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RATES OF ABSORPTION OF A DIPEPTIDE AND THE EQUIVALENT FREE AMINO ACID IN VARIOUS MAMMALIAN SPECIES

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The phenomenon of more rapid intestinal absorption of amino acids from oligopeptides than from the equivalent free amino acids was first shown in man¹. It was confirmed and further investigated in the rat, and found to occur with several di- and tripeptides of glycine and methionine^{2,3}. It seemed of interest to see whether this phenomenon, which is most readily demonstrated at high concentrations, occurred in other mammals, including herbivorous and carnivorous species. The phenomenon has been found to occur at lower concentrations, in the range 1–10 mM, using *in vitro* and *in vivo* techniques^{4,5}. The present results were obtained with the dipeptide L-methionyl-L-methionine and equivalent loads of free L-methionine, in the rat, ferret, rabbit, guinea pig and mouse.

Absorption was measured by disappearance of substrate from tied loops of upper jejunum in anaesthetised animals, as described by MATTHEWS *et al.*³ and expressed as μ moles of amino acid absorbed per cm loop length and per g wet weight of intestine. The solutions introduced into the intestine were L-methionine (200 mM) or L-methionyl-L-methionine (100 mM), and therefore contained the same number of methionine units per unit volume. They were brought up to a total calculated osmolarity of 300 mM with mannitol. In all animals the loops were approx. 5 cm long. The volumes introduced were sufficient to cause slight distension, and varied according to the species of animal (Table I). All animals were young adult males. The absorptive period was 10 min. Methionine and the peptide were estimated by the method of MCCARTHY AND SULLIVAN⁶.

The results (Table I) show that more rapid absorption of methionine units from dipeptide than from the equivalent amino acid was found in all animals tested except the mouse. In the rat, absorption from the dipeptide was approximately twice as rapid as from the amino acid, and in the ferret about 50 % more rapid; in the rabbit and guinea pig the difference was less. The occurrence of the effect in omnivorous, carnivorous and herbivorous mammals suggests that it may be demonstrable in many species. It is already known that certain bacteria take up oligopeptides faster than the corresponding amino acids⁶, so that the biological distribution of this transport phenomenon may be very wide. Bacteria appear to possess oligopeptide entry systems which are partly or completely independent of the more specific systems for free amino acids^{6,7}. Whether such peptide entry systems exist in mammalian gut is uncertain, but recent findings in Hartnup disease⁸ suggest that this is possible.

TABLE I

RATES OF ABSORPTION OF L-METHIONINE FROM FREE AMINO ACID AND THE DIPEPTIDE L-METHIONYL-L-METHIONINE

| Animal | Volume of solution introduced (ml) | Substrate introduced | Absorption rate* | |
|--------------------------------------------|------------------------------------|----------------------|---------------------------------|----------------------------------------|
| | | | $\mu\text{moles/cm per 10 min}$ | $\mu\text{moles/g wet wt. per 10 min}$ |
| Rat (<i>Rattus norvegicus</i>) | 0.25 | Methionine | 2.8 ± 0.2 (6) | 34.1 ± 1.8 (6) |
| | | Peptide | 5.4 ± 0.25 (6) | 70.0 ± 4.8 (6) |
| Ferret (<i>Putorius furo</i>) | 0.5 | Methionine | 8.0 ± 0.6 (10) | 41.3 ± 4.4 (10) |
| | | Peptide | 11.5 ± 0.7 (10) | 61.1 ± 4.0 (10) |
| Rabbit (<i>Oryctolagus cuniculus</i>) | 1.0 | Methionine | 9.9 ± 0.7 (10) | 34.9 ± 1.4 (10) |
| | | Peptide | 12.2 ± 1.1 (9) | 44.0 ± 3.7 (9) |
| Guinea pig (<i>Cavia porcellus</i>) | 0.25 | Methionine | 2.5 ± 0.2 (9) | 28 ± 2.0 (9) |
| | | Peptide | 3.2 ± 0.1 (9) | 38 ± 2.2 (9) |
| Mouse (<i>Mus musculus</i>) | 0.25 | Methionine | 3.0 ± 0.7 (8) | 100 ± 3.0 (7) |
| | | Peptide | 3.3 ± 0.4 (6) | 107 ± 15.0 (5) |

* Mean \pm S.E. (n).

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