

tatively like those of the carotid bodies. Moreover, Comroe (12) has demonstrated that their stimulation by cyanide or lobeline produces a reflex bradycardia just as does that of the carotid chemoreceptors.

Summary and conclusions. 1. Changes in heart rate were recorded during the applica-

tion of hypoxic stimuli limited to the carotid chemoreceptors. 2. The direct reflex change in heart rate initiated by hypoxia at the carotid chemoreceptors was a slowing of moderate degree. 3. It is concluded that the cardiac acceleration of generalized hypoxia does not arise chemoreflexly at the carotid bodies.

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Further Observations on Yeast in Production of Experimental Hepatic Necrosis in Rats.* (18409)

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It has been shown that in rats fed a diet deficient in tocopherol, with yeast as the sole source of protein, the occurrence of massive hepatic necrosis may vary considerably in direct relation to the brand of yeast used (1). Incorporation of a British brand of baker's yeast in the diet led to massive necrosis with great regularity (90-100%). In contrast, substitution of our American brand of brewer's yeast in the same ration deprived it of its "necrogenic" quality. By increasing the fat-content (lard) in the mixture up to 50%, necrosis occurred, even with the American brand of yeast, but the incidence remained relatively low around 50% (2). The necrogenic activity of the British yeast could not be explained by a difference in the content of the sulfur-containing amino acids (cystine, methionine) or of vit. E in these particular British and American brands of yeast. The fact that the British yeast used was a live baker's yeast and the American yeast a heat-killed brewer's yeast made it desirable to test

(1) an American live baker's yeast for its necrogenic activity, and (2) to determine whether the British yeast retained its necrogenic character after inactivation through autoclaving.

Experimental. As in our previous experiments (1,3) the following "necrogenic" experimental diet was used: yeast, 18; corn starch, 79; salt mixture (U.S.P. II), 3%. Peanut oil, 0.5 ml and cod liver oil, 2 drops were added to 8 g of the dry mixture just before feeding. Further, all animals received daily supplements of 20 γ of thiamine, 25 γ of riboflavin, 20 γ of pyridoxine, and 100 γ of calcium pantothenate dissolved together in 1 ml of water, as well as 20 γ of vit. K. We used the British[†] (in diet Y5H) and an American[‡] (in diet Y5F) type of baker's yeast.

In Exp. II, the necrogenic activity of the live British yeast was compared with that of the same brand of yeast after being autoclaved (for 5 minutes with free flowing steam, followed by 25 minutes steam sterilization at 17 lb per square inch, then a 14-inch vacuum

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[†] Obtained under the designation "D.C.L. Vit. B₁ Yeast" from Distiller's Co., Glasgow.

[‡] Type 753-powdered Fleischman's baker's yeast. Furnished by Standard Brands, New York.

TABLE I. Necrogenic Effect of British and American Baker's Yeast.

Exp. I	Diet Y5H with British yeast	Diet Y5F with American baker's yeast
No. of rats	12	13
Avg initial wt (g)	57.0 $\pm$ 0.7	56.5 $\pm$ 0.8
Food intake (avg) g/day	6.5 $\pm$ 0.2	6.9 $\pm$ 0.2
Avg survival time (days)	51.4 $\pm$ 3.5	64.0 $\pm$ 5.3
Massive necrosis at death (rats)	12	12*
Exp. II	Diet Y5H	Diet Y5H autoclaved
No. of rats	13	14
Avg initial wt (g)	48.5 $\pm$ 0.6	49 $\pm$ 0.55
Food intake (avg) g/day	5.9 $\pm$ 0.1	5.6 $\pm$ 0.1
Avg survival time (days)	38.9 $\pm$ 1.7	36.6 $\pm$ 2.4
Massive necrosis at death (rats)	13	14

* One additional rat died after 32 days, without signs of necrosis.

is drawn for 40 minutes).[§] Male rats of the Sprague-Dawley strain were used. The weight of the rats at the start of the experiments varied from 45.0-70.0 g. All rats were kept in single cages, with raised, wide meshed screen bottoms. The daily food intake was measured.

The results as summarized in Table I, illustrated by Exp. I, indicate that the American baker's yeast, in contrast to the previously used (1) American brewer's yeast, was just as conducive to the production of massive hepatic necrosis as the British baker's yeast. The average survival time of the experimental rats was greater when the ration contained American baker's yeast, than with the British brand of baker's yeast. A statistically signifi-

cant difference in survival time was obtained in another experiment in which rats with slightly higher average initial weight (66.5 g) were used. Here the survival time was prolonged in both groups, receiving the British and American brand of yeast, probably due (4) to the higher initial vit. E reserves of the rats used. The average survival time of the rats receiving the British brand of yeast was 98.5 days ($\pm$ 4.5), that of the rats fed the same basal diet containing the American brand of yeast, 153.6 days ($\pm$ 6.3). Thus, it may be postulated that in general the American baker's yeast, although sufficiently necrogenic, is slightly less potent than the British baker's yeast. This difference appears to be related to a better protection of the store of vit. E in the living animal by the American brand of baker's yeast. The necrogenic activity of an American brand of baker's yeast has been demonstrated recently also by Abell, Beveridge and Fisher (5).

In contradistinction to the heat-killed, non-necrogenic American brewer's yeast (1), the necrogenic British and American baker's yeasts are live yeasts. The possibility that such active yeast may be less well digested and utilized (6), could have a bearing on its necrogenic potency. In Exp. II (Table I) comparison was made between active and autoclaved British yeast of the same original batch. The results obtained show unequivocally that heat-killed yeast was just as necrogenic as the same yeast before heat-inactivation.

Conclusions. An American brand of baker's yeast was found to be only slightly less necrogenic than the previously used British baker's yeast. The necrogenic activity of the British yeast was not diminished by heat-treatment (autoclaving).

[§] This experiment was originally devised as preliminary approach to studies on the effect of the necrogenic yeast diet in germ-free animals, to be conducted at the Germ-Free Life Division of Lobund, University of Notre Dame. The preparation of both, autoclaved and non-autoclaved food mixtures used in Exp. II was carried out under the supervision of Dr. T. D. Luckey at Lobund, U. Notre Dame.

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