become smaller, a phenomenon so apparent even at much lower temperature in other worms (Planaria) kept starving. The worms must either have been able to utilize the foodstuffs contained in the media, or the rate of their metabolism must have been exceedingly lowered. Previously published data[3] indicate that the carbohydrate reserves of the worms would last only for 23 days if the rate of metabolism remained unchanged. The observation that sugar in the medium increased the length of life *in vitro* might point towards its actual utilization. At the present time we are inclined to assume that our results approach those achieved with several pathogenic trypanosomes which in suitable media thrive in the stages characteristic for the intermediate host but do not change into the blood forms.

Summary. 1. The maximal survival *in vitro* of an individual Eustrongylides larva at 37.5°C was 346 days. The medium was Bacto Yeast extract 0.5% + NaCl 0.5% + Glucose 0.5%. 2. The maximal average survival of a series of worms was 157 days in a medium containing Bacto-broth 0.8% + NaCl 0.5% + Glucose 0.5%. 3. The molecular concentration of the media could be varied in rather wide limits without material change in the length of survival. 4. The presence of 0.5% glucose was decidedly beneficial. 5. The worms produced acids. 6. No moulting or other sign of development was observed.

13530 P

Ascorbic Acid Requirement of Individuals in a Large Institution.

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A three-year accumulation of data obtained from the analysis of more than 1,000 blood samples indicated that the average plasma ascorbic acid level of the patients in this hospital was less than .40 mg %. The lowest results, averaging .20 mg %, were obtained during the months of April, May and June and the highest during October and November when an average of .59 mg % was achieved. These data on ascorbic acid and others on various nutritional essentials which will be described in subsequent reports indicated that a large mental institution is an exceptional laboratory for conducting

studies of human nutrition and a project has been started to make use of this opportunity. The regulated routine of the majority of the patients, the supervision of the dietary intake, and the choice of age and sex from the large numbers available make it possible to have better controls than is ordinarily so easily available.

A modification of the Mindlin and Butler[1] method was used to determine the plasma ascorbic acid. No cyanide was added to the blood but the plasma was separated from the cells and precipitated with metaphosphoric acid within 30 minutes after the blood was drawn in order to minimize ascorbic acid oxidation. All recent estimations have been made with the aid of a Cenco Spectrophotometer. Prior to January, 1941, a Cenco Photelometer was used with a green filter. All blood samples were taken in the morning before breakfast.

Table I presents the average ascorbic acid levels of different groups who were in residence at this hospital during the months March through June. The differences demonstrated are the direct results of differences in the diets. The patients who had the freedom of the grounds purchased fresh fruits at the commissary; the infirmary patients had been given fruit juices as a regular routine for several years; the dining-room attendants are patients who eat essentially the same diet as the hospital staff, and the staff supplemented their regular meals by the consumption of fresh fruit in their quarters.

In order to determine the minimum amount of ascorbic acid which should be added to the diet to remedy this apparent deficiency in the average patient, an experiment was conducted as follows: A ward containing 40 young, male, schizophrenics was divided into 2 groups of 20 patients each. Starting on April 15, 1941, 50 mg of crystalline ascorbic acid, made up in capsules, were given to Group I twice a week for 2½ weeks. Analyses of blood samples drawn before breakfast, about 20 hours after the ascorbic acid had been taken, indicated that 50 mg given twice a week did not bring about any significant change in the plasma ascorbic acid. When the supplement was increased to 50 mg every other day, there was a gradual in-

TABLE I.
Average Ascorbic Acid Levels During March-June (mg%).

Average patient (380)	.20
Patients with ground passes (76)	.38
Infirmary patients (40)	.56
Patients in staff dining rooms (54)	.80
Staff (30)	1.0

[1] Mindlin, R. L., and Butler, A. M., *J. Biol. Chem.*, 1938, **122**, 673.

TABLE II.

Average Ascorbic Acid During Experiment to Determine Amount of Supplement Necessary.

Twenty patients in each group. Samples taken before breakfast approximately 20 hours after administration of ascorbic acid.

Group I received 50 mg twice a week 4/15 to 5/8 and 50 mg every other day 5/9 to 7/1.

Group II served as control (no ascorbic acid).

Date	4/15	5/9	5/23	6/2	6/16	7/2	7/16
Group I	.20	.21	.34	.43	.59	.74	.52
Group II	.25	.14	.19	—	.15	.17	—

crease in the ascorbic acid content of the blood, as shown in Table II, and after 6 weeks on this regime a more satisfactory value (.74 mg %) was obtained. Withdrawal of the ascorbic acid supplement from Group I caused a decrease in the average plasma ascorbic acid of .22 mg % in 2 weeks. It is interesting that this decrease almost parallels the size of the increase during the 2-week intervals before the ascorbic acid was withdrawn. The second group, which served as the control and received no ascorbic acid, remained at a constant low level throughout the experiment.

A dietary calculation of the ascorbic acid in the food served to the patients during the time of this experiment showed that there was not more than 25 mg in the average daily diet. Since the addition to this diet of 50 mg every 48 hours was sufficient to bring about a slow but steady increase of the plasma ascorbic acid until the blood level was higher than .7 mg %, it can be stated that 50 mg per day is sufficient to keep the sedentary individual in a positive ascorbic acid balance.

The practical problem of supplying vitamin C to individuals fed from kitchens that produce several thousand meals a day on a limited budget is quite different from that encountered in ordinary nutritional practice. While the addition of purified vitamins to the diet should always be considered as an inferior substitute to the use of the proper foods, there are times when the proper foods are not so easily available and the addition of the purified vitamin is justifiable. In the case of ascorbic acid the synthetic substitute is considerably less expensive than the fresh or canned food—approximately 1 cent per week per patient—and it is a simple matter to add ascorbic acid to some of the food after it is cooked.

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