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**Supplementary Proteins and Amino Acids and Dietary
Production of Fatty Livers in Mice.**

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In a previous report¹ it was concluded that, whereas a high fat diet supplemented with cystine produced fatty livers in white rats, supplementary methionine exerted a lipotropic action. While the present study was devised primarily to determine the effects of high fat diets supplemented with homocystine* and cysteine, other diets were included because white mice were used and it was thus necessary to determine whether the level of the liver lipids of mice could be altered in the same manner as those previously reported for rats.

All diets contained 2% agar, 40% lard, 5% salt mixture,² 5 or 20% protein and 33 to 48% glucose (depending on the protein level). Each mouse received 100 mg dried yeast and 1 drop of cod liver oil daily. The proteins used were casein and arachin, the latter being employed because of its low methionine content. The amino acid supplements of the diet are shown in Table I. The duration of the experiments was 3 weeks and the procedures employed were those used previously in the rat experiments.¹

The table shows that methionine and cystine influence the level of liver lipids of mice as observed in rats. Increasing the casein content from 5% to 20% produces a marked drop in liver lipids, whereas a similar increase in the arachin content of the diet was ineffective. This was probably due to the low methionine content of arachin. Homocystine as a supplement behaves like cystine. This was unexpected because of the report of Beach and White³ that homocystine, like methionine, promotes growth in rats on an arachin diet. Channon and co-workers,⁴ however, stated that in one experiment conducted on the rat, homocystine showed a tendency to resemble cystine in its action and duVigneaud, at the 1939 meeting of the Federation of American Societies for Experimental

¹ Tucker, H. F., *J. Biol. Chem.*, 1937, **121**, 479.

* The homocystine was kindly supplied by Professor V. duVigneaud of Cornell University.

² Osborne, T. B., and Mendel, L. B., *J. Biol. Chem.*, 1919, **37**, 572.

³ White, A., and Beach, E. F., *J. Biol. Chem.*, 1937, **122**, 219.

⁴ Channon, H. J., Manifold, M. C., and Platt, A. P., *Chem. and Indust.*, 1938, **57**, 600.

TABLE I.
Influence of Diets on Average Total Lipids in Livers of Mice. Figures in Parentheses Are Ranges with the Individual Mice.

Diet	No. of animals	Liver		Liver lipids	
		g	% of body weight	mg	% of liver
20% Arachin	8	2.46 (1.53-3.67)	11.1 (8.3-18.1)	558 (311-919)	23 (16.7-32.9)
5% Arachin	14	1.36 (0.78-2.30)	8.5 (5.0-14.1)	322 (153-850)	22.5 (13.5-37.0)
20% Casein	8	1.18 (0.91-1.60)	6.5 (4.8-10.2)	131 (119-241)	7.2 (5.9- 9.9)
5% Casein	6	2.01 (1.63-3.12)	9.8 (8.7-14.2)	496 (380-575)	24.2 (19.7-32.5)
5% Arachin	14	2.18 (1.68-2.54)	12.8 (10.3-16.2)	748 (604-872)	34.6 (27.2-39.2)
+ .43% Cystine					
5% Arachin	9	1.47 (1.09-1.82)	7.0 (5.1-10.6)	122 (62-231)	8.5 (3.6-17.7)
+ .64% Methionine					
5% Arachin	8	1.82 (1.26-2.63)	12.2 (8.6-17.8)	658 (354-1025)	35.5 (23.6-45.6)
+ .5% Homocystine					
5% Casein	4	1.92 (1.68-2.28)	11.8 (9.6-18.1)	513 (319-619)	31.5 (29.6-37.4)
+ .5% Homocystine					
5% Arachin	10	1.91 (0.87-2.43)	12.0 (9.2-18.3)	683 (260-1025)	35.4 (29.9-42.0)
+ .7% Cysteine HCl					

Biology, reported that fatty livers were obtained when homocystine was added to the diet of white rats. It is evident from the reports on rats and our data on mice that homocystine itself is not lipotropic. Our data further show that cysteine acts like cystine and not like methionine.

Summary. Fatty livers have been produced in mice by diets which have previously been shown to produce such an effect in rats. High fat diets containing 5% casein, 5% arachin, 20% arachin or 5% arachin supplemented with cystine produced fatty livers in mice. A lipotropic effect occurred when methionine was substituted for cystine in the 5% arachin diet or when a high fat diet containing 20% casein was fed. Fatty livers were obtained when cysteine was added to the 5% arachin diet or when homocystine supplemented the 5% casein or 5% arachin diets. The effects produced when cystine or methionine supplemented the 5% arachin diet resembled those previously reported on rats when these amino acids supplemented a 5% casein diet. The results obtained with the 5% and 20% casein diets were also like those reported for rats.