

Nutritional and Health Benefits of Semi-Elemental Diets: A Comprehensive Summary of the Literature

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Objectives:

This review paper comprehensively summarizes the scientific and clinical evidence associated with the use of enzymatically hydrolyzed, 100% whey protein (WHP) semi-elemental diets in various patient conditions, highlighting nutritional and health outcomes.

Background:

Delivery of adequate nutrition is difficult in high risk populations of patients whose illness precludes the ability to tolerate, digest and absorb whole foods. Use of semi-elemental formulas containing peptides of varying chain length and fat of primarily as medium-chain triglycerides have demonstrated better absorption, tolerance and significant health benefits in patients with malabsorptive conditions.

Large volume of clinical studies have demonstrated significant health benefits with semi-elemental diets.

Materials and Methods:

A comprehensive literature search was conducted through the MEDLINE biomedical literature database for this systematic review of the use of semi-elemental diets in nutritional and health outcomes of various patient populations, including Crohn's disease, pancreatitis, stroke and critical illness. Results from randomized controlled clinical trials, prospective intervention studies, relevant observational studies, case reports and abstracts were included in this review.

Results:

Scientific and clinical evidence indicate that semi-elemental diets are well-tolerated across various patient populations:

- **Crohn's Disease:** 100% WHP diets are well-tolerated and associated with improved nutritional status. Semi-elemental diets may be a viable alternative to corticosteroids at inducing clinical remission, improving lean body mass, reducing risk for growth failure and enhancing probability of maintenance of clinical remission.
- **Short Bowel Syndrome and Intestinal Failure:** Treatment with a semi-elemental diet may provide nutritional benefits through more efficient micronutrient and nitrogen absorption as compared to free amino acid diets.
- **Pancreatitis:** Semi-elemental diets confer more anti-inflammatory effects and promote more rapid resolution of the stress response, including reduced C-reactive protein, fewer septic complications and reduced mortality as well as promoting reduced total health care costs as compared to parenteral nutrition (PN). Semi-elemental diets are associated with less weight loss ($p=0.001$), shorter hospital duration ($p=0.006$) and clinical trend towards reduced risk of infection when compared to standard intact protein diets.
- **Cerebral Palsy with GI Dysfunction:** Whey-predominant formulas provide faster gastric emptying times than casein-predominant formulas and this may be associated with a reduction in vomiting. WHP diets may be beneficial to children with significantly delayed gastric emptying.

- **Cystic Fibrosis:** Semi-elemental diets are as effective as polymeric diets + enzyme replacement in promoting fat absorption while eliminating necessity of consuming large enzyme replacement capsules.
- **Stroke:** 100% WHP diet is associated with beneficial short-term anti-inflammatory effects (decreased interleukin-6 and increased glutathione peroxidase) as compared to a hydrolyzed casein formula. When compared to standard polymeric formulas, 100% WHP semi-elemental diet is associated with significantly lower mortality rates
- **HIV:** 100% WHP formula may improve functional status, reduce diarrhea and reduce HIV-related cachexia.
- **Critically Ill and Intensive Care Unit:** Use of 100% WHP semi-elemental diet versus free amino acid diet in critically ill patients is associated with decreased number of stools. Improved nutrient assimilation occurs when patients receive 100% WHP semi-elemental diets versus standard polymeric diets. Semi-elemental diets may be sufficient to reduce ICU-stress related peptic ulcer disease without need for acid-blocking agents.

Discussion:

Acutely ill and patients with chronic and genetic conditions may suffer from feeding complications that prevent adequate and appropriate nutrient intake from standard oral diets. Semi-elemental WHP diets are well-tolerated, digested and absorbed among various patient groups and perform as well or better than comparison diets of PN, free amino acids or regular enteral diets with respect to weight gain, growth, systemic inflammatory response, nutrient assimilation, mortality rates and health care costs.

Accumulating clinical evidence indicates that patients with feeding difficulties may be able to achieve improved health and nutritional outcomes through the use of 100% WHP semi-elemental diets.

Peptide-based diets may facilitate optimal digestive processes that lead to increased protein absorption. Mechanistic rationale supporting the beneficial role of this formulation includes increased expression of PepT1, a transporter system for protein that is located in the microvillus membrane of the gut that readily transports di- and tri-peptides. In addition, peptides may enhance intestinal microcirculation, thus improving nitrogen absorption. Animal studies suggest that peptide-based diets stimulate the structure and function of the GI tract as well as protecting against induced systemic inflammatory responses.

Conclusions:

Patient populations that have difficulty digesting or absorbing standard diets or those who are unable to attain adequate nutrition, may be able to achieve improved health outcomes and nutritional goals through the use of semi-elemental WHP diet.

The study may be accessed at www.ncbi.nlm.nih.gov/pmc/articles/PMC4848254/.

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