

The Role of Nucleotides in the Immune and Gastrointestinal Systems: Potential Clinical Applications

Hess JR¹ and Greenberg NA.¹ *Nutr Clin Pract* 2012;27(2):281-294.

Purpose:

Review the data showing the physiological actions and biological benefits of supplying nucleotides exogenously, and applications for inclusion in clinical nutritional products.

Background:

- Nucleotides are biological molecules that carry one of five different purine or pyrimidine bases: adenine, guanine, thymine, cytosine or uracil.
- The diet of healthy individuals normally contains 1-2 g of nucleotides per day, primarily from protein.

• *Exogenous sources of nucleotides may confer distinct biological benefits to tissues that undergo rapid turnover, particularly those of the immune and gastrointestinal (GI) systems.*

- Outside of exogenous sources, the body can synthesize nucleotides de novo or via salvage pathways. Immune and GI cells cannot meet nucleotide demands via de novo synthesis and prefer to use the less energy demanding salvage pathway.

Physiological Actions and Biological Benefits:

- Major metabolic functions of nucleotides include: precursors of DNA and RNA, cell division and protein synthesis. They are integral to almost all biological processes in the body.
- Dietary nucleotides are conditionally essential in the presence of various physiological stresses, including growth and development, recovery from injury, infection and certain disease states.

• *The absence of nucleotides has been shown to produce significant reductions in host immune responses, including impaired mucosal integrity and function, impaired T cell function, suppressed lymphocyte proliferation, reduced phagocytosis and decreased resistance to pathogens.*

- Human studies, done in the context of exercise and safety, found supplemental nucleotides may counteract the hormonal response of physiological stress, resulting in a better immune response.

Potential Clinical Applications:

- Nucleotides, as part of immunonutrition formulas, are considered one of several defined substances that are designed to restore cellular defense function.

• *Situations of surgical stress or episodes of infection following injury and trauma show an increased demand for nucleotides to facilitate the synthesis of immune cells, for tissue repair and to maintain organ function.*

Conclusions:

Healthy individuals consuming a varied diet should meet their nucleotide demands, coupled with endogenous synthesis. However, nucleotide requirements increase in various states of physiological stress. In these circumstances, dietary nucleotides are considered conditionally essential to maintain optimal physiological function.

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<https://www.ncbi.nlm.nih.gov/pubmed/22392907>

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