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Total non-protein energy influences growth of *Staphylococcus epidermidis* in parenteral nutrition

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Current guidelines limit administration of parenteral nutrition (PN) regimens containing lipid to 24 hours and regimens without lipid to 48 hours or longer because lipid putatively encourages contaminant growth. These guidelines are based on observations that lipid or the addition of lipid to initially lipid free PN regimens increases contaminant growth, but it is possible that increasing total regimen energy density by the addition of glucose to a PN regimen, with or without lipid, will also increase growth. This study aimed to examine the effect of non-protein energy density of PN regimens on growth of *Staphylococcus epidermidis* and whether this depends on the proportion of energy derived from glucose or lipid.

Staphylococcus epidermidis (NCTC 11047) was inoculated into multilayered PN bags with final concentrations of 8, 11, 14, and 17% w/v glucose ($\times 4$ of each) in both the absence and presence (5% w/v) of lipid (Clinoleic). Trace elements, vitamins, electrolytes and amino acids (Synthamin; final concentration 4.5 gN/L) were constant in all regimens. Microbial colony forming units (cfu)/ml were obtained at time 0 (after inoculation aiming to yield about 50 cfu/ml) and at 48 hours using duplicate blood agar plates. Using multiple regression analysis the 48 hour results were adjusted for cfu/ml at time 0, pH, total non-protein energy and proportion of non-protein energy as glucose.

Overall growth increased only slightly from a mean of 32.6 ± 1.4 (se) cfu/ml to 55.2 ± 2.9 (se) cfu/ml, with no significant effect of pH ($P = 0.329$). Growth was enhanced by total energy (27.7 ± 8.0 (se) cfu/ml increase per 1Mcal (1000 kcal); $P = 0.002$). Growth was also independently enhanced by an increase in the relative proportion of glucose to lipid but this was not significant (2.6 ± 1.6 (se) cfu/ml increase per 10% increase in the proportion of energy derived from glucose relative to lipid; $P = 0.119$).

Although current guidelines on the duration of infusion of PN consider the presence and absence of lipid on growth of contaminants, this work with *Staphylococcus epidermidis* suggests that they should also consider the total energy density of the regimen, and, to a lesser extent, the proportion of non-nitrogen energy as glucose.

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