sible for the deterioration of flavor and destruction of ascorbic acid and carotene during storage. The use of these heating agencies, however, often damages the texture of the vegetable, making them undesirably soft. Moreover, the steam or boiling water leaches out vitamin C and members of the vitamin B complex from these foodstuffs.

It has occurred to us that if electronic heat could be employed in lieu of steam or boiling water, the texture might be improved and losses in vitamin content due to leaching greatly reduced, if not eliminated. Further, through the use of high frequency electricity it was thought possible to place the washed fresh vegetables in the final retail cartons, pass them through a high frequency field for enzyme inactivation and thence into the freezer. Such a procedure should eliminate much handling and possible attendant contamination of the vegetable before it reached the consumer in the frozen state.

In preliminary experiments frequencies of 7 to 10 and 28 to 29 megacycles were used, but the application of sufficient r.f. power to cause the rapid heating of peas, diced carrots and diced potatoes resulted in arcing between the electrodes and any projecting vegetable tissue. There was also burning between individual pieces, although the tendency to arcing or flashover was less at the higher frequency. Recourse was then made to a frequency of 150 megacycles. Experiments conducted on the heating of cabbage with an oscillator[2] having an output of 750 watts at this high frequency have shown that there is little tendency to arc if the vegetable is tightly packed into the container. In testing the effectiveness of dielectric heating, heads of cabbage were cut into slices an eighth of an inch thick and the shredded material packed into Peters-type cartons commonly used in the freezing of vegetables. A carton of shredded cabbage was placed between two copper electrodes mounted in an electric air oven. Tuning stubs were attached to the electrodes to eliminate standing waves[3] and assist in coupling the load to the oscillator. An oven temperature of 100° C. was used to prevent the condensation of moisture on the electrodes and counteract heat losses from the carton by radiation. A heating period of two to three minutes was sufficient to raise the temperature of 180 grams of cabbage to 99° C., as indicated by a spirit-filled thermometer inserted in the carton.

As an indication of the small nutrient losses that may be expected in blanching with r.f. power, the ascorbic acid contents of raw and of water, steam and electronically blanched cabbage samples were determined. The blanching periods were in each case of minimal duration to insure a negative catalase test. The results are presented in Table 1.

TABLE 1

LOSS OF ASCORBIC ACID DURING BLANCHING BY BOILING WATER, STEAM AND R.F. POWER

Sample	Blanching time in minutes	Ascorbic acid content mg/gm	Per cent. loss on blanching
Raw I		0.38	
Steam blanched	2.5	0.26	32
Water blanched	0.75	0.23	40
Raw II		0.34	
Electronically blanched	2.5	0.33	3

The same lot of shredded cabbage was used for all three blanching operations, and 35-gram portions were taken for analyses to insure adequate sampling. The water and steam treatments were carried on simultaneously, hence only a single analysis of the raw product sufficed as a reference. Since the electronic blanching was performed an hour later and raw shredded cabbage loses ascorbic acid on standing, a second raw sample was analyzed immediately prior to r.f. application.

The nearly negligible loss of ascorbic acid during electronic blanching in contrast to the 30 to 40 per cent. losses occurring in the steam and water processes points the way to production of processed vegetables of higher nutritive value. Other vegetables have been successfully blanched by electronics, and more extensive studies of the value of dielectric heating for the inactivation of enzymes in fruit and vegetables are in progress and will include storage trials.

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DISCUSSION

FAGARINE, A POSSIBLE SUBSTITUTE FOR QUINIDINE

THE present difficulty of obtaining quinidine in quantity has prompted us to send the following information on α-fagarine, which has cardiac effects similar to those of quinidine leading us to believe that it might be employed as a substitute and, more important, that it might open the way for the prepara-

[2] We are indebted to R.C.A. for the loan of the oscillator and to Dr. G. H. Brown and Mr. R. A. Bierwirth, of the R.C.A. Laboratories, Princeton, N. J., for their help in the arrangement of the tuning circuit.

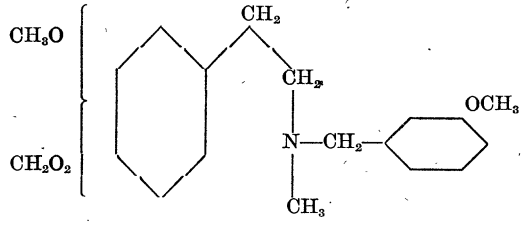
[3] R. A. Bierwirth and C. N. Hoyler, *Proc. Inst. Radio Engrs.*, 31: 529–536, 1943.

tion of new substances having the same or superior quality as the classical cinchona alkaloid.

Stuckert[1] was the first to isolate some new crystalline bases from the leaves and young twigs of *Fagara coco* (Gill) Engl., a tree growing in central and northern Argentina. He called the three major alkaloids α, β and γ-fagarine. We shall designate the first alkaloid as fagarine only in this article and in future papers, and shall leave the other two names with the Greek initial letters to differentiate them.

Deulofeu, Labriola and De Langhe[2] showed that β-fagarine was identical with skimmianine and that γ-fagarine was a methoxydictamine. It has been finally established that the last base corresponds to 8-methoxydictamine. Details of this work by Berinzaghi, Deulofeu, Labriola and Muruzabal are in course of publication.[3]

Fagarine has a structure different from the other two bases. Deulofeu, Labriola and De Langhe[2] found that it was a stronger base, had two methoxyl groups, one dioxymethylene group and one methylimino group. They proposed the formula $C_{18}H_{21}NO_4$. Deulofeu and Labriola in unpublished experiments have found on the basis of new analyses of the picrate and the methiodide that formula $C_{19}H_{23}NO_4$ agrees better with the analytical data. On oxidation with acid permanganate, fagarine yields m-methoxybenzaldehyde, so that a probable structure could be:



The pharmacological effects of this alkaloid were studied by Stuckert and Sartori,[4] who found in amphibians and rabbits a depressive action on cardiac function. Moisset de Espanés and Moyano Navarro[5] found in dogs a depression of all cardiac fundamental properties. The cronaxie of the myocardium is prolonged.[6]

The threshold for tachysistolia and fibrillation, both auricular and ventricular, to faradic stimulation, is increased, fagarine being more active than quinidine when given in the same doses; besides the spontaneous auricular fibrillation developed in the course of some experiments on the exposed heart rapidly vanished under the effect of fagarine.[7]

Fagarine, as opposed to quinidine tried out under the same conditions, decreased in dogs the risk of primary ventricular fibrillation following experimental coronary occlusion.[8] So far as toxicity is concerned, dogs and rabbits tolerated doses of 5 mg per kilo given endovenously three times a day for 45 days, without any actual or subsequent disturbance.[9]

Taquini[10] has tried fagarine with six patients, two with auricular flutter and four with auricular fibrillation. The cases with auricular flutter had a coronary cardiopathy; two out of the four with auricular fibrillation were affected by rheumatic mitral stenosis, and the other two had a coronary cardiopathy. All the cases were studied for a period varying from several weeks to several months before the administration of fagarine. In all of them but one, quinidine administered in the usual dose had failed.

From 0.06 to 0.1 g of fagarine hydrochloride, in water solution, were administered intramuscularly to each patient in a single dose. Within 30 minutes in all cases a normal sinus rhythm was reinitiated. In one of the cases after 28 days the flutter recurred as a consequence of an unusual effort of the patient. A new administration of fagarine was again efficient to reinstall a sinus rhythm.

According to these results we believe that this drug will be successfully employed in the treatment of these and other disturbances of the cardiac rhythm. The detailed clinical observations and the pharmacological effects on man will be published soon.

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