ach. The lyophilized plasma was dissolved in 30 ml of saline and 10 ml of this solution was injected into a carotid artery. Within a short latent period, distinct contractions of the stomach appeared. Injections into the carotid artery of control samples obtained from the donor without vagus stimulation or injection of saline or dextran did not produce contractions of the stomach.

In the fourth method, "cross-circulation" experiments were performed. Two dogs were heparinized and their internal jugular veins and one external jugular vein were ligated. The other external jugular vein was cut, its peripheral end ligated, and its end coming from the head connected to a femoral vein of the other dog. Cross circulation was regulated with flowmeters, so that one dog would not bleed out into the other one. In dog A, both vagi were cut in the neck and their ends toward the head attached to electrodes; when these were stimulated, the stomach of dog B showed distinct multiple contractions after a latent period of a few minutes. The contractions sometimes lasted up to half an hour, but usually they lasted 5 to 10 minutes. The state of the blood pressure (rise, fall, no change) following stimulation of the vagus nerves did not correlate with contractions of the stomach. Stimulation of the end of a cut femoral nerve did not produce contractions of the stomach.

The results of these experiments give evidence which supports the suggestion that a humoral factor is liberated in the brain of a dog upon stimulation of the cut ends of the vagus nerves. Experiments in which animals are hypophysectomized and in which drugs with blocking action are used may reveal the nature of this humoral factor that stimulates the stomach.

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Decontamination of Potato Tubers Containing Cesium-137

Abstract. *Stirring for 16 hours at 26° to 35°C of peeled and sliced tubers in a solution consisting of 1.2 percent KCl and 0.16 percent NaCl and containing a cation-exchange resin in the mixed K^+, Na^+ form effected Cs^{137} removals exceeding 95 percent. Neither nutritional value nor palatability of the tubers was adversely affected.*

Heavy and either widespread or local contamination of the biosphere with fission products might necessitate attempts to limit the intake of long-lived radionuclides by the human population. One way of limiting this intake would be to remove a contaminating radionuclide from a food that forms an important part of the diet and that also contains high levels of the nuclide. It has been suggested that when potato tubers are an important item in the diet they may be one of the main sources of Cs^{137} (*1*). Thus a method of removing Cs^{137} from tubers could effect a significant reduction in the intake of Cs^{137} by man (*2*). We present here details of a simple and economical decontamination procedure that removes at least 95 percent of the Cs^{137} from potato tubers without significantly changing either the nutritional value or the flavor of the cooked tuber.

Tubers containing high concentrations of Cs^{137} were produced under "natural" conditions by painting the leaves of the plants (*Solanum tuberosum* L., cv. Netted Gem) with a $Cs^{137}NO_3$ solution (*3*). For Cs^{137} determinations, the tubers (17 to 65 g fresh weight) were digested in concentrated HNO_3 until a clear solution was obtained. The radioactivity of samples of the solution was measured, to within 2 percent standard error, on glass planchets in an argon-methane gas-flow proportional counter equipped with a thin (80 $\mu g/cm^2$) window. No self-absorption corrections were necessary. In the decontamination experiments, one-half of a peeled tuber (cut longitudinally) always served as a control for the other half since the Cs^{137} content varied somewhat between tubers from the same plant. The radioactivity was symmetrically distributed about the longitudinal axis. The removal of a peel approximately 1 mm thick and representing 17 to 20 percent of the fresh weight of the tuber resulted in the loss of only 25 to 27 percent of the Cs^{137} present in the intact tuber.

It was assumed that removal of the Cs^+ ion from the living cells of a potato tuber could be effected by a simple diffusion process. In the selection of conditions that might accelerate this process, the exchange of Cs^{137} ions with ions of stable Cs was ruled out as being too costly. Hypo-, hyper-, and isotonic solutions of KCl and NaCl were not as effective in removing Cs^{137} as was water alone, either at 20°C or at 36°C. Although the degree of decontamination effected in all solutions was much higher at 36°C than at 20°C, raising the temperature of any solution to 100°C resulted in the removal of only about 54 percent of the Cs^{137}, presumably owing to decreased permeability to ions of the cooked, starchy outer cells of the tubers. In the foregoing experiments, palatability of the tubers was inversely related to the efficacy of the decontamination procedure used. Although the degree of decontamination could be increased by adding finely divided vermiculite (exploded mica) to the treatment solution, treated tubers were virtually inedible after cooking. We attribute our inability to develop a practical decontamination procedure making use of vermiculite to the difficulty of changing the chemical composition of this ion-exchange material to correspond to that of the tuber. We thus concluded that a highly effective decontamination process based on the principle of accelerated diffusion of Cs^{137} ions from the cells should be possible if an ion-exchange agent capable of removing these ions from an isotonic treatment solution more effectively than vermiculite could be found. If an ion-exchange agent itself was not detrimental to the tuber (as was the vermiculite) and if the time of treatment could be kept short, then preservation of a high proportion of the nutritional value and the palatability of the tuber should also

Table 1. Removal of Cs^{137} from peeled and sliced potato tubers.

Treatment	Specific activity (10^3 count/min) per g (fresh wt) Before treatment	Specific activity (10^3 count/min) per g (fresh wt) After treatment	Cs^{137} removed (%)
Constant stirring of 2-g pieces in H_2O with cation-exchange resin (K^+ form), 17 hr at 34°C	3.10	0.174	95
Same, with addition of 1.2% KCl to H_2O	22.1	.241	99

be possible. Rohm and Haas' Amberlite IR-120 proved to be such an agent (*4*). Data showing its effectiveness are presented in Table 1.

In the procedure adopted for removal of Cs^{137} the tubers are peeled and cut transversely into slices about 0.5 cm thick. The slices are immersed in an isotonic solution (10 to 15 ml per gram of fresh weight of tuber) consisting of 1.2 percent KCl, 0.16 percent NaCl, and 50 parts per million of $Na_2S_2O_5$ (to retard discoloration) and stirred continuously for 16 hours at 26° to 35°C with the specially prepared cation exchange resin (0.25 g wet resin per gram of fresh weight of tuber). Before use, the resin is converted to the mixed form (both potassium and sodium ions) by equilibrating it with a solution consisting of 4 percent KCl and 0.53 percent NaCl, and then washing it free of chloride with distilled water.

The degree of decontamination for tubers treated in this manner is consistently greater than 95 percent. Nonradioactive tubers subjected to this treatment and then boiled are almost indistinguishable in palatability (appearance, texture, and flavor) from untreated controls as shown by organoleptic tests. If the time of treatment is extended from 16 to 24 hours, the removal of Cs^{137} exceeds 99 percent but the palatability of the subsequently boiled tubers, while still very good, is inferior to that of tubers treated for the shorter time. At temperatures much below 26°C, the degree of decontamination decreases (presumably as a result of slowed diffusion of ions from the cells), while at temperatures in excess of 35°C, quality of the product is detrimentally affected. If the thickness of the tuber slices is increased, the time required for treatment increases, as expected. The potassium and sodium content of the tubers are not altered by the outlined treatment. Thus tubers decontaminated in this manner would provide not only an important source of carbohydrate but also an important source of Cs^{137}-free potassium in the diet, in times of local or national emergency. Clearly, the use of ion-exchange resin in any other than the mixed K^+-Na^+ form described will result in an altered balance of these ions in the decontaminated tubers as would the use of a solution of any other composition than that outlined.

The treated tubers lose 80 percent of their ascorbic acid content. Although in the recommended North American diet potatoes supply as much as 50 percent of the minimal daily requirements of this vitamin, up to 50 percent of the ascorbic acid content is normally lost on cooking, depending upon the method of cooking used (*5*). Since this loss can readily be compensated for by increased consumption of other foods high in vitamin C or by the incorporation of ascorbic acid tablets into the diet, under conditions in which the proposed decontamination procedure would be used this objection is not considered to be important. Although niacin, riboflavine, thiamine, and iron are also likely to be lost by this treatment, low initial contents compared to the minimal daily requirements coupled with losses during cooking (*5*) combine to rank cooked potatoes well below many other foods as a source of these nutrients in a normal North American diet.

This procedure should be easily and economically adaptable to commercial operations: either raw (preserved with metabisulfite) or cooked (as, for instance, potato flakes) Cs^{137}-free tubers could be supplied to the consumer. For domestic use, and at nominal cost, the householder could be supplied with the previously conditioned ion-exchange resin and with KCl in the form of packets resembling tea bags. The metabisulfite could probably be eliminated from a domestic process since it is used primarily for esthetic reasons, slightly discolored tubers being no less nutritious or flavorful (even if less palatable) than normal tubers.

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3. The Radiochemical Centre, Amersham, Bucks., England. A manuscript describing the production of these tubers is in preparation.
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Pteropod Ooze from Bermuda Pedestal

Abstract. *Twenty pteropod species and two subspecies are present in the Bermuda Pedestal pelagic sediments. Some species having thin, fragile shells were absent from the sediments but present in the deep water off Bermuda. The subarctic species was present only in the sediments, which indicates that the subarctic current probably invaded the Bermuda region some time ago.*

Recent deposits of typical pteropod ooze are limited almost entirely to the vicinity of oceanic islands or to the summits and sides of submarine elevations in tropical and subtropical areas (*1*). The pteropod ooze from Bermuda Pedestal is one of the best examples. This study compares the species composition and abundance of the pteropod ooze from the Bermuda Pedestal pelagic sediments with those of living shell-bearing pteropods from the overlying water column. Subsequently these data might be applied to paleoecological interpretation of Cenozoic and Cretaceous marine sediments in which pteropod fossil assemblages occur.

Pteropod ooze was used by Murray and Renard (*2*) to designate deep-sea deposits in which a very large part of the calcareous organisms consists of the dead shells of pteropods and heteropods, along with the shells of other pelagic and larval mollusks. Pteropod ooze was defined by Sverdrup *et al.* (*3*) as pelagic deposits with more than 30 percent calcium carbonate of organic origin, pteropod and other pelagic mollusk shells being the most important constituents.