incidence of about 20% of hypertension, whereas those maintained on adequate diets rarely developed the disorder spontaneously. The existence of lesions comparable to those observed would account for the rises in blood pressure observed in the rabbit and dog following unilateral nephrectomy.[6,13,14]

Summary. The incidence of hypertension following unilateral nephrectomy is recorded in 100 rats. The development of hypertension was shown to be dependent on the status of the kidneys at the time of removal of the first kidney. If lesions are present, hypertension develops; if absent or minimal, the animals remain normotensive. The bearing of these observations on current theories as to the pathogenesis of experimental hypertension are discussed.

The effects of unilateral nephrectomy on the weight of the heart and remaining kidney and the influence of various types of diet on the survival period following removal of the remaining kidney were also determined. Enlargement of the heart as a result of hypertrophy, as well as of the remaining kidney, may be correlated with the degree of hypertension induced by unilateral nephrectomy. Removal of potassium from the diet markedly prolongs the survival period following bilateral nephrectomy.

Received May 3, 1949. P.S.E.B.M., 1949, **71**.

17203. Limiting Essential Amino Acids of Some Legume Seeds.

WERNER G. JAFFE.

From the Section of Nutritional Chemistry, Ministry of Agriculture, Caracas, Venezuela.

Pulses are one of the most important sources of vegetable proteins in human diets and knowledge of their amino acid composition is of interest especially in countries where there is insufficient consumption of animal products. The present experiments are part of a study on the nutritional problem in Venezuela, where legumes play a very important role in human nutrition.

The experiments were performed with young rats of the Sprague-Dawley strain. Each group consisted of 2 male and 2 female animals, housed individually in screen-bottomed cages. In most cases the animals were put on the experimental diet at the age of 3 weeks and weighed about 40 g each; in some cases animals weighing about 100 g were used. The diets used were similar to those described by Russell *et al.*[1] and contained 10% of protein and 4-5% of fat, with the exception of the soybean diets which contained 7% of fat. Food and water were given *ad libitum*. All animals received 3 drops of liver extract 3 times weekly by dropper; this amount was sufficient to promote maximum growth on a soybean-corn diet when tested by a method previously described.[2] Each group received the unsupplemented diet for 3 weeks, immediately followed by the supplemented diet for the same time. In some cases the diets were given for 10 periods only. Animals were weighed every 5 days and food consumption was recorded. Digestibility was determined for all the legumes studied. Since good correlation between growth and protein efficiency was observed in accordance with the results of other authors,[3] only weight changes are reported.

The legume seeds were obtained from the Genetical Division of the Ministry of Agriculture in Maracay or were purchased from the local market. All seeds were ground and autoclaved at 10 lb. pressure for 20 minutes with the exception of the kidney and hyacinth beans, which were soaked in water over night, autoclaved for 30 minutes at 10 lb. pressure,

1 Russell, W. C., Taylor, M. W., Mehrhof, T. G., and Hirsch, R. R., *J. Nutr.*, 1946, **34**, 491.

2 Jaffé, W. G., and Elvehjem, C. A., *J. Biol. Chem.*, 1947, **169**, 287.

3 Hegsted, D. M., and Worcester, J., *J. Nutr.*, 1947, **33**, 685.

TABLE I.
Weight Changes of Rats Receiving Diets Containing Legumes as Only Source of Protein, With, or Without, Methionine Supplementation.

Legume	Scientific name	No. of samples studied	Wt change/ day/animal on basal diet	Wt change/ day/animal on diet supplemented with 0.3% methionine
Black kidney beans	*Phaseolus vulgaris*	4	0.0	3.1
Red " "	" "	3	—0.1	2.5
White " "	" "	1	0.9	2.6
Adzuki "	" *angularis*	1	1.0	1.8
Mung "	" *aureus*	1	0.5	2.3
Cow peas	*Vigna sinensis*	4	0.3	1.5
Soy beans	*Glicina soja*	3	1.3	2.5
Split peas	*Pisum sativum*	2	—0.1	0.9
Dried green peas	" "	1	0.2	1.7
Lentils	*Lens esculenta*	2	—0.1	0.5
Chick peas	*Cicer arietinum*	2	1.3	2.9
Hyacinth beans	*Dolichos lablab*	2	—0.3	4.4
Pigeon peas	*Cajanus indicus*	4	0.2	0.3*
Casein		1	2.0	4.2

* Supplemented with 0.075% tryptophan 0.2
" " " " and 0.3% methionine 3.1

then dried and ground. This procedure was adapted because these seeds contained a toxic principle in the raw stage which has been found not to disappear completely after autoclaving the dry ground material.[4]

With the exception of soybeans and chick peas, none of the legumes studied promoted more than very slight growth in rats if present in the diet in amounts corresponding to 10% of protein. Dried split peas, lentils and pigeon peas did not cause good growth even when fed together with methionine. Diets containing kidney beans or hyacinth beans supplemented with methionine promoted as good or better growth than did soybeans supplemented with methionine and comparable with casein.

The data show that under the experimental conditions, methionine was a limiting indispensable amino acid in all the samples. In the cases where previous studies exist, our results are in accordance with published data.[1,5-7] The results obtained with pigeon peas show that the value of the proteins for growing rats is limited by both methionine and tryptophan, as supplementation with one of these alone caused no growth response, while a combination of both resulted in enhanced weight increase.

Summary. The essential amino acid of legume seeds limiting growth of young rats was methionine in all cases studied, with the exception of pigeon peas, in which methionine and tryptophan were both limiting under the experimental conditions.

[4] Jaffé, W. G., *Experientia*, 1949, **5**, 81.

[5] Block, R. J., and Michell, H. H., *Nutr. Abstr. and Rev.*, 1946, **16**, 249.

[6] Richardson, L. R., *J. Nutr.*, 1948, **36**, 451.

[7] Belton, W. E., and Hoover, C. A., *J. Biol. Chem.*, 1948, **175**, 377.

Received April 29, 1949. P.S.E.B.M., 1949, **71**.