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Action of Peptides in the Nutrition of Young Mice.

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It seems impossible to make young mice grow at a normal rate on any mixtures of known amino acids substituted for the protein of the diet, no matter what the proportion of the amino acids. By adding the vitamin B in the form of yeast slight growth is obtained, but by adding the vitamin B fraction in the form of the Osborne-Wakeman preparation there is usually a decline in weight. Since the active principle in the cure of pernicious anemia as well as insulin, secretin, and glutathione, are all said to be peptides, it seems probable that peptides are necessary in nutrition. The end products of both gastric and pancreatic digestion of proteins contain peptides, and it seems probable that they, to some extent, would be absorbed as such. If the stomach is removed from a mammal, death finally occurs accompanied by anemia. A dog may live for some months or a man for some years without a stomach but finally dies. A person with pernicious anemia has no gastric digestion and when fed the gastric digest of a protein is cured of the symptoms. It may take a long time to find just what peptides are necessary. So far the results are: Young mice fed on a mixture of the known amino acids, some radicals of prosthetic groups vitamines, mineral salts, carbohydrate, and fat, decline in weight and health. Control mice fed on this diet to which has been added all of the peptides which I have yet been able to obtain, decline at a less rapid rate, are more lively and apparently healthy, and live longer than those not receiving the peptides.

If casein is hydrolyzed with acid, there is a progressive hydrolysis of all imid linkages, accompanied by a slow destruction of the amino acids. Some peptides do not give the biuret reaction and I know of no way of proving the total absence of peptides except by the purification of the amino acids in the hydrolysate. The hydrolysis may be continued until mice no longer grow when it is substituted for protein in the diet. There is no growth on casein hydrolyzed for 36 hours with boiling acid, even though all of the known amino acids are added to it to make up for any that might be destroyed. It seems possible that casein hydrolyzed for 16 hours or less, may contain minute traces of peptides or diketopiperazines.

Since the experiments have continued 2 years and have been for the most part negative, only an example will be given in detail. Diet 15 contained in decigrams: glycine 2, alanine 4, valine 8, amino-n-valerianic acid 1, amino-n-butyric acid 1, aminoisobutyric acid 1, amino-n-caproic acid 1, leucine 10, isoleucine 1, proline 4, hydroxyproline 1, aspartic acid 10, glutamic acid 10, serine 1, phenylalanine 3, tyrosine 5, arginine 5, lysine 4, histidine 2, tryptophan 1, cystine 1, creatine 1, uracil 1, alloxan 1, spermidine 1, spermine 1, taurine 1, glucosamine 1, cholesterol 1, cellulose 1, glucose 75, dextrin 150, salts 6, Osborne-Wakeman vitamin B 15, butter fat 60. Diet 16 contained the same as diet 15 plus glycine anhydride 2, glycyl glycine 2, glutathyone 2, Dakin's liver extract, dipeptide of hydroxyproline and hydroxy-glutamic acid (impure) 20. Two white mice weighing 7.6 and 8.6 gm. were placed on diet 15 and 2 litter mates weighing 7.7 and 8.2 gm. were placed on diet 16. Their combined weights each day were:

Diet	Combined Weights Each Day.									
15	16.2	14.2	14.2	13.5	12.9	12.5	10	7.7	dead	(not weighed)
16	15.9	15.0	14.8	14.0	13.9	13.1	12.3	12.0	12.0	lively

Since mice lived for months on diets similar to 16 and the experiments are so expensive, this experiment was discontinued when the controls died. The other experiments were similar except for variation in the proportions of the amino acids.