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 Title : SUBSTRATE UTILIZATION IN ACUTELY ILL PATIENTS  
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**Introduction.** It has been previously demonstrated that the administration of a large glucose load to acutely ill patients does not totally suppress the net fat oxidation as it does in patients with nutritional depletion. Rather, there is an increase in  $O_2$  consumption, continuing oxidation of fat and an apparent increase in the conversion of glucose to glycogen (1). The mechanisms of this altered pattern of fuel utilization is not known. Previous studies have suggested that substrate supply is an important determinant of fuel utilization (2) and in some groups of patients this may be reflected by plasma concentration. This study examines the relationship of plasma FFA concentrations during glucose loading to fat oxidation as measured by indirect calorimetry.

**Methods.** Studies were performed in 9 acutely ill patients (secondary to injury or sepsis) and 15 patients with nutritional depletion (weight loss greater than 10% with no evidence of infection).

The details of the experiments, including risks were explained to each patient and written consent was obtained. The protocol of this study has been approved by the Columbia University Institutional Review Board. Daily oxygen consumption and  $CO_2$  production were assessed using a canopy system. Nitrogen excretion was measured. These procedures have been described in detail (3). Resting energy expenditure and net rates of substrate oxidation were determined using indirect calorimetry.

Isonitrogenous parenteral diets with varied glucose contents were administered. Simultaneous determinations of free fatty acids (FFA), and glucose concentrations and net fat and glucose oxidation were made after 4-8 days on the assigned diet. Forty seven and 23 measurements were made in the depleted and acutely ill group respectively.

**Results.** At all levels of plasma free fatty acid concentration there was a greater degree of net fat oxidation in the injured and infected group as compared to the nutritionally depleted group. A greater correlation was seen in the injured and infected group (Fig. 1). The slopes of the two lines are significantly different ( $p < 0.01$ ). A much higher correlation coefficient was seen in both the injured and infected ( $r=0.70$ ) and nutritionally depleted patients ( $r=0.88$ ) when carbohydrate intake was plotted against net fat oxidation. A poor correlation exists when carbohydrate intake is compared to plasma free fatty acid concentration in both groups (depleted  $r=0.27$ , injured and infected  $r=0.66$ ).

**Discussion.** The determinants of fuel utilization in acutely ill patients are unknown. The data from this study suggests that a close correlation between plasma free fatty acids and net fat oxidation exists in this group. A much weaker correlation between plasma FFA and net fat oxidation exists in patients who are not acutely ill and are receiving nutritional support. The glucose intolerance observed in injured and infected patients may provide an impediment to effective nutritional support. This glucose intolerance has been related to an altered substrate utilization in injury and infection. The altered pattern of fuel utilization in these patients may be related to the altered relationship between FFA concentrations and cellular metabolism.

#### References.

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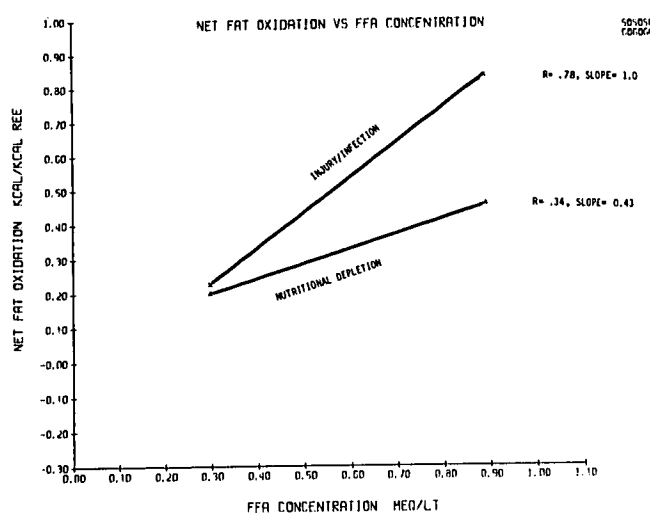


Figure 1