cretion of creatinine, but it may be noted that the aglomerular tubule must excrete its own water, this water moving in the same direction as the excreted solutes. Whether this circumstance imposes a relationship upon the mechanism of transfer which is absent in the glomerular nephron cannot be determined at present. If the transport of creatinine and water are independent functions, it is possible that the concentration of creatinine in the final tubular urine imposes a limitation upon its excretion. There would appear to be no reason to postulate a different mechanism of excretion in the aglomerular and glomerular nephron; but if such a relationship exists in the latter it may not be discoverable since the creatinine is excreted into a relatively large quantity of glomerular filtrate which subsequently undergoes concentration by the tubular reabsorption of water.

9808 P

Action of High Pressures on Plant Viruses.

J. BASSET, A. GRATIA, M. MACHEBOEUF AND P. MANIL. (Introduced by J. H. Northrop.)

From the Institut de Bacteriologie de l'Universite de Liege, Institut Pasteur de Paris, Institut Agronomique de l'Etat à Gembloux.

Two of us (J. Basset and M. Macheboeuf) with the help of several coworkers[1] have submitted different biological samples to the action of an apparatus devised several years ago by Basset[2] which realizes enormous pressures (beyond 20,000 atmospheres). Non-sporulated bacteria were killed after 45 minutes of exposure to a pressure around 5,000 atmospheres, while sporulated bacteria resist as high pressures as 20,000 atmospheres. Certain viruses and bacteriophages, on the contrary, are inactivated at pressures around 3,000-4,000 atmospheres, while some enzymes are inactivated at about 13,000 atmospheres and toxins at 17,000-19,000 atmospheres. Thus, if toxins behave much like enzymes, bacteriophages behave more like viruses. Globulins are denatured around

[1] Basset, J., Macheboeuf, M., and coworkers, *Compt. rend.*, 1932, **195**, 1431; 1933, **196**, 67, 1138, 1540; **197**, 796; 1935, **200**, 496, 1072, 1247, 1882; 1936, **202**, 121; *Bull. soc. philomath.*, 1933, 575; *Ergebnisse der Enzymforschung* (Leipsig), 1931, **3**, 304; *Bull. soc. chim. biol.*, 1936, **18**, 1181.

[2] Basset, J., *Compt. rend.*, 1927, **185**, 343; 1930, **191**, 928.

8,000 atmospheres while albumins usually resist much higher pressures.

On the other hand, two of us (Gratia and Manil)[3] studying the antigenic properties of plant viruses have found that there exist a few which are not only neutralized by the action of corresponding anti-serums but are also heavily and specifically flocculated, while most of them are neutralized without exhibiting any precipitation. In the first group are the common mosaic of tobacco and the X virus of potato, while in the second are the virus of tobacco necrosis and Y virus of potato. The heavy flocculation of the first ones is caused by the presence of a heavy active protein which was purified into a crystalline form by chemical means,[4, 5] and by ultra-centrifugation.[6, 7]

It seemed interesting to test the resistance to high pressures of both types of plant viruses, either pure or mixed. The results of 2 experiments follow:

Active, specific protein of tobacco mosaic virus, obtained by differential ultra-centrifugation, was divided into 5 parts. One remained untreated and served as a control; the 4 others were pressed for 45 minutes respectively at 2,000, 4,000, 6,000 and 8,000 atmospheres. The control and each of the 4 pressed samples were then divided in 3 portions. To the first was added an equal volume of anti-tobacco mosaic serum for the flocculation test; to the second was added a quarter volume of saturated ammonium sulfate solution containing 5% acetic acid for the crystallization test, and the third portion was inoculated on leaves of *Nicotiana glutinosa* for the virulence test. The results were as follows: Flocculation test was much alike for the control and for the samples pressed at 2,000, 4,000 and 6,000 atmospheres, *i. e.*, there appeared a heavy precipitate in the form of a gel much like a clot that slowly retracts; the mass of the gel was somewhat smaller for the samples treated at 4,000 and 6,000 atmospheres. On the contrary, the sample pressed at 8,000 atmospheres presented a very striking difference, the pre-

3 Gratia, A., and Manil, P., *Compt. rend. soc. biol.*, 1933, **114**, 923, 929, 1382; **115**, 189, 1239; 1934, **117**, 490, 493; **118**, 379; 1936, **122**, 814; **123**, 325, 509; 1937, **126**, 67; *Bull. l'acad. roy. med. Belg.*, 1935, 208.

4 Stanley, W. M., *Science*, 1935, **81**, 644; 1936, **83**, 85, 626; *Phytopathology*, 1935, **25**, 922; 1936, **26**, 305.

5 Bawden, F. C., Pirie, N. W., Bernal, J. D., and Fankuchen, I., *Nature*, 1936, **138**, 1051; Bawden, F. C., and Pirie, N. W., *Proc. Roy. Soc.* (London), 1937, B **123**, 272.

6 Wyckoff, R. W. G., Biscoe, J., and Stanley, W. M., *J. Biol. Chem.*, 1937, **117**, 57.

7 Gratia, A., and Manil P., *Compt. rend. soc. biol.*, 1937, **127**, 423.

cipitate being reduced to a few small clumps which sedimented readily. Similarly, the crystallization test was much alike for the control and the 3 first pressed samples while the last one, pressed at 8,000 atmospheres, exhibited an amorphous precipitate in which only a very few crystalline forms could still be seen. The virulence test gave the following number of lesions: 90, 49, 63, 58, and 2 respectively for the control and the 4 pressed portions.

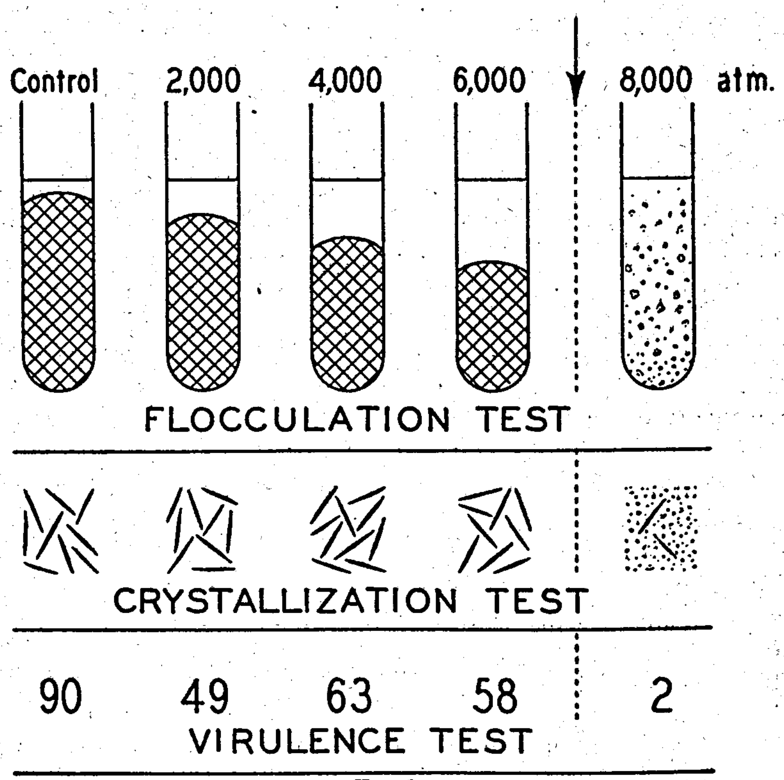

FIG. 1.

It is evident that the specific protein resists apparently up to a pressure of 6,000 atmospheres but undergoes a marked change at 8,000 atmospheres. This change parallels the serological, chemical, and virulence test.

The next experiment was then performed comparatively with plain unpurified juices of tobacco plants infected either with tobacco mosaic virus or with tobacco necrosis virus, a virus which is neutralized by the corresponding antiserum but which does not show any precipitation nor has it been obtained as a crystalline protein.

The virulence test on *Nicotiana tabacum* was performed for tobacco necrosis and on *Nicotiana glutinosa* for tobacco mosaic and gave the results shown in Table I.

TABLE I.

	Control	3,000 atmospheres	5,500 atmospheres	8,000 atmospheres
Tobacco necrosis on *Nicotiana tabacum*	lesions	lesions	0	0
Tobacco mosaic on *Nicotiana glutinosa*	66	121	90	39

The second experiment confirmed the first one in regard to tobacco mosaic virus, the destructive action of pressure being more than 8,000 atmospheres which is well above the usual lethal pressure for certain viruses and close to the denaturing pressure for globulin. On the other hand, tobacco necrosis is inactivated between 3,000 and 5,000 atmospheres, the usual virus lethal pressure.

It might be of interest to note that in both experiments the number of lesions for tobacco mosaic was somewhat higher after the virus had been pressed between 3,000 and 6,000 atmospheres than when pressed at lower or higher pressures. This fact might be of importance if duplicated.

9809

Effect of Autoclaving on Vitamin Potency of Nicotinic Acid.*

SUSAN GOWER SMITH, GEORGE MARGOLIS AND LESTER H. MARGOLIS. (Introduced by D. H. Sprunt.)

From the Department of Medicine, Duke University School of Medicine, Durham, N. C.

Smith and Hendrick[1] and Goldberger, Wheeler, Lillie, and Rogers[2] of the U. S. Public Health Service showed that the vitamin B value of yeast, as then understood, was due, in part, to the antineuritic substance which was destroyed by autoclaving, and, in part,

* Part of the expenses of this work was covered by grants from the Rockefeller Foundation and the Lederle Biological Laboratories.

1 Smith, M. I., and Hendrick, *U. S. P. H. Rep.*, 1926, **41**, 201.

2 Goldberger, Jos., Wheeler, G. A., Lillie, R. D., and Rogers, L. M., *U. S. P. H. Rep.*, 1926, **41**, 297.