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Gallstone Formation and Intake of B Vitamins in Cholesterol-Fed Guinea Pig.

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Thiamin, riboflavin, pantothenic acid and biotin are all reported to produce fatty livers in the rat; choline, inositol, and pyridoxine to prevent them.[1] Biotin fatty livers alone have a high cholesterol ester content.[2]

The cholesterol-fed guinea pig develops a fatty liver, enlarged spleen and a severe anemia. Liver damage can to some extent be judged by red cell count.[3]

Vitamin requirements of the guinea pig are not entirely known. Findings reported here are the indirect results of an attempt to improve the nutrition of our animals and so make it possible to study the lesions remaining after a period of cholesterol feeding.

Diet "A" had been planned to parallel in respect to protein and fat content an egg yolk diet previously used. It supported growth in control animals slightly less well than our stock diet. Possible shortcomings seem to be low riboflavin and pantothenic acid and too much fat.

Diet "B" in which the amounts of these components were adjusted as indicated below, increased apparent well being in both control and cholesterol-fed animals. We were greatly surprised, therefore, when the cholesterol-fed animals on this diet showed

TABLE I.
Basal Diets Fed *ad libitum*.

	Group "A"		"B," "C," "D"	
	Control	Cholesterol	Control	Cholesterol
Casein, commercial, parts	20	20	20	20
Fat ("Crisco") "	15	15	12.5	12.5
Wheat bran "	5	5	5	5
Dried brewers yeast "	10	10	10	10
Hubbels salt "	2.5	2.5	2.5	2.5
Agar "	2.5	2.5	2.5	2.5
Cornstarch "	45	44	47.5	46.5
Cholesterol "	0	1.0	0	1.0

10 g of these diets, or a minimum daily intake, assayed by microbiological technic:* 90 γ thiamin, 90 to 120 γ riboflavin, 500 γ nicotinic acid and 140 γ pantothenic acid.

TABLE II.
Daily Doses of Vitamin Supplements, Given by Pipette.

Group A	¼ g "cerophyll"* ≅ 2.5 γ pantothenate, 2.5 γ thiamin, 6 γ riboflavin, grass juice factor, "K," etc. 25 γ thiamin 3 cc orange juice + 2.5 mg ascorbic acid 75 I.U. "A" as carotene 25 I.U. "D" as irradiated ergosterol 1 drop wheat germ oil
Group B	As group "A" plus 25 γ riboflavin and 125 γ pantothenate
Group C	As group "A" plus 125 γ pantothenate only
Group D	As group "A" plus 25 γ riboflavin only

*Microbiological assays by Dr. Relda Cailleau of this laboratory.

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1 Engel, R. W., *J. Nutr.*, 1942, **24**, 175.

2 McHenry, E. W., and Gavin, G., *Fed. Proc.*, 1942, **7**, 124.

3 Okey, R., and Greaves, V. D., *J. Biol. Chem.*, 1939, **111**, 729.

TABLE III.

Summary of data	Cholesterol fed animals only			
Groups	A	B	C	D
No. of pigs	11	12	4†	5
No. of animals with gallstones	0	10*	1	5

*No satisfactory autopsy on 2 remaining animals which died at night. Gall bladders burst and contents were lost.

†Bile murky but no hard stones in 3 animals.

an abrupt fall in red cell count without the usual preliminary loss in weight and other evidences of illness, and when the autopsies showed gallstones.

Guinea pig bile contains relatively little lipid. These gallstones were rich in calcium phosphate, although they contained some cholesterol. Irritation of the membranes of the gall bladder and the biliary passages was common and some impaction of ducts was observed in cholesterol-fed animals. No stones were found in control animals.

If this high incidence of gallstones is to be attributed to the relatively small increase in riboflavin intake, these data suggest that a critical level of tolerance was exceeded. That this is not a definite figure but may vary with the intake of other dietary factors is also suggested.

Examination of autopsy notes for guinea pigs of our previous series revealed that all the animals which had gallstones were on diets which probably contained extra riboflavin. Incidence was especially high when unextracted casein and/or egg yolk protein had been fed at levels exceeding 25%. We thought at the time that the gallstones might be due to high protein intake.

The whole problem of the relationship of the intake of B vitamins to tolerance for foods high in cholesterol obviously needs further investigation. Preliminary publication of our findings seems desirable at this time because of the wide and indiscriminate use of very high dosages of preparations of the various B factors.

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Mortality in Severe Experimental Burns as Affected by Environmental Temperature.

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Our armed forces are on duty in all parts of the globe, and are subjected to all extremes of temperature—from arctic to equatorial. Burns from bomb flashes, gasoline fires and escaping steam are common in modern war, yet we have been unable to find any observations on the effect of environmental temperature on the early mortality resulting from such events. The only comment on the environmental management of the burned patient is that he should be kept warm because of the fall in body temperature commonly accompanying shock. While engaged in a study of certain pathological and chemical changes following experimental burns in dogs, the results of which will be reported elsewhere, we noted an increased mortality during several hot days during the summer months when the temperature rose to 95°F. These observations seemed to indicate that environmental temperature actually did affect mortality.

As an experimental approach to this problem, we have burned rats under controlled conditions, placed them at 4 different temperatures, and determined their survival after 24, 48 and 72 hr. Our major interest was in the mortality during the first 24 hr, since