TABLE I.

Method used	Individuals tested	Errors	% errors	Time required per 25 tests
4-tube	39	0	0	2 hr (estimated)
Hollow-ground slide	36	0	0	45 min (measured)
Glass slide	249	11	4.4	1 hr "
Author's	324	1	0.3	20 min "

All tests done by the author's method were checked by one of the other 3 tests, usually the glass slide method. Whenever there was disagreement between the author's method and the glass slide method the blood was retyped by one of the other 2 methods.

be as simply and quickly determined, carrying out the test as described but substituting anti-M and anti-N sera for anti-A and B sera. Thus on 4 fingers of an individual one can determine in 3 minutes or less his A, B, M, and N types. We have not been successful in using this test to determine the presence or absence of the Rh factor.

I am indebted to Lieut. George P. Heckel, M.C., U.S.N.R., for enabling us to carry out the method on the V-12 students under his care and to Miss Dorothy Miller for her interested cooperation.

Summary. A simple, rapid blood-typing test is described which requires a minimum of equipment, gives clear cut reactions and a very low percentage of error. It is especially useful for typing large groups because of the impossibility of mislabelling the bloods. It is so simple that blood typing can be made a home or office procedure.

14612

A Granular Body Characteristic of Certain Non-Bacterial Pneumonias of Mice.*

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Several strains of non-bacterial pneumonia readily transmissible by intranasal infection have been established in mice with throat washings or lung suspension from human atypical pneumonias.[1] The lung lesions in 3 of these strains are characterized by large spherical or oval bodies measuring approximately 12 to 30 micra in greatest diameter and composed of myriads of minute granules or short rods (Fig. 1-5). These structures will be designated as granular bodies, and their minute components as elementary particles.

The shape of the granular bodies is sharply defined by a thin capsule or membrane.

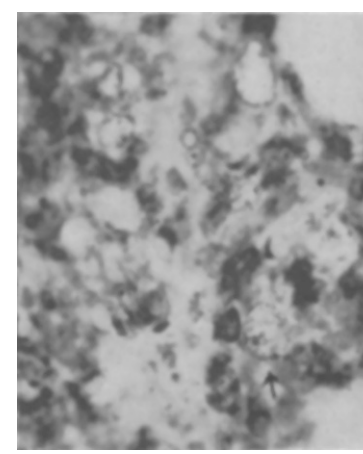

FIG. 1.

Mouse killed 5 days after infection with "mouse pneumonitis virus" (Nigg). The arrows point to 2 characteristic granular bodies. Others in the field are not well in focus. × 400.

* These investigations were made under the Commission on Pneumonia, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the United States Army.

[1] deGara, P. F., and Furth, J., to be published.

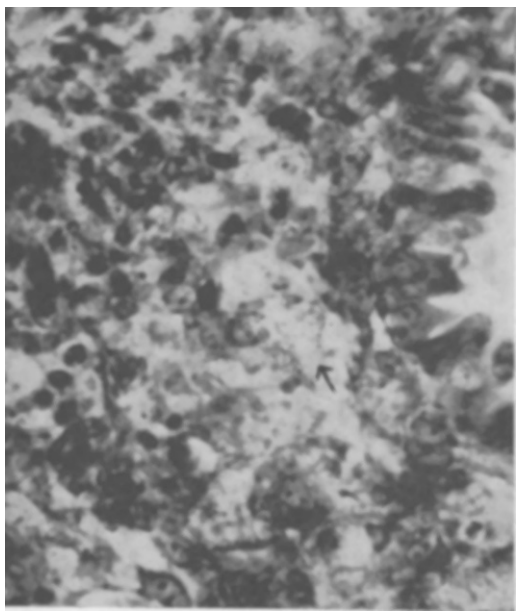

FIG. 2.
Same mouse. Arrow points to a large granular body, part of which is not in focus. × 400.

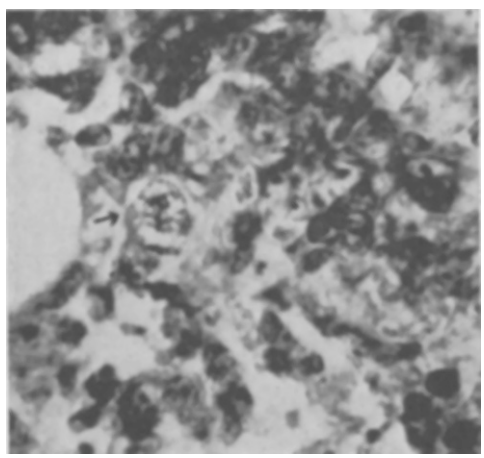

FIG. 3.
Same mouse. Arrow points to granular body, at the margin of which is a spindle-shaped mass, possibly a compressed nucleus. × 400.

Within this membrane are large numbers of minute, spherical elementary particles of more or less uniform size, separated by ample clear space. A few of the particles, notably those close to the membrane, are of the size of a staphylococcus, but most of them are much smaller. In hematoxylin and eosin or Gram-stained sections, the granules are indistinct

FIG. 4.
Mouse killed 7 days after infection with strain Br62. × 300.

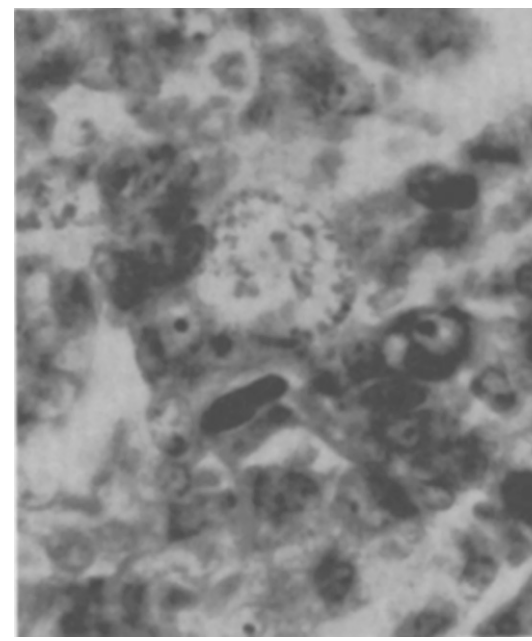

FIG. 5.
Same mouse. The granules are slightly blurred, not being well in focus. × 1300.

or unstained, and the lesion resembles a giant vacuole. In Gram-stained preparations the elementary particles are either pale-staining, gram-negative, or unstained. They are well defined in Giemsa-stained sections of tissues fixed in Zenker-formol and embedded in paraffin. Granular bodies were found only in consolidated areas, and were not seen within vessels or in tissues other than the lung.

Virus pneumonia in which these granular

bodies are present is essentially an interstitial inflammation with infiltration of large mononuclear cells and few polymorphonuclear leukocytes. It is accompanied, however, by the accumulation of large numbers of polymorphonuclear leukocytes within the alveoli, with relatively few large mononuclear cells at the onset of consolidation. Minute granules with the size, shape, and staining properties of elementary particles are seen in the cytoplasm of mononuclear cells but seldom in those of polymorphonuclear leukocytes. Inclusions resembling the granular body are rarely seen in the cytoplasm of bronchiolar epithelial cells. These, however, contain numerous coarser particles, and the nucleus of the cell is clearly seen close to the basement membrane, whereas the characteristic granular body is usually devoid of any recognizable cellular component.

The precise relation of the granular body to other structures of the pneumonic lung has thus far not been ascertained. The first impression gained is that the granular bodies represent giant nuclei which have disintegrated into minute particles, but pyknosis and karyorrhexis are not associated with such an enormous swelling of nuclei or with their disintegration into particles so small and uniform. A large and characteristic granular body contains nothing but minute elementary particles of uniform size (Fig. 1, 2). Occasionally a flattened structure, perhaps a nucleus, is seen on the margin of the body (Fig. 3), giving the impression that the granular bodies may have originated from intracytoplasmic accumulation of elementary particles. Very rarely a pale-staining structure, resembling a fading nucleus, is seen within such a body. More common is the presence of larger coccoid particles, the significance of which is likewise uncertain. The granular bodies can be readily distinguished from large mononuclear leukocytes which have phagocytosed cellular debris.

The granular bodies were discovered in the course of attempts to identify the non-bacterial transmissible strain of pneumonia Br62.† In order to ascertain whether their presence is of diagnostic value, pneumonia was produced by different agents, and the lungs, sectioned under comparable conditions, were examined for granular bodies. These were not seen (a) in more than 20 pneumonias produced by influenza virus B,‡ (b) in 10 pneumonias produced by the PVM virus of Horsfall and Hahn§[2] (c) in 5 pneumonias produced by the MP virus of Francis and Magill,‡[3] and (d) in numerous samples of spontaneous pneumonias of mice. In the lesions produced by "mouse pneumonitis virus" of Nigg,§[4] on the contrary, granular bodies were seen in large numbers. Thus, this lesion can be regarded as characteristic of non-bacterial pneumonias of the type produced by strains Nigg[4] and Br.[1] The relation of these two strains to each other and to viruses of lymphogranuloma and psittacosis is under investigation.

Granular bodies were noted as early as 2 days and as late as 21 days after infection of the animal. Strain Br62 is less virulent for mice than the strain of Nigg, and the pneumonias produced by it are slow to develop. After 21 days, however, they may produce as many granular bodies as the Nigg strain after 3 days. The finding of granular bodies proved to be of value in the course of investigations of the non-bacterial pneumonias; *e.g.*, it indicates that the pneumonia was produced by the agent studied and was not an intercurrent disease. In the light of well-known investigations of others (*cf.* [8]) on related elementary particles, this finding strongly suggests that the lesion is still active. In older lesions in which lymphocytes and fibroblast-like cells are numerous in interstitial locations and acute exudate is absent, granular bodies were usually not seen.

† The abbreviation "Br" represents "Fort Bragg," and the number is that of the patient. The material used for inoculation was obtained through the courtesy of Drs. J. H. Dingle and T. J. Abernethy. The relation of the viruses here described to the human pneumonias is under investigation.

‡ These strains were received through the courtesy of Dr. T. P. Magill.

§ These strains were received through the courtesy of Dr. F. L. Horsfall, Jr.

[2] Horsfall, F. L., Jr., and Hahn, R. G., *J. Exp. Med.*, 1940, **71**, 391.

[3] Francis, T., Jr., and Magill, T. P., *J. Exp. Med.*, 1938, **68**, 147.

[4] Nigg, C., *Science*, 1942, **95**, 49.

Granular bodies were not seen in imprints, probably because of their fragility. The current custom is to depend on imprints or smears, which show elementary particles but not granular bodies. This may explain why the granular body has not been noted previously.

In a recent description of lesions caused by the Nigg strain,[5] the presence of intracytoplasmic elementary particles is emphasized, this and other findings linking its agent to those of lymphogranuloma venereum and psittacosis.[5] The intracytoplasmic collection of elementary particles in experimental lymphogranuloma venereum has been named by Miyagawa and associates[6] "granulocorpuscle," and their work has been confirmed by Shaffer, Rake, and McKee.[7] In the yolk sac infected with lymphogranuloma virus, Rake and Jones[8] noted the formation of a "vesicle" containing minute spheroid particles, the whole being similar to the granular body noted by us in the lungs of mice.

Summary. A granular body composed of large numbers of minute spherical particles of uniform size is described in pneumonic consolidations. This lesion appears to be characteristic of certain transmissible non-bacterial pneumonias of mice.

5 Nigg, C., and Eaton, M. D., *J. Exp. Med.*, 1944, **79**, 477.

6 Miyagawa, Y., Mitamura, T., Yaoi, H., Ishii, N., Nakajima, H., Okanishi, J., Watanabe, S., and Sato, K., *Jap. J. Exp. Med.*, 1935, **13**, 1.

7 Shaffer, M. F., Rake, G., and McKee, C. M., PROC. SOC. EXP. BIOL. AND MED., 1940, **44**, 408.

8 Rake, G., and Jones, H. P., *J. Exp. Med.*, 1942, **75**, 323.

14613 P

Specificity of Cutaneous Allergy to Procaine in Man.

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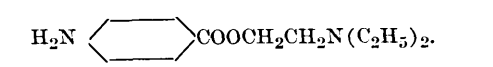
This study was carried out on a 26-year-old dentist who was found to respond with itching, vivid erythema, edema, vesiculation, and oozing to contact with aqueous solutions of procaine hydrochloride. The threshold concentration at which this eczematous reaction was just visible, was found to be at 1:36,000 with aqueous solutions of procaine salts (hydrochloride, borate, butyrate), as well as with the base procaine dissolved in triethanolamine.

The cutaneous reactions to procaine and related compounds were tested by the simple drop method, which consisted of applying drops of equal size to the intact skin, and allowing them to remain there for exactly 5 minutes. The reactions were observed and noted 24 hours later. The standard test concentration of all solutions tested was 2½%, *i.e.*, 900 times the threshold concentration of procaine. Bases were dissolved in triethanolamine; salts in water.

Procaine has the structure of an ester:



The two compounds forming this ester, namely, the acid, *p*-aminobenzoic acid, and the alcohol, β-diethyl-amino-ethanol: $HOCH_2CH_2N(C_2H_5)_2$, when tested separately, yielded completely negative skin reactions in our subject. Similarly, seven alkyl esters of *p*-aminobenzoic acid up to C_5, including the isopropyl and isobutyl esters, proved to be without any effect when dissolved in triethanolamine and tested in 2½% concentration. Several aliphatic compounds containing a tertiary amine-N, as does the side chain of procaine, such as triethylamine, $(C_2H_5)_3N$, and its hydrobromide, triethanolamine, $(HOCH_2CH_2)_3N$, and β-chloro-ethyl-diethyl-

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