

differences are slightly larger, the disadvantages of those with low iron status are not major.

In Africa the state has limited financial and other resources for maintaining health and combating disease. In the absence of prospective studies, a widespread improvement of iron status would seem to have lower priority than many other health promotion endeavours, such as water supply, immunisation of children, and 24 hour availability of staff at clinics.

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#### Authors' reply

EDITOR.—Alexander R P Walker and Demetre Labadarios's first question is whether children of vegetarians are likely to be disadvantaged in terms of haem iron intake. In a large community prevalence study that we have recently completed we found no significant association between vegetarianism and iron depletion.<sup>1</sup> This is probably because, in Australia, vegetarianism is a matter of choice rather than a cultural dictate and vegetarians are usually well informed about dietary issues such as iron intake. The authors' comparison of vegetarian women and toddlers, in whom the central nervous system is still developing, may not be appropriate. A wealth of literature suggests that, among other effects, iron deficiency in young children impairs cognitive development<sup>2</sup> and immunity<sup>3</sup> and enhances absorption of lead from the environment.<sup>4</sup>

Australia has a high standard of living, a comprehensive social security system, and a well developed system of primary care. A safe water supply is guaranteed, levels of sanitation are high, and a wide range of foods is available at moderate cost. Conclusions drawn from data collected in a country such as Australia may not be applicable to the developing world; for this reason we described in our article the context in which our study took place.

In answer to the question whether the particular drawback of low ferritin concentrations would be clinically discernible, the answer is no. Firstly, it is iron deficiency anaemia rather than iron depletion that is associated with permanently impaired cognitive development. Secondly, the effects of iron deficiency anaemia on cognitive ability are too small to be detected in any individual child but in Australia are important on a population basis. The same is likely to be true for the other effects of iron deficiency. Whether these effects are demonstrable on a population basis in Africa requires research.

Ideally, decisions on the allocation of resources and priorities in any country should be based on an active and informed dialogue

between public health officials and the community. In Africa the water supply, sanitation, availability of food, immunisation, breast feeding, education (especially of women), and political stability are likely to be of higher priority in promoting health and cognitive development than is the isolated problem of iron deficiency.

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### Tea flavonoids have little short term impact on serum antioxidant activity

EDITOR.—There is currently much interest in the possible benefits of dietary flavonoids in preventing cardiovascular diseases.<sup>1,2</sup> The apparent protective effect has been attributed to the potent antioxidant activity of flavonoids. In vitro flavonoids are powerful inhibitors of the oxidation of low density lipoproteins, a process that has been strongly implicated in the development of atherosclerosis.<sup>3</sup> For some years we have been using enhanced chemiluminescence as a simple method of measuring antioxidant activity in biological and other fluids.<sup>4</sup> Since black tea may account for over half of the flavonoid intake in Western diets we recently investigated the antioxidant activity of a variety of black teas as well as their potential impact on antioxidant status in vivo.

We prepared eight samples of black tea by adding 0.5 g of tea leaf (from eight popular commercially available brands) to 25 ml of boiling water, which was regularly agitated for three minutes. The mean antioxidant activity in the resulting solutions was 8477  $\mu\text{mol/l}$  (range 4275-12 110  $\mu\text{mol/l}$ ), which confirms that tea at typically consumed concentrations has powerful antioxidant properties in vitro. These values compare with typical serum antioxidant activities of 350-550  $\mu\text{mol/l}$ .<sup>4</sup> It therefore seemed likely that ingestion of tea would have a considerable impact on serum antioxidant activity in vivo. We investigated the impact of drinking 500 ml of English breakfast tea (1 g/100 ml) on serum antioxidant status in 10 healthy volunteers (five male, five female; mean age 21.1 years; mean body mass index 24.0). After a four hour fast an intravenous cannula was inserted and the volunteers drank tea without milk over 20 minutes at lunchtime. Mean serum antioxidant activity before and at 60, 120, and 180 minutes after ingestion of the tea was 430, 434, 447, and 439  $\mu\text{mol/l}$ , respectively (no significant change over time).

These results indicate that the rapid ingestion of large amounts of tea flavonoids has little short term impact on serum antioxidant activity and are in contrast to the results of similar studies by our group examining the impact of red wine flavonoids.<sup>5</sup> This does not exclude the possibility of a long term cumulative impact of drinking tea

on antioxidant status. We suggest that further studies are required to determine the extent to which dietary flavonoids are absorbed and contribute to antioxidant activity in vivo.

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### Immediate enteral feeding after gastrointestinal resection

#### Tests of intestinal permeability were inadequate

EDITOR.—Cornelia S Carr and colleagues report a trial with the important message that early enteral feeding after major surgery is both possible and safe.<sup>1</sup> Their conclusion about the changes seen in intestinal permeability is, however, unjustified.

Tests of intestinal permeability were performed preoperatively and on day 5 postoperatively. No significant change was found in the permeability index (lactulose:mannitol absorption ratio) on these two days in the group given early enteral feeding. This does not mean, however, that no rise occurred in this index: the permeability may have increased but returned to normal by day 5. Wicks *et al* showed that, after liver transplantation, permeability was increased only on day 1 and had returned to normal on day 3.<sup>2</sup> This is corroborated by our preliminary data showing that permeability in a range of patients in an intensive therapy unit may be greatly increased on admission but has returned to normal by day 6 (fig 1).

We also question the authors' experimental design and methodology with respect to the permeability tests. They state that after the test

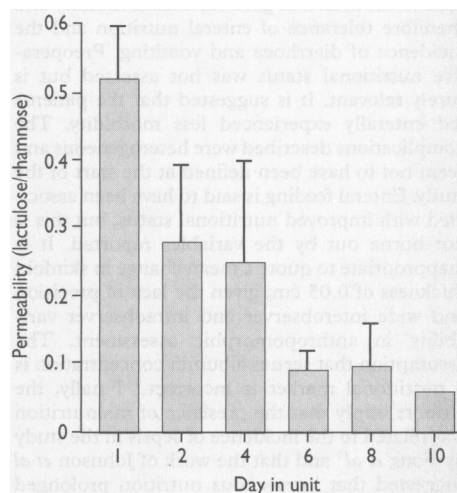


Fig 1—Mean (SE) changes in permeability in six patients admitted to general intensive therapy unit

solution was given "a urine sample was taken 12 to 24 hours later." The conventional test requires a five hour urine collection with measurement of the percentage dose excreted for each sugar. This test assesses only the permeability of the small intestine as in the colon the sugars are degraded by the colonic flora.<sup>3,4</sup> The results obtained from a urine sample taken between 12 and 24 hours are likely to be affected by the colonic bacteria, especially if no urine collection was performed. Moreover, the group given early enteral feeding had a nasojejunal tube in situ; the test solution is likely to have entered the colon earlier in this group than in the group fed conventionally as gastric stasis will not affect patients fed nasojenually. It could be argued that this in itself could be responsible for the difference in the changes in permeability seen between the two groups. Finally, by not standardising the timing of the urine sample the authors may have introduced potential errors and bias.

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#### Study was not sufficiently rigorous

EDITOR,—Cornelia S Carr and colleagues have added to the evidence that enteral nutrition may be started soon after gastrointestinal surgery.<sup>1</sup> The importance of anticipating the need for postoperative nutritional support cannot be underestimated, particularly when postoperative complications may delay oral intake. The content of this paper fails, however, to support its title and the key points listed.

The nature of the procedures that the patients underwent is not stated; sepsis was scored but the scores are not given. Both factors would influence the degree of postoperative stress and hence the nutritional markers. Moreover, the nature of the surgical procedure might affect the time to the return of gastrointestinal motility and therefore tolerance of enteral nutrition and the incidence of diarrhoea and vomiting. Preoperative nutritional status was not assessed but is surely relevant. It is suggested that the patients fed enterally experienced less morbidity. The complications described were heterogeneous and seem not to have been defined at the start of the study. Enteral feeding is said to have been associated with improved nutritional status, but this is not borne out by the variables reported. It is inappropriate to quote a mean change in skinfold thickness of 0.05 cm, given the lack of precision and wide interobserver and intraobserver variability in anthropomorphic assessment. The assumption that serum albumin concentration is a nutritional marker is incorrect.<sup>2</sup> Finally, the authors imply that the presence of malnutrition was related to the incidence of sepsis in the study by Fong *et al*<sup>3</sup> and that the work of Johnson *et al* suggested that intravenous nutrition prolonged ileus.<sup>4</sup> Neither study supports these statements.

The benefit of early enteral nutrition on outcome after orthopaedic surgery has been

shown.<sup>5</sup> To confirm those findings after gastrointestinal surgery will require more rigorous studies than this.

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#### Fluid regimen given to control group is increasingly being abandoned

EDITOR,—Having read Cornelia S Carr and colleagues' paper on their trial of immediate postoperative enteral feeding in patients undergoing gastrointestinal resection, I question the fluid regimen given to the control patients, who were kept nil by mouth until the passage of flatus.<sup>1</sup> Such a regimen has been increasingly abandoned because randomised trials have shown that the immediate introduction of oral fluids after laparotomy (including bowel resection) is not associated with a higher rate of complications or fluid and electrolyte imbalances but does improve patients' comfort and allows earlier discharge.<sup>2-4</sup> Gastric activity returns 24 hours after laparotomy, and only about 2% of patients require nasogastric drainage.<sup>5</sup>

The mucosal protection associated with enteral nutrition could have been achieved more simply, cheaply, and comfortably by allowing patients to drink at will in the postoperative period.

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#### Serum albumin concentration is not a marker of nutritional status

EDITOR,—In their paper on postoperative enteral feeding in patients undergoing bowel resection Cornelia S Carr and colleagues used serum albumin concentrations as one of six markers of nutritional status.<sup>1</sup> Doweiko and Nompoggi and Klein show that although protein energy malnutrition causes a decrease in the rate of synthesis of albumin, this has little impact on albumin concentrations because of albumin's low rate of turnover and large pool size.<sup>2,3</sup> Even during chronic malnutrition, serum albumin concentration is maintained because of a compensatory decrease in the degradation of albumin and transfer of extravascular albumin to the intravascular compartment. Hence the serum albumin concentration changes little in patients with anorexia nervosa.

Although inadequate nutrition may contribute to low serum albumin concentrations in patients in

hospital, the metabolic response to stress—for example, surgery and disease—is a far more important factor. In such "inflammatory stress" states, synthesis of albumin decreases and degradation and transcapillary losses of albumin increase. Disruption of the normal ratio between body compartments alone will change the serum albumin concentration. Hence, in Carr and colleagues' study I would not expect the serum albumin concentration to have differed between the groups fed enterally and conventionally unless their metabolic response to surgery differed.

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#### Authors' reply

EDITOR,—As we did not measure intestinal permeability postoperatively before day 5 we cannot exclude the possibility that a rise occurred. Nevertheless, the striking difference at day 5 between the patients managed conventionally and those fed enterally is surely noteworthy. S M Gabe and D B A Silk's figure shows that intestinal permeability had normalised by day 6 in their series of six patients in an intensive therapy unit. The authors do not mention outcome, so they may be interested to learn that in one study intestinal permeability remained increased in non-survivors but returned to normal in survivors of intensive care (T W Evans, Royal Brompton Hospital, personal communication).

We agree that the permeability test assesses small bowel function and absorption, so we fail to see the relevance of colonic bacterial degradation of the sugars. We know of no data showing that this affects either interpretation of the test or the sugar ratio in the urine. The purpose of measuring a ratio of at least two sugars is to circumvent problems related to gastric stasis and other extraneous factors; furthermore, the timing need not be fixed to a conventional five hour collection.<sup>1</sup>

N J Everitt requests more data; unfortunately, space constraints required our original submission to be reduced to a maximum of 1000 words (and this response to a maximum of 400 words). By necessity, details had to be removed—for example, the fact that complications were defined at the outset. We will gladly supply further details on request. Everitt's remarks about two of our references is correct in that they were accidentally transposed, but Everitt reads too much into our study; we did not make any claims regarding benefit (which would require a much larger study) but simply showed safety and efficacy.

Sudip Ray argues for oral fluids to be given immediately after laparotomy; we do not disagree, but old habits die hard and traditional postoperative starvation is still common.

Finally, Emma Chojnowska queries our use of serum albumin concentration as one of six markers of nutritional status; we readily accept that it is better used as a marker of inflammation.

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