carried out in the various commercial, university and government laboratories.

DR. WILLIAM A. SHURCLIFF, of the Office of Scientific Research and Development, who served for eight years as acting head of the laboratory of physics of the American Cyanamid Company, has been named technical consultant to the Bureau of Industry of the New York State Department of Commerce.

DR. FRANK J. RUDERT, Ph.D. (Cornell), has joined the Merrell Research Laboratories to study the development of new antibiotics.

DR. J. H. SIMONS, professor of physical chemistry at Pennsylvania State College, has been appointed director of the Fluorine Research Laboratories.

PROFESSOR EMERITUS WILLIAM H. HOBBS, of the University of Michigan, has returned from a month's field season spent in mapping the now abandoned shore-lines of Glacial Lake Leverett, which was discovered in 1943 (SCIENCE, September 10, 1943, pp. 227–230).

THE special committee on atomic energy of the Senate opened hearings beginning on Monday, November 26. Among the witnesses were Dr. Vannevar Bush, director of the Office of Scientific Research and Development; Dr. Harold Urey, professor of chemistry at the University of Chicago; Dr. Irving Langmuir, associate director of the Research Laboratories of the General Electric Company at Schenectady; Dr. E. P. Wigner, Thomas P. Jones professor of physics at Princeton University; Dr. H. D. Smyth, reseach chemist of Carleton and Hovey Company; Dr. Edward U. Condon, now director of the National Bureau of Standards, and representatives of government, labor and agriculture.

WALTER N. BANGHAM, director of the plant research department of the Goodyear Rubber Plantations Company, San José, Costa Rica, has recently returned from a two-week visit to the El Palmar area of Mexico, where he made a survey of planting practices on the Hevea Plantations for the Secretaria de Agricultura y Fomento, Mexico.

DR. JOHN B. LUCKE has returned to his work as associate professor of geology and head of the department of geology and geography at the University of Connecticut. During the past year, as Lieutenant, U.S.N.R., he was photo interpretation officer in charge of terrain and beach studies at the Joint Intelligence Center, Pacific Ocean Areas, Pearl Harbor, T. H.

ANTHONY PUGLIESE, A.U.S. retired, assistant professor of design at Brooklyn College, has returned from military leave. He is an honorary member of the Armée de l'Air Français. He will divide his time between the Veterans' and War Counseling Office and studio classes in the department of design.

PROFESSOR ROGER ADAMS, head of the department of chemistry of the University of Illinois, and chairman of the board of directors of the American Chemical Society, has been appointed special adviser to Lieutenant General Lucius DuB. Clay, deputy military governor of Germany and U. S. deputy member of the Allied Group Control Council in Berlin.

DR. ALLEN B. SCOTT has returned to his position as instructor in chemistry at the Oregon State College after four years of military service. He was separated with the rank of captain in the artillery of the Seventieth Division and was decorated with the Bronze Star medal.

The British Medical Journal reports that Professor R. P. Linstead, F.R.S., has been appointed director of the chemical research laboratory in the Department of Scientific and Industrial Research. He was formerly Firth professor of chemistry in the University of Sheffield and in 1939 was elected to the chair of chemistry of Harvard University. During the war he returned to Great Britain.

SPECIAL ARTICLES

THE RELATION BETWEEN EPIDEMICS OF ACUTE BACTERIAL PNEUMONIA AND INFLUENZA[1]

THERE is insufficient knowledge of the underlying causes of the localized epidemics of pneumonia which are known to occur in institutions, camps, rural areas, families and hospital wards.[2] In the present paper the possibility will be discussed that some of these localized outbreaks of bacterial pneumonia are related to epidemic influenza. One instance of a laboratory confirmation of this hypothesis will be reported.

According to Collins and Gover[3, 4] 16 widespread epidemics of influenza have occurred in the United

[1] This investigation was supported in part through the Commission on Acute Respiratory Diseases, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Service, Office of The Surgeon General, United States Army, and by grants from the Commonwealth Fund, the W. K. Kellogg Foundation, the John and Mary R. Markle Foundation and the International Health Division of the Rockefeller Foundation to the Board for the Investigation and Control of Influenza and Other Epidemic Diseases for the Commission on Acute Respiratory Diseases.

[2] M. Finland, *Medicine*, 21: 307–344, 1942. (Includes an extensive bibliography of reported epidemics.)

[3] S. D. Collins, *Pub. Health Rep.*, 45: 361–406, 1930.

[4] Mary Gover, *Pub. Health Rep.*, 58: 1033–1061, 1943.

States between the years 1920 and 1944. At least 6 of these have been nationwide in extent, while the remaining 10 have been recognized in 4 or more of the 9 geographic areas of the country as designated by the United States Public Health Service. During each of the 8 epidemics which have occurred since 1932 the presence of specific influenza type A or B has been demonstrated by virus isolations or by serological methods or both.[5, 6]

A sharp increase in mortality from pneumonia has accompanied each epidemic of influenza.[3, 4] The specific etiology of these pneumonias is apparently varied. It is the common experience of clinicians that an unusually large number of pneumococcal and other bacterial pneumonias occur during these periods.[7] There can be little question that in some manner an epidemic of influenza leads to a high incidence of bacterial infections of the respiratory tract.

A review of the localized epidemics of type specific pneumonia which have been reported in recent years reveals that most of these have occurred during the periods of widespread influenza infection.[2] Smillie, Warnock and White[8] indicate that influenza A infection occurred during an epidemic of type I pneumonia in a mental institution in Massachusetts in 1937. Finland, Peterson and Strauss,[9] and Pearson, Eppinger, Dingle and Enders[10] have reported the association of influenza A with both staphylococcal and pneumococcal pneumonia during the epidemic in Boston in 1940–41. The outbreaks of pneumonia which have occurred in camps and institutions have usually been preceded by waves of influenza-like infection, although the specific causes of such infections have only seldom been identified.

In epidemics in rural areas or villages, the concurrence of influenza-like illnesses has been reported less frequently. Such an outbreak was studied by Rogers, Bahlke and Harris[11] in Northville, N. Y., in 1940. There were 11 cases of pneumonia in a population of approximately one thousand people. Of these, 8 were due to type I pneumococcus. The cases occurred during a five-month period from December, 1939, to April, 1940. As a part of this study a sample comprising approximately one fourth of the total population was interviewed at monthly intervals, between January and May for a history of acute illness. An estimate for this period for the town as a whole based on these histories disclosed approximately 156 cases of acute respiratory disease with grippe-like symptoms and 148 cases of mild gastro-enteritis which epidemiologically seemed to be spread by the respiratory route. It seemed likely, however, that this incidence was not above the endemic level for these conditions in a rural community.

Blood specimens were secured from more than 100 individuals of this sample, during February, March or early April, and second specimens were obtained approximately four to six weeks subsequently. These bloods were collected for the purpose of studying pneumococcal antibodies.[11] Many of these sera, particularly those from the cases of pneumonia and the carriers of type I pneumococcus, were exhausted in these tests. Recently, the 55 sets of sera which remained were studied for antibodies to influenza A and B. The chicken erythrocyte agglutinin-inhibition test of Hirst[12] was employed for all the sera and a confirmatory mouse neutralization test was used in 3 instances.

The results are shown in Table 1. There were 4

TABLE 1

CHANGES IN TITER OF ANTIBODIES TO INFLUENZA TYPES A AND B IN 55 SETS OF SERA COLLECTED FROM A SAMPLE OF THE NORMAL POPULATION, NORTHVILLE, N. Y., FEBRUARY TO MAY, 1940

Change in titer	Number of individuals	
	Type A	Type B
Decreases		
Four-fold		
Two-fold	1	3
No change	50	42
Increases		
Two-fold	4	6
Four-fold		2
Eight-fold		2
Total	55	55

two-fold increases in antibody to influenza A. These slight rises in the absence of any greater increases in antibody are of doubtful significance. There were, however, 2 four-fold rises and 2 eight-fold rises in titer to influenza B. Three of these 4 "diagnostic" increases were confirmed by mouse neutralization tests. Insufficient serum was available to test the fourth. Thus 4 individuals, 7 per cent. of the sample, suffered from infection with influenza B during the interval between which the blood specimens were taken. The findings in this small group indicate that influenza B existed in the community during the winter and spring of 1940.

DISCUSSION

The demonstration of influenza B in Northville, N. Y., is of some interest because Francis[13] and

[5] T. Francis, SCIENCE, 97: 229–235, 1943.

[6] J. E. Salk, W. J. Menke and T. Francis, *Jour. Am. Med. Asn.*, 124: 93, 1944.

[7] M. Finland, M. W. Barnes and B. A. Samper, *Jour. Clin. Invest.*, 24: 192–208, 1945.

[8] W. G. Smillie, G. H. Warnock and H. J. White, *Am. Jour. Pub. Health*, 28: 293, 1938.

[9] M. Finland, O. L. Peterson and E. Strauss, *Arch. Int. Med.*, 70: 183–205, 1942.

[10] H. E. Peterson, E. C. Eppinger, J. H. Dingle and J. F. Enders, *New England Jour. Med.*, 225: 763–770, 1941.

[11] E. S. Rogers, A. M. Bahlke and A. H. Harris, *Am. Jour. Pub. Health*, 33: 671–681, 1943.

[12] G. K. Hirst, *Jour. Exp. Med.*, 75: 49–64, 1942.

Magill[14] first isolated this virus during the same season and year in other parts of New York State. A widespread prevalence of influenza, however, was not recognized in this region at that time. According to the study of "excess pneumonia mortality"[4] which is the usual criterion for indicating the prevalence of influenza, the epidemic of 1940 was limited to the South Atlantic and some of the Central States. Clearly these mortality studies do not demonstrate the full extent to which influenza may occur. It is becoming increasingly apparent that influenza may be present in some communities without attracting particular attention.

The association of influenza B with this outbreak of pneumococcus pneumonia raises the possibility that many of such localized epidemics may be secondary manifestations of influenzal infections. This idea is supported by the fact that most of the reported outbreaks of pneumonia have occurred during the years when widespread epidemics of influenza have been known to be present. Other factors also must be considered, such as the prevalence of carriers of type specific pneumococci in the population, the pathogenicity of the particular strains, and the immunity status of the population to such strains. It seems quite possible, however, that the presence of influenzal infection may be one of the determining factors. Whether the influenzal infection may predispose directly to the development of pneumococcal infection in particular cases, or may enhance the transmission of the specific pneumococci among the population, or both, remains to be elucidated.

Epidemics of pneumonia in institutions have usually been as explosive in character as epidemics of influenza. Some rural outbreaks of pneumonia, however, and the Northville outbreak in particular, have been protracted. Cases have occurred over a period of several months or throughout the "respiratory season." It is difficult to reconcile this protracted course with the usual short duration of influenza epidemics. It is possible that (1) the apparent susceptibility to pneumonia which is produced by influenza infection lasts for several months, or (2) in rural areas influenza epidemics may continue for a longer period than has been generally appreciated, or (3) some of the cases of pneumonia may have resulted independently of influenzal infection.

Epidemics of pneumonia have occurred in the absence of known wide-spread influenza. One of these developed in Wyoming County, N. Y. during the winter of 1937–38.[15] Neither influenza A nor B was reported from any part of the country during this period. The sporadic occurrence of single cases and small outbreaks of influenza A and B, however, are now being discovered with increasing frequency.[6, 16, 17, 18, 19, 20] Localized outbreaks of pneumonia in the absence of recognized prevalence of influenza might result: (1) from the occurrence of such small outbreaks of influenza A or B, or (2) from the prevalence of other, as yet unidentified respiratory diseases, or (3) from other causes independent of a preceding or concurrent respiratory infection.

Aside from these hypothetical considerations, the findings in the Northville sera clearly indicate that an increased prevalence of pneumonia may be a useful clue to identifying and studying outbreaks of influenza.

SUMMARY

The presence of influenza B infection during an epidemic of type I pneumococcus pneumonia in Northville, N. Y., in 1940 has been reported. The possibility is discussed that some localized outbreaks of acute bacterial pneumonia are secondary manifestations of influenza epidemics.

COMMISSION ON ACUTE RESPIRATORY DISEASES[21]
FORT BRAGG, N. C.

AND

THE NEW YORK STATE DEPARTMENT OF HEALTH[22]
ALBANY, N. Y.

ON THE IN VITRO PROTEOLYSIS OF EGG WHITE[1]

RECENT investigations on the nutritional value of various proteins have renewed interest in the properties of egg proteins. Murlin[2] has reported high biologic value for egg white in humans and various unpublished experiments on dogs have come to our attention. Since some of this work has involved the use of dried egg white it has seemed worthwhile to

[13] T. Francis, Jr., SCIENCE, 92: 405–408, 1940.
[14] T. P. Magill, *Proc. Soc. Exp. Biol. and Med.*, 45: 162–164, 1940.
[15] New York State Health Department, unpublished studies.
[16] C. Nigg, C. M. Eklund, D. E. Wilson and J. H. Crowley, *Am. Jour. Hyg.*, 35: 265–284, 1942.
[17] F. M. Burnet, *Med. Jour. Australia*, 11: 393–398, 1943.
[18] R. Hare, J. Hamilton and W. R. Feasby, *Can. Jour. Pub. Health*, 34: 453, 1943.
[19] C. H. Stuart-Harris, R. E. Glover and K. C. Mills, *Lancet*, 790, December 25, 1943.
[20] Commission on Acute Respiratory Diseases, unpublished data.
[21] Members and associates of the Commission on Acute Respiratory Diseases are: John H. Dingle, Major, M.C., A.U.S., Director; Theodore J. Abernethy, Major, M.C., A.U.S.; George F. Badger, Major, M.C., A.U.S.; Joseph W. Beard, M.D.; Norman L. Cressy, Major, M.C., A.U.S.; A. E. Feller, M.D.; Irving Gordon, M.D.; Alexander D. Langmuir, Major, M.C., A.U.S.; Charles H. Rammelkamp, Jr., M.D.; Elias Strauss, Captain, M.C., A.U.S.
[22] Division of Communicable Diseases and Division of Laboratories and Research.
[1] These experiments were carried out with the assistance of Miss Jeanne D. Medler.
[2] J. R. Murlin, L. E. Edwards and E. E. Hawley, *Jour. Biol. Chem.*, 156: 785, 1944.