CHANGES IN BODY COMPOSITION FOLLOWING INJURY

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70 Fat 60 50 Protein 40 FFM or LBM Intracellular Mass (kg) 30 water 20 Extracellular 10 water Minerals 0 The chemical body composition of a normal 70 kg male. FFM, fat-free mass; LBM, lean body mass.

The main labile energy reserve in the body is fat, and the main labile protein reserve is skeletal muscle. While fat mass can be reduced without major detriment to function, loss of protein mass results not only in skeletal muscle wasting but also in depletion of visceral protein status. Within lean tissue, each 1 /uni00A0 g of nitrogen is contained within 6.25 /uni00A0 g of protein, which is contained in approximately 36 /uni00A0 g of wet weight tissue. Thus, the loss of 1 /uni00A0 g of nitrogen in urine is equivalent to the break down of 36 /uni00A0 g of wet weight lean tissue. Protein turnover in the whole body is of the order of 150–200 /uni00A0 g per day . A normal human ingests about 70–100 /uni00A0 g protein per day , which is metab olised and ex creted in urine as ammonia and urea (i.e. approx imately 14 /uni00A0 g /uni00A0 N/day). During total starvation, urinary loss of nitrogen is rapidly attenuated by a series of adaptive changes. Loss of body weight follows a similar cour se (Figure 1.6 accounting for the survival of hunger strikers for a period of 50–60 days. Follo wing major injury , and particularly in the presence of ongoing septic complications, this adaptive change fails to occur and there is a state of ‘auto-cannibalism’, result ing in continuing urinary nitrogen losses of 10–20 /uni00A0 g /uni00A0 N/day (equivalent to 500 /uni00A0 g of wet weight lean tissue per day). As with total starvation, once loss of body protein mass has reached 30–40% of the total, survival is unlikely . Critically ill patients admitted to the intensiv e care unit with severe sepsis or major blunt trauma undergo massive changes in body composition (Figure 1.7). Body weight increases immediately on resuscitation with an expansion of extracellular water by 6–10 litres within 24 hours. Thereafter, even with optimal metabolic care

and nutritional support, total bod y protein will diminish by 15% in the next 10 days, and body weight will reach negative balance as the expansion of the extracellular space resolves. In marked contrast, it is now possible to maintain body weight and nitrogen equilibrium following major elective surgery . This can be achieved by blocking the neuroendocrine stress response with epidural analgesia/other related techniques and providing early oral/ enteral feeding. Moreover, the early fluid retention phase can be avoided by careful intraoperative management of fluid balance, with avoidance of excessive administration of intravenous saline. Figure 1.6 Summary box 1.7 Changes in body composition following major surgery/ critical illness /uni25CF /uni25CF - - -

14 12 10 (%) 8 Sepsis and multiorgan Weight gain 6 4 2 2 24 68 10 12 14 16 18 20 22 days 4 6 8 Uncomplicated major (%) 10 12 Weight loss 14 16 Starvation failure surgery Changes in body weight that occur in serious sepsis, after uncomplicated surgery and in total starvation. Catabolism leads to a decrease in fat mass and skeletal muscle mass Body weight may paradoxically increase because of expansion of /f_l uid within the extracellular /f_l uid space

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Revision #1
Created 2025-12-31 15:07:41 UTC by Omar Ayman
Updated 2025-12-31 15:07:41 UTC by Omar Ayman