Stimulation of colorectal tumour protein synthesis, in vivo, by nutritional support. By S. D. HEYS[1,2], K. G. M. PARK[1,2], M. A. MCNURLAN[1], E. MILNE[1], R. A. KEENAN[2], J. D. B. MILLER[2], J. BROOM[2], O. EREMIN[2] and P. J. GARLICK[1], [1]*Rowett Research Institute, Bucksburn, Aberdeen AB2 9SB*, [2]*Department of Surgery, University of Aberdeen, Foresterhill, Aberdeen AB9 2ZD*

Malignant disease is frequently accompanied by weight loss and malnutrition, which are associated with an increase in patient mortality and morbidity. Supplemental nutrition has therefore been provided in an attempt to reverse this weight loss and improve nutritional status, but a major concern has been a possible stimulation of tumour growth. Animal experimental studies have shown that nutrition can stimulate tumour growth (Torosian & Daly, 1986), but to date there is no evidence for stimulation of human tumour growth in vivo. Growth of a tissue depends on an excess of protein synthesis over degradation. However, experimental studies have shown that in malignant cells in culture, protein synthesis is the primary determinant of cell growth (Baccino *et al.* 1980).

The measurement of human tumour protein synthesis in vivo using the 'flooding dose' technique has been previously described (Heys *et al.* 1989). This approach has now been applied to investigate the effect of intravenous nutrition on patients with colorectal cancer.

Patients with localized colorectal carcinoma with no evidence of metastatic disease were studied. They were randomly allocated to one of two groups: (1) to be fasted for 24 h before surgery (n 9), or (2) to receive intravenous nutritional support for the 24 h before surgery (n 9). Nutritional support comprised 1·25 g protein/kg body-weight (Vamin-9-glucose) and 105 kJ (25 kcal) energy/kg body-weight, with 40% of the total energy as glucose and 60% as lipid. The nutritional status of both groups before inclusion in the study was similar. Measurements of colorectal tumour protein synthesis were made at the end of this 24 h experimental period, by intravenous injection of L-[1-^{13}C]leucine, 4 g/70 kg body-weight, 19·6 atoms % in 200 ml saline (9 g sodium chloride/l). Biopsies from the tumour were then taken endoscopically, immediately after induction of anaesthesia, allowing 60–90 min for incorporation of the isotope into protein. The fractional rates of protein synthesis were calculated from the increase in enrichment of protein-bound leucine in the tumour and the average free leucine enrichment in the plasma, determined by isotope ratio and gas chromatography–mass spectrometry.

The mean rate of protein synthesis in colorectal tumour tissue was 22·6 (SEM 1·9)%/d in the fasted patients, but rose significantly to 43·9 (SEM 3·4)%/d ($P = 0·002$) in the group receiving nutritional support. This increase in tumour tissue protein synthesis provides evidence, in vivo, that nutritional support might lead to stimulation of human tumour growth.

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