Title: NUTRITION FOR THE PATIENT WITH RESPIRATORY FAILURE


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Total parenteral nutrition (TPN) is currently advocated for a wide spectrum of acutely ill patients, many of whom have compromised pulmonary function. Glucose, the main source of calories in TPN, is oxidized with a respiratory quotient of 1.0 and hence is associated with a greater degree of CO₂ production than fat. Although fat emulsions are available as a calorie source in TPN, these are not widely used. We recently reported a case of respiratory distress secondary to a marked increase in CO₂ production associated with a high glucose load (1). On the average a shift in nutritional support from 5% Dextrose to TPN utilizing a glucose/amino acid mixture causes a 25 to 72% increase in CO₂ production (2). Fat emulsions which are oxidized with a RQ of .7 and can be given parenterally might be expected to cause a lesser CO₂ production and minimize the respiratory work load while improving the nutritional state of the patient. This study compares ventilatory response and CO₂ production in nutritionally depleted patients receiving TPN with (a) glucose as the main source of calories vs (b) fat emulsions and glucose.

Method: A canopy spirometry computer system previously described was used for the simultaneous, non-invasive measurement of gas exchange and spirometry (3). Measurements were made of O₂ consumption (V̇O₂), CO₂ production (V̇CO₂), tidal volume (Vₜ), frequency (f) and minute ventilation (Vₐ). Each run consisted of at least 300-600 breaths. All patients received a caloric intake equal to 1.5 times the resting energy expenditure (REE). Group I (N=8): (a) fat emulsions were used to supply 1/3 of the non-protein caloric requirement alternating with (b) glucose alone. Group II (N=6): (a) fat emulsions supplied 1/2 of the non-protein calories alternating with (b) glucose alone. Diets were alternated weekly. The minimum length of the study was 2 weeks. All patients received 10 gms nitrogen/day. This study was approved by the Institutional Review Board; informed consent was obtained.

Results: The table shows the % change in shifting from glucose alone to fat plus glucose.

Discussion: Utilizing glucose as the entire source of non-protein calories is associated with a greater degree of CO₂ production than diets utilizing fat as a significant portion of the non-protein calories. As the fraction of calories supplied by fat in-

<table>
<thead>
<tr>
<th>Group</th>
<th>V̇CO₂</th>
<th>V̇O₂</th>
<th>Vₜ</th>
<th>f</th>
<th>Vₐ</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>-18*</td>
<td>-2</td>
<td>-35*</td>
<td>-4</td>
<td>-39*</td>
</tr>
<tr>
<td>II</td>
<td>-24*</td>
<td>-12</td>
<td>-35*</td>
<td>-4</td>
<td>-39*</td>
</tr>
</tbody>
</table>

* P.<.01; +P.<.05

REFERENCES