Oct. 22, "Human Relations"; Oct. 29, "The Psychology of Language"; Nov. 5, "The Psychology of Language" (continued)—"The Origin of Language"; Nov. 12, "The Psychology of Government"—"Rulers and Ruled"; Nov. 19, "The Psychology of Government" (continued)—"Laws and the Law"; Dec. 3, "The Psychology of Punishment"; Dec. 10, "The Psychology of Welfare"—"The Welfare of Individuals"; Dec. 17, "The Psychology of Welfare" (continued)—"The Welfare of Communities." The lectures are open to the public.

THE *Journal* of the American Medical Association reports that the Washington State Department of Health and the U. S. Public Health Service cooperated in the establishment of an industrial hygiene division on October 1. The new division will be housed in the same office building as the State Department of Health.

The Harvard Alumni Bulletin states that the latest reports show that four hundred members of the faculty of Harvard University have either left or are on full- or part-time leave for war service. They represent twenty per cent. of the teaching staff. At the Harvard Medical School alone, 180 faculty members have left, many of them to serve in base hospitals overseas from Northern Ireland to the central Army hospital in Australia. Faculty members in many other departments have been granted leaves of absence either to serve with the armed forces or to engage as civilians in special war work in Washington. Others have been permitted to give full time to research projects financed by the Federal Government and carried on in laboratories at Harvard and elsewhere.

THE *Journal* of the American Medical Association reports that the U. S. Army headquarters for the European theater of operations has announced that the American Red Cross-Harvard University Hospital in southern England has been taken over by the Army and will be the central laboratory for U. S. armed forces in Britain. This hospital was established in 1940 and operated jointly by the American Red Cross, Harvard University and the British Ministry of Health for the study of wartime epidemics. Its twenty-two buildings were all fabricated in the United States, from which the sixty-six thousand pieces of fabricated building material were shipped to England to be erected by British workmen. The director of the hospital was Dr. John E. Gordon, professor of preventive medicine and epidemiology at Harvard University Medical School. The staff comprised ten doctors, sixty-two nurses, six technicians and eight administrative members. The hospital will be turned over to the British Ministry of Health at the end of the war.

DISCUSSION

THE PROBABILITY OF OBTAINING POTENTIALLY DANGEROUS POOLS OF HUMAN SERUM OR PLASMA

THE mixture of plasmas or serums containing antagonistic isoagglutinins results in their inactivation.[1,2,3] The reaction takes place in a quantitative manner.[3] For this reason the practice of pooling serums or plasmas of unknown isoagglutinin content has gained wide popularity. Such pools usually consist of eight to sixteen individual serums or plasmas. Since the groups of the individual components of the pools are not customarily determined, it would seem possible that pools containing disproportionate numbers of serums or plasmas of one type might occur, so that the phenomenon of inactivation might not take place. Such a possibility possesses more than a theoretical danger, since Polayes and Squillace[4] have reported a near-fatal reaction following the transfusion of pooled plasma. The pooled plasma was later found to be capable of agglutinating the red blood cells of the recipient. In this paper we shall attempt to demonstrate the mathematical probability of obtaining potentially dangerous pools of human serum or plasma.

In order to simplify the calculation, three assumptions were made: (1) each donor contributes equally to the pool; (2) each sample has the same titer of isoagglutinins; (3) the presence of an excessive preponderance of one group in a pool renders such a pool potentially dangerous for transfusion, *e.g.*, 12 or more samples of Group A or O in a pool of 16; 6 or more samples of Group A or O in a pool of 8; 3 or more samples of Group A or O in a pool of 4.

In this investigation we have used Snyder's[5] data (based upon 20,000 random samples from the U. S. population) regarding the relative incidence of the four main blood groups: Group O, 45 per cent.; Group A, 41 per cent.; Group B, 10 per cent., and Group AB, 4 per cent.

In order to determine the probability that a certain number of any particular group (O, A, B or AB) of serum or plasma would occur by random sampling of the U. S. population in pools of sixteen, eight and

[1] S. O. Levinson and A. Cronheim, *Jour. Am. Med. Asn.*, 114: 2097, 1940.

[2] R. Jakobowicz and L. M. Bryce, *Med. Jour. Australia*, 1: 318, 1941.

[3] H. A. Davis, *Surgery*, 10: 592, 1941.

[4] S. H. Polayes and J. A. Squillace, *Jour. Am. Med. Asn.*, 118: 1050, 1942.

[5] L. H. Snyder, "Blood Grouping in Relation to Clinical and Legal Medicine," Williams and Wilkins Company, Baltimore, 1929.

four sample pools, the binomial expansion was used. Thus the expression $(P_1+P_2)^n$ may be expanded into the general term:

$$\frac{n!}{a_1! \times a_2!} \times P_1{}^{a_1} \times P_2{}^{a_2} = P$$

Where:

P is the probability of obtaining a pool of a_1 samples of one blood group and a_2 samples of any of the other groups when n samples are taken to make the pool and P_1 is the probability of obtaining that group and P_2 is the probability of obtaining any other groups. In the calculations reported here, P_1 took values of 0.45 for group 0; 0.41 for group A; 0.10 for group B; and 0.04 for group AB. Corresponding values for P_2 were taken as 0.55 for A, B, AB; 0.59 for O, B, AB; 0.90 for O, A, AB; and 0.96 for A, B, O.

In Table 1 is illustrated the probability of obtaining an excess of any group in pools of 16, 8 or 4 serums or plasmas by random sampling of the U. S. population. As might be expected, the smaller the pool, the greater is the probability of obtaining a preponderant number of serums or plasmas of one group. Moreover, Groups O and A tend to be present with greater frequency in such pools. Defining "potentially dangerous" pools as those containing more than 12 samples of O, A or B bloods in 16, more than six in pools of eight, and more than three in pools of four, then the probability of obtaining potentially

TABLE 1

PROBABILITY (AND APPROXIMATE ODDS) OF OBTAINMENT IN POOLS OF SIXTEEN SERUMS OR PLASMAS SAMPLES OF

Group	16 times	15 times or more	14 times or more	13 times or more	12 times or more
O	0.000003 (1 : 330,000)	0.000058 (1 : 20,000)	0.00048 (1 : 2,000)	0.00328 (1 : 300)	0.0143 (1 : 70)
A	0.0000006 (1 : 1,700,000)	0.000015 (1 : 66,000)	0.000173 (1 : 5,800)	0.00123 (1 : 800)	0.0062 (1 : 160)
B	1×10^{-16}	1×10^{-14}	8×10^{-13}	4×10^{-11}	1×10^{-9}
AB	4×10^{-23}	2×10^{-20}	3×10^{-18}	3×10^{-16}	3×10^{-14}

IN POOLS OF FOUR SERUMS OR PLASMAS SAMPLES OF

Group	8 times	7 times or more	6 times or more
O	0.0017 (1 : 600)	0.0181 (1 : 55)	0.0884 (1 : 12)
A	0.008 (1 : 1250)	0.01 (1 : 100)	0.0563 (1 : 18)
B	1×10^{-8}	7×10^{-7}	2×10^{-5}
AB	6×10^{-12}	1×10^{-9}	1×10^{-7}

IN POOLS OF FOUR SERUMS OR PLASMAS SAMPLES OF

Group	4 times or more	3 times or more
O	0.04 (1 : 25)	0.25 (1 : 4)
A	0.03 (1 : 33)	0.19 (1 : 5)
B	0.0001 (1 : 10,000)	0.0037 (1 : 270)
AB	0.000002 (1 : 500,000)	0.0002 (1 : 5,000)

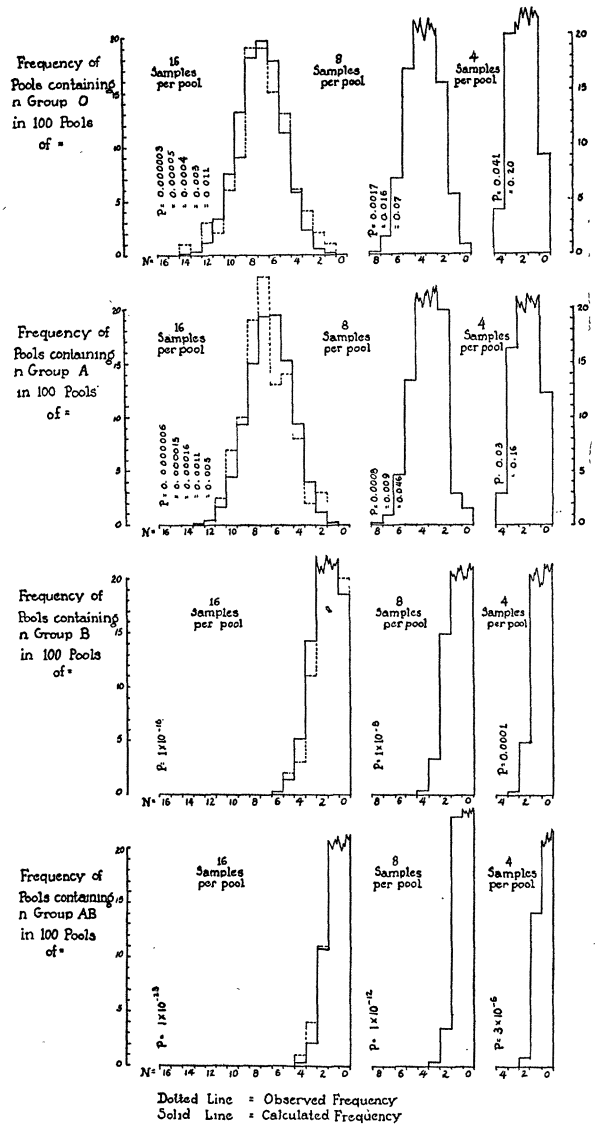

FIG. 1. Frequency distribution of 100 pools of human serum or plasma of 16, 8 and 4 components.

dangerous pools is the sum of the probabilities of obtaining predominantly O, A or B pools. For pools of sixteen, the probability is 0.02 (*i.e.*, odds of 1 : 50); for pools of eight, 0.14 (odds of 1 : 7); and for pools of four, 0.44 (odds of 1 : 2.3). The frequency distribution of groups in 100 pools of 16, 8 and 4 components is shown in Fig. 1. Also shown are the results obtained by actual sampling of marked balls made up to represent the blood group population. It will be noted that the observed frequency follows closely the calculated frequency in the 100 pools containing 16 components.

Certain tentative conclusions may be drawn from these results. The wide-spread practice of pooling serum or plasma without knowledge of the groups

present may lead to the production of potentially dangerous pools. This is more likely to occur when the number of components of the pool is small (such as 4) and less likely to occur when the number of components is large (such as 16). It is suggested that the isoagglutinin titer of all pools be determined in order to exclude those possessing dangerously high titers of isoagglutinins.

HARRY A. DAVIS
GEORGE R. MENEELY
DEPARTMENTS OF SURGERY AND MEDICINE,
LOUISIANA STATE UNIVERSITY SCHOOL OF MEDICINE, NEW ORLEANS

A CAUTION ON THE USE OF MALEIC ANHYDRIDE AS A REAGENT FOR CONJUGATED DIOLEFINS

ALTHOUGH maleic anhydride is commonly used as a selective reagent for the conjugated diolefins in gasolines and other hydrocarbon mixtures from cracking, it is not generally known that certain dienes fail to respond.

Farmer and Warren[1] early showed that 4-methylpentadiene-1,3 fails to form the expected simple adduct with the anhydride. Since that time other observations reported in the literature indicate that dienes with doubly substituted carbon atoms in the terminal (1,4) positions of a conjugated system RRC = C – C = CRR either give polymeric adducts or, under antioxidation conditions, no appreciable reaction of any kind.

More recently the writer and his coworkers reported that the *cis* isomer of pentadiene-1,3 fails to show significant reaction with maleic anhydride.[2] Since pentadiene-1,3 (piperylene) is the first member in the homologous series of conjugated dienes to exhibit geometrical isomerism, there seems little doubt that analogous isomers of higher dienes will behave similarly, although this has not yet been proved. The writer has also observed in the case of piperylene that the *cis* isomer is much more prominent in mixtures from high temperature processes.

RICHARD F. ROBEY
ESSO LABORATORIES,
STANDARD OIL DEVELOPMENT COMPANY,
ELIZABETH, N. J.

PYRIDOXIN AND COACERVATES IN PLANT CELLS

PYRIDOXIN may enter into the formation of characteristic aggregates in the vacuoles of senescent or poorly nourished cells which we have recently studied. Free-hand sections of the stems of stunted mustard plants grown without zinc under rigidly controlled conditions show, in the vacuoles of the cells, globular aggregates which have the characteristics of autocomplex "coacervates." A similar phenomenon has been described whereby the phenolic compounds originally distributed at random in the water phase of the vacuolar solution may be condensed into globular aggregates surrounded by lipoids.[1]

Pyridoxin-indophenol may be demonstrated by the Scudi reaction[2] when free-hand sections of tissues are immersed in an alkaline phosphate or, preferably, veronal buffer, in which 2–6 dichloro quinone chloroimide is suspended. Indophenol first forms where pyridoxin exists, within the coacervates; indophenol, being fat soluble, is then absorbed by the lipoid coating the coacervate which it stains blue. The reaction does not occur in a borate buffer where the phenolic group of pyridoxin is known to be masked by the formation of a complex.

We have found *per contra* that in the post-meristematic or the perivascular cells in the roots of mustard or of snapdragon plants grown in a nutrient solution containing zinc and other necessary elements pyridoxin is randomly diffused in the vascuolar solution. It appears to become "coacervated" in the older cells of plants which remain stunted. A healthy condition is probably dependent upon the presence of pyridoxin in the vacuole. Coacervates may therefore inactivate an important constituent of the cell system.

HOWARD S. REED
UNIVERSITY OF CALIFORNIA
JEAN DUFRENOY
LOUISIANA STATE UNIVERSITY

X-RAY EVIDENCE FOR A THIRD POLYMORPHIC FORM OF SODIUM STEARATE

THE x-ray work of Thiessen and Stauff gave evidence that there are two distinct crystallographic forms of sodium stearate[1] called by them the α and β forms. The authors have discovered a third form[2] which may be called the γ form, in conformity with the notation of Thiessen and Stauff.

The new γ form was detected by noting that it had a unique long spacing. The several spacings assumed to be $d_{(001)}$, are as follows:

Form	Spacing
α	51.8Å
β	46.6Å
γ	44.6Å

1 Howard S. Reed and Jean Dufrenoy. *Am. Jour. Bot.*, 29: 544–551, 1942.

2 J. V. Scudi, H. F. Koones and J. C. Kuesztesy, *Proc. Soc. Exp. Biol. and Med.*, 43: 118, 1940; J. V. Scudi, *Jour. Biol. Chem.*, 139: 707, 1941; O. D. Bird, J. M. Vandenbelt and A. D. Emmett, *Jour. Biol. Chem.*, 142: 317, 1942; J. V. Scudi, R. P. Birks and D. B. Hood, *Jour. Biol. Chem.*, 142: 323, 1942.

1 Farmer and Warren, *Jour. Chem. Soc.*, 3221, 1931.

2 Robey, Morrell and Wiese, *Jour. Am. Chem. Soc.*, 63: 627, 1941.

1 *Zeit. Physik. Chemie* (A), 176: 397, 1936.

2 A. de Bretteville, Jr., Thesis under Dr. J. W. McBain, "X-ray Diffraction Study of Oriented Soaps," Stanford University, 1942.