese Zucker	19.1	28.1	20.3	24.1	19.9

†Mean of four experiments

Under the conditions of these experiments it appears that the hepatic glucose:glucose 6-phosphate futile cycle does not differ significantly in hepatocytes from lean and obese animals.

REFERENCE

JAMES, W.P.T., & TRAYHURN, P. Lancet, 1976, *i*, 770.

* CSIRO Division of Human Nutrition, Kintore Avenue, Adelaide, S.A. 5000.