parathyroids is not clear but it may not be impertinent to suggest that it might be removed with glutathione from the other tissues, to detoxify certain injurious metabolic products that may arise after parathyroidectomy. Each of the 3 amino acids, glycine, glutamic acid, and cysteine are important detoxifying agents.[9]

These data on glutathione in parathyroid cataract suggest further the possible rôle of parathyroid deficiency (even in the absence of any tetany) in the pathogenesis of senile cataract.

7240 P

A Simple Method for Production of Vitamin D Milk of Known and Controllable Potency.

DAVID H. SHELLING AND H. C. TIDWELL.

From the Harriet Lane Home, Johns Hopkins Hospital, and the Department of Pediatrics, Johns Hopkins University.

Since the introduction of irradiated ergosterol and irradiated foods for the prevention and treatment of rickets, several methods have been employed in order to impart anti-rachitic properties to milk. Among these may be mentioned: (1) the irradiation of milk in both the powdered and liquid forms; (2) irradiation of the cow; and, (3) feeding to the cow substances containing large amounts of vitamin D, as for example cod liver oil or irradiated yeast. The irradiation of the cow as a means of imparting vitamin D to the milk is obviously most impractical from the commercial point of view, as is also the feeding of large amounts of cod liver oil. The irradiation of the milk itself has the practical disadvantage of being expensive since it involves the installation, maintenance and operation of expensive apparatus in the farm or dairy where it is employed. The direct irradiation of the milk and the indirect method of feeding irradiated yeast to the cow both have the disadvantage that they are not absolutely reliable methods of holding the vitamin D content at fixed concentration, so that repeated testing of the milk at regular intervals becomes necessary in order to be sure that the vitamin D content of the milk has not fallen below the standard.

In view of these difficulties it occurred to us that the method for adding fats to milk, which has been employed successfully by Holt, Tidwell and their associates, in our laboratories, for the past 4 years, might also be more practical for fortifying milk with vita-

[9] Brand, E., and Harris, M. M., *Science*, 1933, **77**, 589.

min D. Our procedure consists simply of homogenizing, in water, a concentrated oily solution of viosterol of known potency, with the aid of an emulsifying agent. We have tried several emulsifying substances, which are quite feasible as such, but in order to produce an emulsion which will be stable for months or years under ordinary environmental conditions, we have found lecithin to meet this requirement. This stable emulsion appears white as milk, is miscible with it, and has no objectionable odor or taste. It may be kept in the ice box, under ordinary conditions; it could be aerated with nitrogen, sealed in vials, and shipped for distribution. Since each cc. of the emulsion is of known anti-rachitic potency, a given amount of the emulsion may be thus added to a measured amount of milk so as to impart to it a desired number of *international* or *rat units* per quart. The emulsion may be added to the milk before pasteurization, as this procedure does not impair the vitamin D potency.*

The following figures exemplify the amounts of the emulsion necessary to impart to each quart of milk an amount of vitamin D equal to 5 or 10 drops of viosterol 250-D.† If the original viosterol concentrate contains 25,000 D per cc. then a 5.0% emulsion will be 1250 D per cc., or 5 times the potency of the commercial viosterol—250 D. Since oily solutions contain about 45 drops per each cc., it is thus necessary to add but one cc. of the emulsion to 45 or 22.5 quarts of milk, depending whether 5 or 10 drops of viosterol is desired in each quart. The potency of the emulsion could be increased by using a more concentrated viosterol preparation or by increasing the percentage of viosterol concentrate in the emulsion.

We have tested the emulsion after several months standing and found it to be as potent as the original viosterol and not to have lost its potency after 15 minutes heating at 100°C. Further work on animals as well as clinical tests on a group of colored babies is now in progress. The results will be published in detail at a future date.

We believe that this method of fortifying milk with vitamin D is the most practical, since it is the simplest and is controllable and offers a universal means of supplying vitamin D to those who are in need of it and would not otherwise receive it. It ought to be much less expensive than the other methods. Its cost will depend on the price of viosterol as determined by the Wisconsin Foundation.

* In dairies equipped with homogenizers the concentrated viosterol may be added to a small amount of fresh milk, homogenized, and added to a calculated quantity of milk before it is pasteurized.

† 37 rat units = 100 international vitamin D units.