

New vitamin K analysis supports the triage theory

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An important analysis conducted by Children's Hospital Oakland Research Institute scientists suggests the importance of ensuring optimal dietary intakes of vitamin K to prevent age-related conditions such as bone fragility, arterial and kidney calcification, cardiovascular disease, and possibly cancer (1). Vitamin K is concentrated in dark green plants such as spinach or Swiss chard, and is either not present or present in only small amounts in most multivitamin pills.

This finding comes from Associate Staff Scientist, Joyce McCann, PhD, and Senior Scientist, Bruce Ames, PhD, who analyzed data from hundreds of published articles dating back to the 1970's. Their review was designed to test Dr. Ames' "triage" theory that provides a new basis for determining the optimum intake of individual vitamins and minerals (also called micronutrients), and has major implications for preventive medicine. The analysis, which strongly supports his theory, will be published in the October 2009 issue of the [American Journal of Clinical Nutrition](#).

Dr. Ames proposed the triage theory in 2006 (2,3) to explain numerous observations from his own lab and the scientific literature. The theory explains why diseases associated with aging like cancer, heart disease, and dementia (and the pace of aging itself) may be unintended consequences of mechanisms developed during evolution to protect against episodic vitamin/mineral shortages. If correct, the triage theory has widespread implications for public health because modest vitamin/mineral deficiencies are quite common. The theory also suggests

a new scientifically based and consistent strategy for establishing optimal vitamin/mineral intake standards, and it provides a research strategy to uncover early biomarkers of chronic disease.

Vitamin K is known as the "Koagulation" vitamin because about half of the 16 known proteins that depend on vitK are necessary for blood coagulation. The other vitK-dependent proteins are involved in a variety of different functions involving the skeletal, arterial, and immune systems.

Average intakes of vitamin K in the United States and the United Kingdom are less even than currently recommended intakes, which are primarily based on levels to ensure adequate coagulation. McCann & Ames' analysis supports recommendations by some experts that non-clotting functions requiring vitamin K may need higher intakes than are currently recommended.

McCann says, "Encouraging support for the triage theory from our vitamin K analysis suggests that experts aiming to set micronutrient intake recommendations for optimal function and scientists seeking mechanistic triggers leading to diseases of aging may find it productive to focus on micronutrient-dependent functions that have escaped evolutionary protection from deficiency."

This vitamin K analysis is the first in a series of literature-based studies conducted by Drs. Joyce McCann and Ames to test the basic premises of the triage theory. As a reviewer of the manuscript notes, "...this review provides a unique perspective of consequences of vitamin K insufficiency and may serve as an important future reference, as new vitamin K dependent proteins are identified and new (non-clotting) functions of vitamin K are elucidated. More broadly, an assessment of micronutrient sufficiency from the perspective of triage theory may provide a valuable point of view, as current recommendations for

nutrient intakes are reconsidered."

References:

1. McCann, J. C., and Ames, B. N. (2009) Vitamin K, an example of triage theory: is micronutrient inadequacy linked to diseases of aging? *AJCN* 90 (4): Epub

2. Ames, B. N. (2006) Low micronutrient intake may accelerate the degenerative diseases of aging through allocation of scarce micronutrients by triage. *PNAS* 103, 17589-94.

3. Ames, B. N., and McCann, J. C. (2009) Forword: Prevention of cancer, and the other degenerative diseases of aging, through nutrition. In *Chemoprevention of cancer and DNA damage by dietary factors* (S. Knasmüller, D. M. D. I. J. C. G., eds), WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim [This paper presents a short summary of the triage theory and the [vitamin K](#) analysis]

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