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**Maintenance values for the proteins of milk, bread-and-milk,  
meat and soy bean curd in human nutrition.**

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Thomas (1909) endeavored to determine "biological values" for a number of foods, including milk, meat, and wheat flour, but none of his periods was long enough, nor were the nitrogen and energy intake uniform enough to determine maintenance values. Recently Martin and Robison have reported experiments more suitably planned, using milk and whole wheat bread, but their energy allowance seems above actual requirement, especially in the case of milk, yet their results show failure to attain nitrogen equilibrium on as much as 0.11 gm. of milk nitrogen per day, while their work on bread is at variance with that of Sherman and his co-workers, who found about 0.6 gm. of protein per kilo of body weight adequate for maintenance of nitrogen equilibrium over 12 and 15 day periods without increase of total energy intake above normal requirement when about 90 per cent of the protein was derived from a cereal grain. It seemed desirable to continue investigation of this matter.

A basal diet was devised which was eaten without difficulty, being fairly palatable and easily digested. It contained arrow-root starch, dextrimaltose, lactose, butter fat and apple. This never yielded more than three per cent of the total nitrogen of the diet, 97 to 98 per cent coming from the particular food under investigation. The fluid intake was uniform throughout, to guard against irregular flushing out of the nitrogen.

The subjects were two healthy women, each taking daily 40 calories and 0.077 to 0.08 gm. of nitrogen per kilo of body weight (or approximately 4 gm. per day), over 12 or 15 day periods preceded by a short preliminary period to adjust to the diet.

The results are summarized in the following table:

Subject	No. days	Source of Protein	N per kg body wt. gm.	N from protein studied per cent	N intake gm. per day	N output gm. per day	Balance gm.
T.Y.Y.	12	Soy bean	0.08	97.0	4.00	3.97	+0.03
B.B.	15	Meat	0.08	97.6	4.32	4.26	+0.06
B.B.	12	Milk	0.077	97.6	4.15	3.60	+0.55
B.B.	12	Milk and bread	0.077	{ 50.0 48.0	4.12	3.72	+0.41

The relative efficiency of the four sources of protein used in the present experiments is best brought out by a comparison of the total protein storage by twelve day periods.

Food	Protein storage in 12 days (N × 6.25) gm.
Soy Bean .....	2.12
Meat .....	4.33
Milk .....	41.44
Bread-and-milk .....	30.37

If we assume a food to be efficient for maintenance when nitrogen equilibrium can be established on 0.08 gm. of nitrogen per kilo of body weight, the energy intake being adequate to maintain body weight, and assign this a value of 100 per cent, then the "biological" values for the foods under consideration might be stated in the following way, to express their relative value:

$$\frac{\text{Standard Requirement}}{\text{Actual Requirement}} \times 100, \text{ giving the results below.}$$

N intake	N for maintenance	Difference	Biological Value
gm. per kg.	gm. per kg.	gm.	
0.08	0.08		100
Soy bean 0.08	0.079	+0.001	101
Meat 0.08	0.079	+0.001	101
Milk 0.077	0.066	+0.014	121
Milk and bread 0.077	0.069	+0.011	116