pH 4.0, 300 cc of acetone were added and the precipitate obtained, separated by centrifugation. The precipitate was dissolved in 100 cc of 0.02 M NaCN and then reprecipitated by the addition of another 300 cc of acetone. This last precipitate was washed with acetone and ether and then placed in a vacuum desiccator over $CaCl_2$. The dried precipitate was pulverized in a porcelain mortar until a fine, whitish powder was obtained. The yield of crude enzyme was 5 gm.

The activity of this preparation, when in solution at a pH 5.9, is of 390 milk-clotting units per gm. This enzyme is a typical papainase, as it is reversibly inactivated by $H_2O_2$ and iodine, and activated by NaCN and cysteine. Like other papainases, this enzyme digests live tissue. *Macracanthorhynchus hirudinaceus* (from hog intestine) were digested by a 1 per cent. solution of our enzyme preparation in less than 12 hours, when incubated at 40° C at pH 5.5. Controls in the same solution, previously boiled, were not digested.

The amount of crude enzyme that can be recovered from maya juice is a little over 17 times the amount of bromelin obtained from the average pineapple juice. Both enzyme preparations have about the same milk-clotting activity, therefore the maya may prove, in the future, to be an important source of a papain-like enzyme.

Having found in the available literature no account of this enzyme, we submit this brief report, which will be followed in due course by a more complete description, and suggest the name "pinguinain" for this new enzyme, as the generic name of the plant source has already been used in naming bromelin, the enzyme obtained from the pineapple.

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## PARTICULATE GLYCOGEN*

BY fractional centrifugation of finely dispersed liver suspensions a submicroscopic particle containing glycogen was obtained. This particle has an approximate sedimentation constant of $4{,}000 \times 10^{-13}$. This means a particle size much larger than the tobacco mosaic virus, which has a molecular weight of 15–20 million and a sedimentation constant of $191\text{–}239 \times 10^{-13}$.[1] The particle is stable at 37° C. but can be dispersed by heating at 100° C. for several hours. It may also be dispersed by trichloracetic acid or potassium hydroxide. The dispersed glycogen can not be separated at 12,000 r.p.m.; this is the speed used to separate the original particle. According to Oakley and Young,[2] glycogen separated by the usual methods has a molecular weight of only two million. Clearly, then, particulate glycogen is an aggregate of smaller glycogen units.

The particle contains a high percentage of water; however, practically all the dried residue is glycogen. The dried particle also contains about 1 per cent. protein. This protein may play an important role in the maintenance of the particle, inasmuch as all the agents which disperse the particulate glycogen markedly alter the protein. None of these is thought to alter the properties of glycogen.

It is clear that, if this protein, or some other agent, combines with the dispersed glycogen as the latter is synthesized in the liver cell the glycogen will be removed from solution. By the law of Mass Action the enzymatic reaction

$$\text{Glucose-1-phosphate} \rightleftharpoons \text{Glycogen} + \text{Phosphate}$$

would be shifted in favor of glycogen synthesis, therefore facilitating glycogen storage in the liver. The concentration of glucose in the liver cell would be diminished. This would favor the removal of glucose from the blood stream and a consequent lowering of blood sugar.

The action of this coacervating agent, which may be protein, seems to parallel the action of insulin, because insulin is known to lower blood sugar and facilitate glycogen storage in the liver. The relationship, if any, between the protein contained in particulate glycogen and insulin is being investigated.

I should like to express my deep appreciation to Professor R. R. Bensley for his suggestions, criticisms and constant encouragement.

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## AN UNIDENTIFIED VIRUS WHICH PRODUCES PNEUMONIA AND SYSTEMIC INFECTION IN MICE[1]

IN the course of attempts to isolate viruses by direct inoculation of albino Swiss mice with throat washings from clinical cases of influenza, non-influenzal pneumonias were frequently encountered in the passage mice. The pneumonias observed were of two types. One type was grossly indistinguishable from that produced by influenza virus, and the etiological agent of this type was found to be a filtrable virus

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[1] Erriksson-Quensel and Svedberg, *Jour. Am. Chem. Soc.*, 58: 1863, 1936.

[2] Oakley and Young, *Biochem. Jour.*, 30: 868, 1936.

[1] These investigations were financed largely by a grant from the International Health Division of the Rockefeller Foundation.

which was subsequently identified, on the basis of serological reactions, with that described by Horsfall and Hahn.[2] Dochez, Mills and Mulliken[3] and Gordon, Freeman and Clampit[4] have described similar pneumonia-producing viruses isolated from apparently normal mice. The second type of pneumonia encountered was likewise found to be due to a filtrable virus, but the microscopic demonstration of elementary bodies, the characteristic appearance of the early lesions,[5] the greater virulence and the serological reactions definitely distinguished this virus from the former.

Three strains of this virus were isolated from mice during the course of serial lung passages initiated with throat washings from three different cases of clinical influenza. Two strains were subsequently isolated from apparently normal mice in the course of serial lung passages initiated with the lungs of uninoculated mice. These five strains of virus were apparently identical.

The etiological agent was found to pass through a Berkefeld N filter. When stained with Giemsa, Castaneda and Macchiavello stains, virus particles of variable morphology, similar to those described for psittacosis and lymphogranuloma venereum, were demonstrable.

The virus was readily cultivated by the method of Cox[6] in the yolk sac membrane of the developing chick embryo, the morphological characteristics of the cultivated virus being in every way identical with those seen in lung preparations from infected mice.

The earliest pulmonary lesions observed in mice consisted of scattered pinpoint raised gray focal lesions. With progression of the infection these lesions coalesce to produce complete pulmonary consolidation grayish red in color. Intranasal inoculation of 0.05 cc of a $10^{-1}$ suspension of infected mouse lung kills mice within 24 hours.

Upon intracerebral inoculation of mice, the virus was recovered from both brain and lungs but could not be passed serially from brain to brain. Upon intranasal inoculation, virus was recovered from the lungs and spleen but not from the brain. These observations indicate both pneumotropic and viscerotropic properties.

A more complete presentation of the study of this virus will appear in a subsequent publication.[7]

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# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## COMPUTING SCALES FOR CALCULATING PERCENTAGE DEVIATION FROM AVERAGE WEIGHT[1]

THE accompanying scales were set up to calculate the percentage by which a man of specified age, height and weight differs in weight from the average of accepted white male life insurance applicants of the same age and height.[2] To use these scales, first set a pair of dividers on the appropriate rulings on the left-hand scale. These rulings have been so calibrated that the span between the divider points represents the logarithm of the average weight of men whose heights and weights are specified. The dividers are then lifted; one point is placed, as illustrated, at the proper place on the weight scale, and opposite the lower point, one can read off the percentage deviation. In this operation, one subtracts the logarithm of the expected weight from the logarithm of the observed weight, obtaining the logarithm of the ratio of observed to expected weight. The lower part of the right-hand line is labeled so that the ratios can be read off directly.

The net effect is to replace three variables, height, age and weight by one new variable, percentage weight deviation. In certain statistical problems[3] this represents a useful simplification of the data. The computing scales of Fig. 1, or a slide rule described elsewhere,[4] may be used in problems in which height, weight and age are under study.

In other problems involving multiple correlation or joint correlation, it may be advantageous to make

2 Frank L. Horsfall, Jr., and Richard G. Hahn, *Jour. Exp. Med.*, 71: 391, 1940.

3 A. R. Dochez, K. C. Mills and B. Mulliken, *Proc. Soc. Exp. Biol. and Med.*, 36: 683, 1937.

4 F. B. Gordon, Gustave Freeman and J. Marion Clampit, *Proc. Soc. Exp. Biol. and Med.*, 39: 451, 1938.

5 A personal communication from Dr. Monroe D. Eaton and Miss M. Dorthy Beck has called my attention to the similarity between the elementary bodies and pulmonary lesions characteristic of this virus, the pneumonitis virus described by Eaton, Beck and Pearson (Monroe D. Eaton, M. Dorthy Beck and Harold E. Pearson, *Jour. Exp. Med.*, 73: 641, 1941) and the meningo-pneumonitis virus of Francis and Magill (Thomas Francis, Jr., and T. P. Magill, *Jour. Exp. Med.*, 68: 147, 1938).

6 Herald R. Cox, *Public Health Rep.*, 53: 2241, 1938.

7 Clara Nigg and Monroe D. Eaton. To be published.

1 From the Division of Industrial Hygiene, National Institute of Health, U. S. Public Health Service, Washington, D. C.

2 Assoc. Life Insurance Med. Dir. and the Actuarial Soc. Amer. Medico-Actuarial Mortality Investigation. Vol. I. 1912.

3 P. A. Neal, R. H. Flinn, T. I. Edwards, *et al.*, *Public Health Bulletin* No. 263, 1941.

4 T. I. Edwards, A slide rule and two nomograms by which the percentage deviation of a man from the average weight of men of his height and age may be calculated. *Amer. J. Hyg.* In press.