Nitrogen balance

Nitrogen balance is a measure of nitrogen input minus nitrogen output.

Nitrogen Balance = Nitrogen intake - Nitrogen loss

Sources of nitrogen intake include meat, dairy, eggs, nuts and legumes, and grains and cereals. Examples of nitrogen losses include urine, feces, sweat, hair, and skin.

Blood urea nitrogen can be used in estimating nitrogen balance, as can the urea concentration in urine.

A normal subject fed a protein-free diet for 3 days will excrete 85 mg of nitrogen/kg/d. These losses increase with injury. The rise in urinary Nitrogen is due primarily to an increase in urea (comprises 80–90% of urinary N). This is thought to represent an increase in mobilization and breakdown of amino acids, which are felt to originate mainly from skeletal muscle [1].

Some of this represents a primary reaction to injury in which certain vital organs seem to be maintained at the expense of less active organs, and a significantly higher nitrogen balance cannot be achieved by increasing the number of calories supplied as protein beyond a certain level [2] [3]

Catabolism of protein yields 4kcal/g (the same as for carbohydrates, compared to 9 kcal/g for fat), and in the non-injured adult normally supplies only ≈ 10% of energy needs [4].

As an estimate, for each gram of N excreted (mostly in the urine; however, some is also lost in the feces), 6.25 gm of protein have been catabolized. It is recommended that at least 15% of calories be supplied as protein. The percent of calories consumed (PCC) derived from protein can be calculated from Eq (58.4), where N is nitrogen in grams, and BEE is the basal energy expenditure5 (see Eq (58.1), (58.2), and (58.3)). N ðgm NÞ # 6:25 gm protein # 4:0 kcal PCC ðfrom proteinÞ 1⁄4 gm N gm protein # 100 ð58:4Þ BEE Thus, to supply PCC (protein) = 15% once the BEE is known, use Eq (58.5). Some enteral formulations include Magnacal® (PCC = 14%) and TraumaCal® (PCC = 22%). N ðgm NÞ 1⁄4 0:006 # BEE ð58:5Þ

1)
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Hadley MN, Grahm TW, Harrington T, et al. Nutritional Support and Neurotrauma: A Critical Review of Early Nutrition in Forty-Five Acute Head Injury Patients. Neurosurgery. 1986; 19:367–373
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