about the mean of ±1 per cent., whereas the corresponding coefficients of variation in our two sets of measurements were greater than 50 per cent. But their frequency distribution was based upon averages of all threshold determinations for each subject, and such values would normally show less variation than a distribution of single threshold measurements. Similar average thresholds have been computed from our data, and means, standard deviations, and coefficients of relative variability have been determined. For the first day's averages, these three measures were as follows, in microampere units: mean, 16.06; standard deviation, 7.86; S.D./Mean, 49 per cent. Corresponding values for the second day were: mean, 18.0; standard deviation, 8.12; S.D./Mean, 45 per cent. These indices of relative variability are somewhat lower than those for the single measurements, but they are still almost fifty times as great as the value reported for thermal stimulation.

These results show definitely that pain thresholds for this form of electrical stimulation are not uniform or constant in different individuals. A further question arises as to the constancy of sensitivity in the same individual. Does the subject with a low threshold for one series of measurements continue to exhibit the same level of sensitivity in subsequent tests in the same area, in different areas, or on different days? In order to test the reliability of these thresholds, rank-difference correlation coefficients have been computed between several series of measurements. First, the averages of all thresholds for one day were correlated with those for the second day, and the coefficient was .55. This represents a moderately high degree of correlation, but it is far too low for accurate prediction of an individual's standing from one day to the next. It should be noted, however, that one half of the subjects had almost identical ranks on the two days, while the other half exhibited the variability which lowered the correlation.

The consistency of the two sets of threshold measurements made upon the same spot was next determined. The correlations were high between the averages of each of these two series, for all four of the spots tested on the first day. The coefficients were .86, .91, .89 and .94, for arm, head, head, arm, respectively. But the correlations between average thresholds for different spots in the same body area were much lower, varying from .32 to .44. Finally, averages of all threshold determinations made for the arm on a given day were correlated with corresponding averages for the forehead. The correlations of two sets of such values, secured on the two days, were exactly the same, the coefficient in each case being .60.

It is clear from these correlations that the electrical pain threshold of an individual may vary considerably from day to day, and from one skin area to another. Certain subjects are relatively stable, while others fluctuate over a wide threshold range. Further study of the conditions of such individual variability is needed.

LYLE H. LANIER

DEPARTMENT OF PSYCHOLOGY,
VASSAR COLLEGE

THE EFFECT OF SODIUM BICARBONATE ON THE THIAMINE CONTENT OF PEAS[1]

IT is generally believed by nutritionists that cooking with sodium bicarbonate results in the destruction of a large proportion of the thiamine content of foods. In order to obtain definite data on this subject, the experiments recorded in Table 1 were carried out with fresh and frozen peas.

TABLE 1*

Type of peas and method of cooking	No. of tests	Time of cooking	pH of water after cooking	Thiamine in gamma		
				Per 100 gm peas	In total cooking water	Total
		min.				
Frozen-Type I†						
Raw	3					408
Water-cooked	3	6	7.66	326	90	416
Sodium bicarbonate-cooked	3	4	8.77	330	44	374
Frozen-Type II†						
Raw	1					351
Water-cooked	1	6		238	102	340
Sodium bicarbonate-cooked	1	4	8.70	193	25	218
Fresh						
Raw	4					333
Water-cooked	4	17	7.29	257	78	336
Sodium bicarbonate-cooked	4	8	8.84	258	63	321

* In all tests 85 gms of peas were cooked with 180 cc of water. In sodium bicarbonate tests 0.22 gm of sodium bicarbonate was added.
† Type I represents a brand of peas prepared by tunnel freezing; Type II, plate freezing.

The average time necessary to complete the cooking of the peas was determined in separate tests where it was found that sodium bicarbonate greatly reduces the time of cooking. Thiamine was determined by a modification of the fermentation procedure of Schultz, Aiken and Frey.[2] The applicability of the above method of biochemical determination was confirmed by bioassay of dried ground water-cooked and sodium bicarbonate-cooked peas by the method of Kline, Hall and Morgan.[3]

The greater loss in thiamine found in Type II of the frozen peas is probably to be ascribed to the partial mashing of the peas by this method of freezing.

[1] This investigation was aided by a research grant from the Church and Dwight Company, Inc.

[2] A. S. Schultz, L. Aiken and C. N. Frey, *Ind. Eng. Chem., Anal. Ed.*, 14: 35, 1942.

[3] O. L. Kline, W. L. Hall and J. F. Morgan, *Jour. Asn. Off. Agr. Chem.*, 24: 147, 1941.

In another series with fresh peas which were overcooked to the extent of rupture of the hulls, an average destruction of 35 and 57 per cent. of the original thiamine occurred when cooked with water or water and sodium bicarbonate, respectively.

The experiments indicate that no greater destruction occurs in the thiamine remaining in the intact pea after cooking with sodium bicarbonate than when water alone is employed. Slightly greater destruction results in the thiamine leached out of the pea during cooking. The loss only amounts to 8.3 per cent. in the frozen peas and 3.6 per cent. in the fresh peas cooked with sodium bicarbonate.

HARRY J. DEUEL, JR.
CORNELIA JOHNSTON
LOUISE SCHAUER
SAM RAPAPORT

UNIVERSITY OF SOUTHERN CALIFORNIA
MEDICAL SCHOOL,
LOS ANGELES

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN APPARATUS FOR DETERMINATION OF THE BACTERIAL CONTENT OF AIR[1]

A NUMBER of devices have been employed for determining the bacterial content of air. To be satisfactory, such a device must trap all or nearly all the air-borne microorganisms, must allow quantitative recovery of the bacteria for counting, must allow sampling of a large volume of air so that the sample obtained is representative, and must be simple and convenient to operate under field conditions.

The Wells centrifuge has perhaps been used most widely for bacterial air analysis. Theoretical considerations and experimental data have been put forth by Phelps and Buchbinder[2] showing that only those bacteria carried on droplet nuclei greater than a certain minimum size can be retained by the Wells Centrifuge. Wheeler, Foley and Jones[3] have suggested bubbling air through glass beads immersed in broth, as had been done by Robertson and associates.[4] In experiments testing the recovery of bacteria from room air, Wheeler showed that the glass beads device recovered eight times as many bacteria per cubic foot of air as the Wells centrifuge. A discussion of the merits of other bacterial samplers is given by Bourdillon, Lidwell and Thomas.[5]

The apparatus described in the present paper and pictured in Fig. 1 utilizes the principle of atomization to coat the bacterial particles with a layer of liquid.[6] The mist thus produced is carried into the second chamber of the collector, where it is bubbled through liquid which absorbs the droplets.

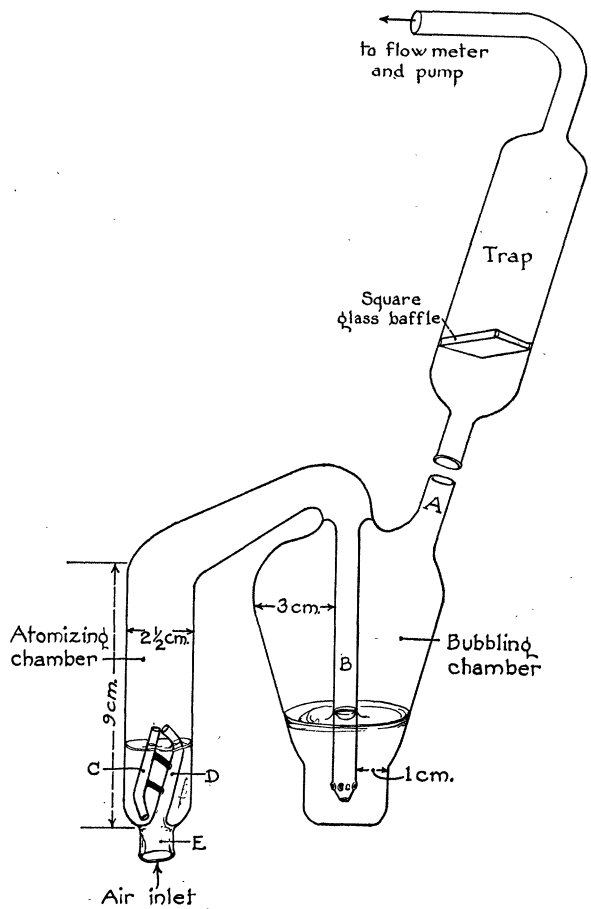

FIG. 1. Atomizer Collector for bacterial air analysis. The capillary, C, is about 1 mm, inner diameter; D is about 1.5 mm, inner diameter, at the tip. At the bottom of tube B are five holes 1 mm in diameter.

The procedure of operation is as follows: Fifteen cc of sterile broth plus two drops of sterile olive oil are pipetted into opening A of the apparatus which

[1] This investigation was aided in part through the Commission on Cross Infections in Hospitals, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Division, Office of the Surgeon General, United States Army.

[2] E. B. Phelps and L. Buchbinder, *Jour. Bact.*, 42: 321, 1941.

[3] S. M. Wheeler, G. E. Foley and T. Duckett Jones, SCIENCE, 94: 445, 1941.

[4] O. H. Robertson, Edward Bigg, B. F. Miller, Zelma Baker, SCIENCE, 93: 213, 1941.

[5] R. B. Bourdillon, O. M. Lidwell and J. C. Thomas, *Jour. Hygiene*, 41: 197, 1941.

[6] The Palmer water sampler for dust collection also has made use of this principle, G. T. Palmer, *Amer. Jour. Public Health*, 6: 54, 1916. S. H. Katz, G. W. Smith, A. M. Myers, L. J. Trostel, Margaret Ingels and Leonard Greenburg, *Pub. Health Bull.*, No. 144, 1925.