azide on normal yeast. It is of interest to note that reduction of the fermentation rate in both normal and mutant yeast did not lead to a corresponding reduction in potassium uptake in normal yeast but did in the mutant. It is possible that the mutant has lost a certain flexibility possessed by normal yeast which permits the cell to carry on some of its physiological activities at normal levels, even though its total energy supply is reduced.

The results also show that sodium extrusion is less dependent on metabolic activity of the cell than is potassium uptake and that alcohol dehydrogenase appears to be directly involved in the supply of energy at least for potassium transport.

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Use of Carbon-14-labelled Arginine to measure Catabolic Rates of Proteins and the Recycling of Amino-acids

Stephen and Waterlow[1] have described the use of carbon-14-labelled arginine to measure the catabolic rate of serum and liver proteins in normal rats and rats fed on a diet deficient in protein. Differential assay of the isotope activity in the C(1) and C(6) atoms of arginine shows a variation in values between the true and apparent half lives of the proteins. The technique is of value for studying the recycling of amino-acids and for measuring catabolic rates. The authors have made the observations that the decrease in protein catabolic rate and the increased recycling of amino-acids which occur in the rats fed a diet free of protein may constitute an adaptive phenomenon for the conservation of protein in the deficient animal.

In the light of experiments on protein metabolism by many workers in this field, there is another interpretation of these results which may be of interest.

It is important in relation to these experiments to view the effects of surgical intervention on the results obtained. This involves the assessment of the magnitude of ether anaesthesia and hepatic biopsy on the test animals and their possible effect on subsequent protein metabolism.

In their study of the effect of surgery on the concentration of some plasma proteins, McCathie, Owen and Macpherson[2] reviewed the effects of certain diseases, trauma and surgery on the catabolism and synthesis of serum proteins. It is evident that in many pathological states and particularly after trauma, there is a marked increase in protein catabolism and a simultaneous increase in synthesis of certain proteins. Plasma measurements represent the balance between synthesis and catabolism. Usually after surgery, however, there is a depletion of albumen and transferrin with an increase in fibrinogen and alpha globulins. The causal factors affecting synthesis and the rate of catabolism are poorly understood, but Freeman[3] has suggested that the amount of haptoglobin catabolized is controlled by the rate of synthesis. He also mentions that it is believed that proteins are catabolized irrespective of their specific function. The idea that catabolism and synthesis may in part be interdependent is important when experiments with ^{14}C-arginine are reviewed. It seems likely that the surgical intervention would have induced a state of increased protein catabolism and that the assumption that the steady state is main-

tained during the test period is incorrect. It seems more likely, however, that most of the measurements recorded can be explained on the basis of altered catabolism and synthesis after operation than on an adaptive change in protein deficiency.

Where a state of increased catabolism is present—especially in the absence of a dietary source of protein—there must be a greater recycling or re-utilization of the amino-acids unless there is increased loss of nitrogen. In this case a greater divergence of the apparent half life over the true half life would be expected with increasing synthesis. This is, in fact, seen in experiments with both serum and liver protein. Although it is more marked in the rats on a diet free of protein, there is a substantial difference between the true half life mean (1·9 days) and the apparent half life mean (5·5 days) in the liver proteins of the normal animals and this is excluding the results of one severely traumatized animal.

The suggestion that the main changes lie with the results of the apparent half life is therefore in keeping with the idea that the results stem from changes in catabolism and synthesis. The variation in true half life is small and particularly so with the liver protein group. It may be significant that the figures for the isotope replacement in the liver proteins are generally higher than in the serum proteins. If there is a cycle within the liver protein situation in which there is an increased rate of degradation and synthesis above that found in the serum protein pool, one is left to wonder whether there is a reason or function which can be ascribed to it. It is tempting to suggest that the increase in catabolic turnover of proteins after a traumatic incident associated with an active metabolic protein pool within the liver is able to provide an immediate source of amino-acids for conversion into the proteins needed specifically in the post-traumatic period. The acute response of liver synthesis of fibrinogen which occurs after the effective stress, such as that reported by Reeve, Takeda and Atencio[4], could be an example of this.

The interpretation of results based on isotope studies in protein metabolism is difficult. A paradoxical situation may arise in that the investigator may seek to divorce synthesis from catabolism and yet at the same time he may be bringing them closer together.

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Lactate Dehydrogenase Isozymes during Dedifferentiation in Cultures of Mammary Secretory Cells

A MAJOR problem associated with the in vitro cultivation of specialized tissues is their failure to maintain their specific functions. Even in some situations where the specialized cells have been shown to survive, they begin to lose their unique functions[1]. The secretory cell of the mammary gland is an outstanding example of a cell where this dedifferentiation may be readily determined by following in culture the multitude of functions unique to the synthesis of milk. These decrease and eventually disappear but at different rates[2-5]. Changes in other functions have also been observed. The specific activity of lactate dehydrogenase (LDH) decreases in culture for a week or two and then increases and levels off with time[3]. This change in the activity of LDH raised the question as to whether it was merely quantitative or if it could be