nervous system, could replace lysine in the diet. No evidence exists that in the young rat aminization of fatty acids with the resulting formation of aminoacids takes place. It was considered that it might be possible to introduce a second amino group into the caproic acid molecule provided one amino group was already present in the α position. In view of the current idea as to the probable position of the ϵ amino group of lysine in the protein molecule, the possibility also suggested itself that synthesis of a protein without the free amino group of lysine might occur by substitution of norleucine for lysine in the molecule.

Young white rats were fed diets containing 18 per cent. gliadin (wheat), lard, purified butter fat, starch, and protein-free milk. Maintenance or slow growth was observed. That this failure of normal growth was due to protein deficiency was demonstrated by normal growth of young rats on a similar diet in which casein replaced gliadin. Substitution of 0.5 and 1.5 per cents. of norleucine for equivalent amounts of gliadin did not alter the rate of growth. Normal growth occurred, however, when 1 per cent. lysine replaced an equivalent amount of gliadin or was substituted for the norleucine. These results are in agreement with those of Osborne and Mendel in demonstrating the efficiency of lysine as a supplement to a gliadin diet. The experiments with norleucine offer no evidence that this amino acid can replace lysine in nutrition.

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A pharmacodynamic analysis of Straub's morphine reaction.

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In 1911 Straub and later his pupil Herrmann described a biological reaction for morphine which they thought was specific for that alkaloid and could possibly be used in forensic work.[1, 2] They noted that after injections of small amounts of morphine in mice there followed a peculiar stiffening and bending backwards

[1] Straub, *Deutsche med. Wochft.*, 1911, 1426.

[2] Herrmann, *Biochem. Zeitschr.*, 1912, XXXIX, 216.

or curling of the tails of those animals. No adequate explanation of this phenomena was given by the authors. In May, 1918, Van Leersum[1] described the same phenomenon in the rat and showed that this peculiar stiffening and upbending of the tail was really due to a spasm of the sphincters of the anus and especially of the bladder and that the same phenomenon could be produced by exciting spasm of the sphincters by other agents, chemical or physical. The researches of the present author on the influence of various opium alkaloids on smooth muscle, which were first reported before the Pharmacological Society in December, 1917,[2] and later, in the PROCEEDINGS OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE in February, 1918, throw additional light on the mechanism of Straub's phenomenon. The author has shown that in respect to their action on plain muscle, the opium alkaloids fall in two groups: the piperidine-phenanthrene group of which morphine is the principal member, and the benzyl-isoquinoline group, of which papaverin is the principal member. It was shown that morphine stimulates the contractions and increases the tonus of smooth muscle, while papaverin inhibits the contractions and lowers the tonus of the same.[3] Injections of morphine in the mouse and rat produce a spasmodic contraction of the bladder and its sphincters, and this probably plays the important rôle in the production of Straub's phenomenon. Van Leersum described the vesical spasm after morphine injections as being of spinal origin. Inasmuch as Macht's experiments were performed on isolated tissues, including the sphincters of the rectum and the bladder, we are forced to regard Straub's phenomenon as being at least in part due to a peripheral effect of morphine.

Further work by the present author sheds more light on the subject. Inasmuch as the morphine molecule structurally is a combination of piperidine and phenanthrene nuclei, experiments were made to determine the effect of phenanthrene and piperidine separately on plain muscle. Experiments with phenanthrene itself revealed that it has no effect on plain muscle. Phenan-

[1] Van Leersum, *Nederland. Tijschft. voor Genesk*, 1912, LXII, 1374.

[2] Macht, *Jour. Pharmacol. and Exp. Therap.*, 1918, XI, 176.

[3] Macht, *Jour. Pharmacol. and Exp. Therap.*, 1918, XI, 389.

threne, however, is practically insoluble in water and experiments with it had to be made using alcoholic solutions of the drug. An attempt was therefore made to obtain a simple compound of phenanthrene which is soluble and could be more conveniently employed for tests in vitro. Through the kindness of the chemist, Dr. Charles Rouiller, a simple phenanthrene sulphonic acid was prepared and a sodium salt of the same, being neutral in reaction and freely soluble in water, was employed in making the pharmacological tests. It was found that sodium phenanthrene-sulphonate had very little or no effect on the contractions and tonicity of isolated smooth muscle organs. On the other hand, experiments with piperidine hydrochloride revealed at once that piperidine is a powerful stimulant of smooth muscle, causing an increase in the rate and strength of its contractions and an increase in its tonicity. Straub's phenomenon may, therefore, be ascribed to the peripheral effect of the piperidine portion of the morphine molecule: and, indeed, the author has found that when a suitable dose of piperidine hydrochloride is injected into a mouse or a rat, a condition resembling Straub's phenomenon is often produced soon after the injection.

The interesting effect of piperidine upon smooth muscle, mentioned above, has, as far as the author has been able to ascertain, never been described before. A complete study on the action of piperidine on plain muscle is at present the subject of further investigation, and will be published in due time.

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The action of prostatic extracts on isolated genito-urinary organs.

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The contractions and tonicity of various surviving excised genito-urinary organs were studied in vitro: firstly, under normal conditions, and secondly, after the addition of prostatic extracts