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3,657,424
**FULL-FLAVORED CITRUS JUICE ENERGY
 SUPPLEMENT**

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10 Claims

ABSTRACT OF THE DISCLOSURE

A fortified citrus juice or other acid fruit juice is provided having increased amounts of sodium, calcium and chloride ions, beyond what is naturally present in the juice, in order to supplement the requirements of individuals having diminished amounts of these substance present in their body fluids.

This application is a continuation-in-part of application Ser. No. 815,506, filed Apr. 11, 1969, now abandoned.

This invention relates to fortified citrus juice or other acid fruit juice having a flavor closely similar to that of natural citrus juice and suitable for replenishing salts whose natural level in the body has been diminished, for example, due to strenuous physical activity. More specifically, this invention relates to fortified citrus juices which contain additional amounts only of those salts naturally present in the citrus juice in sufficient quantity to meet the physiological needs of individuals whose natural level of those salts is lower than normal without adversely effecting, to a significant degree, either palatability, flavor or factors associated with flavor such as acidity.

Vigorous physical activity, whether athletic or vocational, particularly when performed in a relatively high temperature environment, can lead to a loss of body fluids which results primarily in decreased volume of interstitial fluid in the body. If this is severe and progressive, the plasma volume also decreases. Whether or not the blood undergoes contraction depends upon the extent and nature of the electrolyte loss and the consequent changes in the electrolyte concentrations in the extracellular fluids. Those individuals working in very hot and humid environments may, for example, lose 10 to 14 liters daily as perspiration. In extreme cases of dehydration, over 900 milliequivalents of sodium, 820 milliequivalents chlorine, and 150 milliequivalents of potassium may be lost from the human body in twenty-four hours. This hypotonic fluid loss is accompanied by a decrease in sodium chloride content of the perspiration from a normal 40 to 80 milliequivalents per liter to as low as 2 to 5 milliequivalents per liter. Obviously, losses even remotely approaching these magnitudes cannot be tolerated by individuals for longer than brief periods of time. Further, these losses of electrolytes are in excess of those furnished in the normal diet and are not supplied by water alone when no provision is made for simultaneous replacement of the sodium, chlorine, potassium and calcium which have been lost.

It is known that citrus juices contain certain amounts of these calcium, sodium and potassium ions that are lost from the body as a result of heavy physical activity and that these ions are naturally present in amounts more than sufficient for buffering of the juices to taste, when the juices are not extended by appreciable dilution. For example, reconstituted frozen orange concentrate contains 9 milligrams of calcium, 1 milligram of sodium and 186 milligrams of potassium per 100 grams of reconstituted

juice. Single-strength freshly extracted orange juice contain similar amounts of these ions with 10 milligrams of calcium, 1 milligram of sodium and 199 milligrams of potassium available per 100 grams of juice. Further, in extended clinical tests the natural electrolytes present in orange juices have been noted to supply in general the minimum requirements of a large part of the electrolytic profile and in addition many of the vitamins necessary for the actual tone or energy of the human body under normal circumstances.

U.S. Patent 3,114,641 to Sperti et al. discloses extended or diluted citrus juices wherein sodium and potassium phosphate, sodium citrate, and sodium succinate are used as buffers to control pH. Other salts such as calcium chloride, magnesium chloride and sodium and potassium citrate, and tartaric and maleic acids and their salts are used to enhance the flavor of the citrus juice.

The quantity of those salts present in the extended citrus juice of the Sperti et al patent and in natural citrus juices, while sufficient for buffering the flavor of the juice and providing many of the vitamins and electrolytic salts normally required by the human body is, however, not sufficient to meet the physiological needs of people whose bodies have been dehydrated, for example, as a result of strenuous physical activity with an associated loss of body salts. Attempts to prepare entirely synthetic solutions to supplement the depleted level of these salts in individuals have not been altogether successful and in some cases highly detrimental to the well being of individuals with certain physical disorders which may be undetected. Neither has the addition of vitamins and minerals present in the peel of citrus fruits proved a satisfactory solution to the problem.

It is therefore the object of the present invention to provide citrus juices, with increased amounts, beyond what is naturally present, of certain ions naturally present in the unaltered citrus juice in order that the loss of these ions from the bodies of individuals may be supplemented.

According to the present invention, citrus juices which can be in a variety of forms and strengths, are fortified by the addition of sodium and calcium salts and chloride ions in amounts sufficient to replace those elements depleted below the natural level from the individual's body fluids. Relatively small amounts of potassium can also be added to fortify the citrus juice of this invention, although, generally the amount of this element naturally present in the juice is sufficient to replace depletions in the human body and added amounts of potassium salts in excess of about 0.003 weight percent, based on the weight of the natural juice should be avoided as excessive amounts of potassium can prove harmful to some individuals.

The sodium and calcium salts employed in this invention can be, for example, chlorides, citrates or phosphates, although, advantageously, the chlorides are used since this will provide the chloride ion supplement in addition to supplying the sodium and calcium ions. Where small amounts of potassium ions are desired to be added to the citrus juice of this invention, potassium chloride may advantageously be used.

The amount of supplementary salts which are added to citrus juice according to the present invention may vary somewhat, however, no excess of these ions beyond that possible or that will significantly effect the palatability or acidity of the juice should be included in the fortified citrus juices of this invention. Thus, the combined amount of the salts of this invention which are added to citrus juice does not exceed about 0.2 weight percent. Maximum permissible amounts of the respective individual salts which are added is about 0.18 weight percent of the sodium salt, and about 0.04 weight per-