XXVII. A NOTE ON THE CONSERVATION OF THE POTENCY OF CONCENTRATED ANTISCORBUTIC PREPARATIONS. II.

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(Received December 31st, 1923.)

It was previously found [Zilva, 1923] that if concentrated decitrated lemon juice is stored in acid solution in a vacuum over pyrogalllic acid no demonstrable loss in the antiscorbutic potency takes place within three months, thus demonstrating that by observing conditions which prevent the oxidation of the vitamin it is possible to keep concentrated active solutions for some time. The investigation was extended with the purpose of applying this principle to a method which would render possible the preparation of such concentrated solutions for practical application.

Decitrated lemon juice was, therefore, prepared as described in the previous note, concentrated ten times, and acidified (7 g. of citric acid to the litre of juice). 50 cc. of this concentrated juice was then introduced into each of a series of flasks which were tightly stoppered with a rubber stopper containing a thick-walled capillary, evacuated and sealed. The flasks were stored under laboratory conditions in a dark cupboard. Batches were opened three and five months after the preparation and tested out on guinea-pigs. As was done before, the juice was diluted to its original volume and stored in a vacuum over pyrogalllic acid during the period of testing out. No loss in potency could be established at either period. The equivalent of 1.5 cc. of the original juice immediately after preparation and after storage was found to be the minimum daily dose required to maintain a guinea-pig on a scorbutic diet for two months without the onset of scurvy.

Clinical confirmation of the antiscorbutic potency of this stored preparation was obtained by utilising it in the treatment of a case of infantile scurvy after six months' storage. Through the kindness of Dr G. F. Still I am able to give the clinical notes of the case which was treated in one of his wards at the Hospital for Sick Children, Great Ormond Street.

Monica, T. Aged 8 months. Admitted October 30th.

Admitted for loss of power in legs and to a less degree in arms. Six weeks ago cried when bathed and lost power in legs, recently seems to be tender in arms.

Has been fed on Allen and Hanbury's Food, No. 1, since birth, with addition of Virol during past three months, and Bovril during last two months. Has recently had some boiled egg on alternate days. During last 10 days has had baked apple, one teaspoonful 2 times, and stewed prunes 3 times. Has had half a teaspoonful grape juice 3 times in last week. No previous illness.

Present Condition.

Fairly nourished, lies quiet when not touched, but cries when touched or moved. Lies with legs almost motionless, slight movement of toes and ankles. There is some thickening about the left femur especially at the upper part. There is slight thickening just above both radial epiphyses.

Two incisors present in each jaw, gums only slightly purplish, not typical on admission.

Urine 3 days after admission showed a few blood corpuscles. Arms lie flaccid at side but some movements of wrists and fingers. Very marked scorbutic pseudo-beading of ribs.

At 5.30 p.m. on October 30th concentrated decitrated lemon juice begun, $2\frac{1}{2}$ drachms given and repeated at 11 p.m.

At 7 a.m. next morning nurse reports decidedly less tender and no pain on being washed.

During October 31st concentrated lemon juice continued.

8 a.m.	...	...	...	...	$2\frac{1}{2}$ drachms
11 a.m.	...	...	...	...	$2\frac{1}{2}$ "
2 p.m.	...	...	...	...	6 "
5 p.m.	...	...	...	...	4 "
8 p.m.	...	...	...	...	3 "

At 9 a.m. on October 31st more movement of legs and arms noticed and at 6 p.m. definitely improved, flexing left leg readily at knee and right leg also to less extent, both arms moved much more freely, will play with toy, does not object now to being handled.

Stool becoming unhealthy, green with mucus.

November 1st. Stool loose, offensive with mucus. Improvement in limbs continues.

Nov. 1st	8 a.m.	...	3 drachms	Nov. 2nd	5 a.m.	...	1 drachm
	11 a.m.	...	3 "		11 a.m.	...	1 "
	2 p.m.	...	3 "		5 p.m.	...	1 "
	5 p.m.	...	3 "		11 p.m.	...	1 "
	11 p.m.	...	1 drachm	Nov. 3rd	5 p.m.	only	1 "

November 2nd and 3rd amount of concentrated lemon juice had to be diminished as stools continued bad, mucus being passed in considerable quantity and the number of stools 3 and 4 per diem.

By November 4th movement of arms was quite free and by November 6th all limbs were moved normally. Stools continued to show mucus but gradually improved and were pale but otherwise normal by November 8th. On and after November 4th 1 drachm of the concentrated lemon juice was given at 5 a.m. and 5 p.m. until 5 a.m. on November 9th, when it was discontinued as the child was discharged well that day.

It will be seen that the treatment was very intensive. One drachm of the concentrated juice corresponds approximately to the antiscorbutic content of the juice of one lemon and consequently the equivalent of about 48 lemons was administered during the treatment and the equivalent of about 15 lemons was given to the child within the first 24 hours. This, of course, would have been out of the question with any natural active juice. The rapid recovery of the patient confirms the laboratory observations made on this stored preparation.

The above experiments establish the conditions under which a very active antiscorbutic preparation can be stored without deterioration for months under conditions suitable for practical applications and we are thus in a position now to utilise this very potent antiscorbutic in the treatment and prophylaxis of adult and infantile scurvy. It is necessary to observe that the citric acid added was somewhat in excess, as it was originally intended to test the preparation clinically as a prophylactic in which case it would have been used in a diluted condition. It is anticipated that decitrated lemon juice from which the invert sugar has been removed by fermentation in an atmosphere of CO_2 as described in the preceding communication [Zilva, 1924] could also be stored without loss of potency. This would afford an antiscorbutic with even less extraneous matter. Experiments on these lines are in progress.

The author wishes to express his thanks to the Medical Research Council for a whole time grant.

REFERENCES.

- Zilva (1923). *Biochem. J.* 17, 416.
 — (1924). *Biochem. J.* 18, 182.