THE METABOLISM OF PARAFFINS IN RATS

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Received 2 November 1970

1. Introduction

Recently we reported the occurrence of paraffins in both bovine and human cardiac muscle [1, 2]. Such *n*-alkane homologous series were also identified in animal brain by Cain et al. [3] and Dannenberg and Richter [4]. So far as we are aware no metabolic changes of paraffins in the human or mammalian body are known. In this paper we report the metabolism of 1-^{14}C-*n*-octadecane in rats.

2. Results and discussion

A paraffin emulsion (0.5 ml) was administered to rats (average weight 250 g) both perorally and intravenously. The ^{14}C-radioactivity of the given emulsion ranged from 10–20 μCi and was composed of 50 mg *n*-octadecane (Schuchard, Munich), 50 mg cremophor EL (BASF, Ludwigshafen), 10–20 μCi (specific activity 21 mCi/mmole) of 1-^{14}C-*n*-octadecane (The Radiochemical Centre, Amersham) and 0.5 ml of tap water.

Two hours after the administration of *n*-octadecane rats were sacrificed but each 30 min during this time the expired $^{14}CO_2$ was determined (table 1). The expired carbon dioxide was absorbed in 3 ml of Hyamine 10-X, diluted with 20 ml of toluene scintillator (5 g PPO and 0.5 g of DM-POPOP in 1000 ml of toluene) and measured in a Packard Tricarb Instrument. Hyamine hydroxide 10-X, PPO and DM-POPOP were products of The Packard Instrument International Co., Zurich.

Table 1
Radioactivity of $^{14}CO_2$ in the expired air.

	dpm administered	Total dpm after minutes			
		30	60	90	120
Peroral	20×10^6	1,700	8,150	30,450	83,950
Intravenous	36×10^6	2,120	42,920	86,390	154,320

The presence of the $^{14}CO_2$ in the expired air shows that the rat is able both to absorb and to metabolise *n*-octadecane. Only a small part of the administered *n*-octadecane was absorbed from the rat's intestine, but once absorbed, *n*-octadecane was rapidly broken down to carbon dioxide.

In further experiments the distribution of the radioactivity in particular organs was studied. As shown in table 2, the radioactivity was present in all tissues investigated. Most of the ^{14}C activity was present in the liver. Additional analyses of liver lipids showed that *n*-octadecane was incorporated into fatty acids, especially into fatty acids of lecithine. Details on the incorporation of *n*-octadecane into fatty acids will be reported in the forthcoming paper. After intravenous administration of 1-^{14}C-*n*-octadecane (table 2) the spleen showed an extremely high radioactivity (dpm/100 mg). Thus rats are able to metabolise *n*-octadecane.

Acknowledgements

The author was supported by a fellowship from the Alexander von Humboldt Stiftung, West Germany. He is very obliged to Prof. Dr. H.Wagner for his interest and for the permission to work at the Institut für Pharmazeutische Arzneimittellehre, Universität München, and to Dr. J.Hölzl for his helpful suggestions.

Table 2
Distribution of ^{14}C radioactivity. Administration of 1-^{14}C-*n*-octadecane: perorally 20×10^6 dpm, intravenously 36×10^6 dpm.

Tissue	Weight (g)	Administration	dpm / 100 mg	dpm / total	dpm (%)
Liver	11.54	p.o.	21,500	248,000	1.28
	8.95	i.v.	132,000	11900,000	33.0
Spleen	0.61	p.o.	2,920	17,800	0,09
	0.52	i.v.	590,000	3000,000	8.3
Heart	0.88	p.o.	3,750	33,000	0.16
	0.65	i.v.	123,000	800,000	2.0
Kidney	3.58	p.o.	1,790	64,000	0.32
	3.51	i.v.	26,700	900,000	2.5
Lung	1.48	p.o.	4,120	61,000	0.30
	0.65	i.v.	91,500	600,000	1.7
Brain	0.82	p.o.	857	7,000	0.03
	0.60	i.v.	47,800	300,000	0.8
Fat*	15	p.o.	8,800	132,000	0.66
	15	i.v.	43,400	6500,000	18.0
Blood** serum	9 (ml)	p.o.	8,800	132,000	0.66
Blood**	15 (ml)	i.v.	69,500	10400,000	28.7
Stomach	2.82	p.o.	21,200	60,000	0.30
Intestine	9.87	p.o.	49,000	483,000	2.41

* Total fat was calculated as 6% of the body weight.
** Total blood was calculated as 6% of the body weight. Blood serum was calculated as 60% of total blood.

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