A NEW PRINCIPLE FOR THE PRODUCTION OF THIAMIN-DEFICIENT DIETS AND FOR THE BIOLOGICAL ASSAY OF THIAMIN IN FOODSTUFFS

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We have investigated, with the most satisfactory results, the possibility of using sulphur dioxide (Williams, Waterman, Keresztezy & Buchman, 1935) for the selective destruction of thiamin in foodstuffs.

The SO_2, which decomposes the thiamin molecule into its pyrimidine and thiazole moities, is a much milder and more specific agent than the autoclave, and its action upon the nutritional properties of foodstuffs appears to be strictly limited to this scission.

In consequence, the dietary percentage of sulphite yeast (supplemented with thiamin) required for optimal growth is no greater than the percentage of fresh yeast. Two (Chase & Shermann, 1931) or three times (Coward, 1939) as much autoclaved yeast must be used.

If baker's yeast is reduced to thin rods by passing it through a meat grinder and if it is then exposed to sulphur dioxide for 24 or 48 hr. in a closed vessel, it will be found to be free of thiamin. The yeast so heated may be dried and freed from SO_2 by mixing it with one-quarter or one-half of its weight of tapioca, exposing the mixture for several hours to fresh air, and finally by drying it in an oven at 60–70° C. Dry brewer's yeast may be used also, and treated as stated below for casein. It has, however, the inconvenience of forming a sticky paste with water which is difficult to divide into small pieces.

A diet may then be made up as follows: casein (G.L. Casein, A/E Glaxo) 18; tapioca 67; SO_2 yeast 8 (dry weight); salt mixture 5; cod-liver oil 2. This diet when given to young rats for 5–6 weeks produces a severe polyneuritic syndrome with paralysis and spontaneous convulsions, followed by death within 2–4 days.

A more acute deficiency, which causes death from hypothermia and bradycardia but with almost no neurological symptoms, is produced if the casein as well as the yeast has been treated with SO_2. This is done by making a paste of equal parts of casein and water and exposing it in small lumps to the action of the gas. The casein paste is then freed from excess of SO_2 by exposing it to air and finally by drying in the oven. The tapioca need not be treated with SO_2 because it contains practically no casein.

The proof that all the symptoms are exclusively due to thiamin deficiency is given by their dramatic cure, within a few hours, by the administration of thiamin hydrochloride per os or by injection.

This principle is also applicable to the assay of thiamin in foodstuffs. Those rich in thiamin may be administered as a supplement to a basic thiamin-free diet.

When foods poor in thiamin are to be tested a diet (A) should be prepared in which a proportion of the tapioca or casein has been replaced by the foodstuff in question after it has been treated with SO_2 as described for yeast. A similar diet (B) should then be prepared with the natural foodstuff. The growths yielded by graded mixtures of diets A

and B are compared with those obtained by supplementing diet A with 1 i.u. thiamin per animal per day. Under these conditions the growth response with the mixed diets is strictly dependent upon the thiamin contained in the natural foodstuff under investigation, even if the proportion of it is as high as 70%.

A more extensive paper with protocols and technical details will be published elsewhere.

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