Little effect on the fluorescence of epinephrine was noted.

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Digestibility of Uniformly Labeled Carbon-14 Soybean Cellulose in the Rat

Reports in the literature on the fate of ingested cellulose in nonruminant animals and man present a confusing picture. Some workers (*1*) state that digestion, or utilization, of cellulose takes place to an extent varying from 1.5 to 97 percent of the ingested cellulose, while others (*2*) conclude that cellulose cannot be utilized at all. The present isotope study was undertaken in an attempt to resolve these discrepancies.

Uniformly labeled C^{14}-cellulose was prepared from defatted C^{14}-labeled soybean meal. Protein was removed from the meal by thorough extraction, first with cold water, then with 10-percent aqueous sodium hydroxide. Hemicelluloses were further extracted with 10-percent aqueous potassium hydroxide, and the residue was washed successively with water, ethanol, and ether. The dried product (specific activity, 9060 count/min mg) was used in the feeding experiment. This material contained less than 1 percent of protein and yielded no reducing sugars after 6 hours' hydrolysis in 2*N* sulfuric acid at 95°C. Since cellulose is the only major non-nitrogenous constituent present in defatted soybean meal which shows these solubility characteristics and this resistance to acid hydrolysis, the material was considered to be essentially pure cellulose.

Four growing male albino rats (Sprague-Dawley), weighing from 120 to 180 g, were selected for the feeding experiment. During the 4 days preceding the administration of labeled cellulose, the rats were fed by stomach tube a diet consisting of casein (20 percent), starch (61.5 percent), Wesson oil (10 percent), cellulose (4 percent), minerals (4 percent), and vitamins (0.5 percent). This diet was mixed with water in a ratio of 1:6 by weight to facilitate the stomach-tube feeding and was supplemented by a standard diet and water ad libitum.

Following the conditioning period, the rats were placed in metabolism cages attached to gas trains for collection of urine, feces, and expired CO_2. The above diet, with C^{14}-labeled cellulose in place of the nonradioactive cellulose, was fed by stomach tube 3 times daily; a total of 15 to 17 g of the diet-water mixture was thus administered each day for 3 days. A carmine marker mixed with the final C^{14}-cellulose feeding marked the final excretion in the feces of labeled material.

Urine, feces, and expired CO_2 were collected for each rat during the time spent in the metabolism cages. Immediately upon removal from the metabolism cages, the rats were sacrificed, with ether, and the carcasses, plus viscera, were frozen in liquid nitrogen and ground in the frozen state in a burr mill to obtain a carcass homogenate.

All of the homogenized, dried samples, with the exception of urine, were analyzed for C^{14} content by combusting to CO_2 and counting the labeled CO_2 as precipitated barium carbonate. After the dried feces were counted, this material was extracted by the Soxhlet method for 24 hours with petroleum ether (40 to 60° fraction) to remove the lipid portion. The fat-free residues were dried and analyzed for C^{14} content. The total C^{14} in feces, the petroleum-ether insoluble C^{14} in feces, and the petroleum-ether soluble C^{14} in feces (by difference) are recorded in Table 1. An aliquot portion of each urine sample was plated at infinite thinness and counted directly. All calculations were corrected for ash content of the cellulose.

Table 1. Recovery of radioactivity from uniformly labeled C^{14} soybean cellulose fed to rats.

Rat No.	Time in metabolism cage (hr)	Recovery of C^{14} (%)						
		In urine	In feces			In carcass	In expired CO_2	Total
			Petroleum ether insoluble	Petroleum ether soluble (by difference)	Total			
1	79	1.0	47.1	0.1	47.2	19.6	40.4	108.2
2	79	0.4	37.8	10.5	48.3		43.9	
3	96	1.1	42.9	1.6	44.5	9.3	57.0	111.9
4	100	2.3	39.8	13.0	52.8	7.9	45.6	108.6

Data tabulated in Table 1 indicate that a large proportion of the ingested cellulose is converted in the gastrointestinal tract to a form which the rat absorbs and metabolizes readily. The data show that only half of the C^{14} fed the rat is excreted in the feces, the rest being found distributed in the expired CO_2, carcass, and urine.

Since significant percentages of the C^{14} in the feces are present in the form of petroleum-ether soluble materials, it is apparent that the ingested cellulose, which is completely insoluble in petroleum ether, is altered as it passes through the rat's gastrointestinal tract. This finding is in agreement with work reported by others (*3*), who find that a number of microorganisms isolated from the gastrointestinal tract are able to convert cellulose, to a greater or lesser extent, to fatty acids and other metabolic products. It is quite possible that these petroleum ether extractives are among the types of cellulose degradation products which are absorbed into the rat tissues. If this is the case, it seems likely that the production of the absorbable materials from cellulose is a result of intestinal bacterial action rather than of the action of enzymes arising in the rat's own digestive juices.

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