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**DIETARY COMPOSITIONS AND METHODS  
FOR PROTECTION AGAINST  
CHEMOTHERAPY, RADIOTHERAPY,  
OXIDATIVE STRESS, AND AGING**

RELATED APPLICATIONS

This application is a continuation-in-part application of U.S. application Ser. No. 12/058,600, filed Mar. 28, 2008, now U.S. Pat. No. 8,211,700, issued Jul. 3, 2012, which claims priority to U.S. Provisional Application Ser. No. 60/908,636, filed Mar. 28, 2007, now expired, and U.S. Provisional Application Ser. No. 60/942,561, filed Jun. 7, 2007, now expired. The present application also claims priority to U.S. Provisional Application Ser. No. 61/047,680, filed on Apr. 24, 2008, now expired. The contents of U.S. application Ser. No. 12/058,600, now U.S. Pat. No. 8,211,700, and U.S. Provisional Application Ser. Nos. 60/908,636, 60/942,561, and 61/047,680 are incorporated herein by reference in their entirety.

FUNDING

This invention was made with support in part by grants from the National Institutes of Health, AG20642, AG025135, GM075308, and Neurosciences Blueprint. Therefore, the U.S. government has certain rights.

FIELD OF THE INVENTION

The present invention relates in general to treatment of diseases. More specifically, the invention provides dietary compositions and methods for protection against chemotherapy, radiotherapy, oxidative stress, and aging.

BACKGROUND OF THE INVENTION

Modern chemotherapy can improve the quality of life of cancer patients via palliation of cancer-related symptoms, and can significantly extend survival in many malignancies as well. However, the inevitable toxic side-effects frequently limit dose intensity and frequency of drugs administration. For instance, the use of doxorubicin or cisplatin can effectively treat many malignancies, but the drug-induced cardiotoxicity and nephrotoxicity, respectively, limit their full potential. Thus, reducing undesired toxicity by selectively protecting normal cells without compromising cancer targeting would prove beneficial to chemotherapy and enhance clinical outcome.

SUMMARY OF THE INVENTION

The present invention relates to novel dietary compositions and methods useful for protection against chemotherapy, radiotherapy, oxidative stress, and aging.

Accordingly, in one aspect, the invention features a dietary composition comprising 0-0.2% (by weight) L-methionine, as well as L-tryptophan, L-isoleucine, L-leucine, L-lysine, L-phenylalanine, L-threonine, and L-valine in the amount of at least 0.05% (by weight) each, and no protein. The composition may further comprise one or more amino acids selected from the group consisting of L-alanine, L-asparagine, L-aspartic acid, L-cysteine, L-glutamic acid, L-glutamine, L-glycine, L-proline, L-serine, L-tyrosine, L-arginine, and L-histidine.

In another aspect, the invention features a dietary composition comprising 0-0.2% (by weight) L-tryptophan, as well

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as L-methionine, L-isoleucine, L-leucine, L-lysine, L-phenylalanine, L-threonine, L-valine in the amount of at least 0.05% (by weight) each, and no protein. The composition may further comprise one or more amino acids selected from the group consisting of L-alanine, L-asparagine, L-aspartic acid, L-cysteine, L-glutamic acid, L-glutamine, L-glycine, L-proline, L-serine, L-tyrosine, L-arginine, and L-histidine.

In still another aspect, the invention features a dietary composition comprising L-methionine, L-tryptophan, L-isoleucine, L-leucine, L-lysine, L-phenylalanine, L-threonine, L-valine, L-alanine, L-asparagine, L-aspartic acid, L-cysteine, L-glutamic acid, L-glutamine, L-glycine, L-proline, L-serine, L-tyrosine, L-arginine, and L-histidine in the amount of 0-0.2% (by weight) each, and no protein.

In yet another aspect, the invention features a dietary composition comprising glycerol as a substitute for monosaccharides, disaccharides, and polysaccharides.

Also within the invention is a method of protecting an animal or human against chemotherapy, radiotherapy, oxidative stress, or aging. The method comprises administering a composition of the invention to an animal or human, thereby protecting the animal or human against chemotherapy, radiotherapy, oxidative stress, or aging. The method may further comprise exposing the animal or human to the chemotherapy, radiotherapy, or oxidative stress. In some embodiments, the composition is administered to the animal or human for 3-10 consecutive days prior to the exposing step, 24 hours following the exposing step, or a combination thereof. In some embodiments, the composition is administered every third meal or every 3-10 days to protect the animal or human against aging.

In addition, the invention features a hypocaloric or calorie free diet comprising dietary materials capable of providing nutrition to a human subject while providing no more than 813-957 kcal total energy, no more than half of which is in carbohydrates if the carbohydrates are present in the dietary materials, wherein the dietary materials include no more than 30-36 g protein. In some embodiments, the dietary materials are capable of providing no more than 700 kcal total energy.

Moreover, the invention provides a method of protecting an animal or human against chemotherapy, radiotherapy, oxidative stress, or aging by administering to an animal or human a diet capable of providing nutrition while providing no more than 11 kcal energy per kg body weight of the animal or human per day, and no more than 0.4 g protein per kg body weight of the animal or human per day, wherein no more than half of the energy is in carbohydrates if the carbohydrates are present in the diet. In some embodiments, the diet is capable of providing no more than 700 kcal total energy per day. The method may further comprise exposing the animal or human to the chemotherapy, radiotherapy, or oxidative stress. In some embodiments, the diet is administered to the animal or human for 3-10 consecutive days prior to the exposing step, 24 hours following the exposing step, or a combination thereof. In some embodiments, the diet is administered every third meal or every 3-10 days to protect the animal or human against aging.

The invention further provides a method of protecting an animal or human against chemotherapy. The method comprises fasting an animal or human suffering from cancer for 48-140 hours prior to one round of chemotherapy, 4-56 hours following the chemotherapy, or a combination thereof; and exposing the animal or human to the chemotherapy. In some embodiments, the animal or human is fasted for no more than 180 hours prior to and following one round of chemotherapy.

The above-mentioned and other features of this invention and the manner of obtaining and using them will become