



# AN AMINO ACID MIXTURE (AA-ORS) AS A NEW APPROACH TO REDUCING CANCER THERAPY-INDUCED GASTROINTESTINAL TOXICITY?

## A Pragmatic Study

Steven Eric Finkelstein<sup>1</sup> Constantine Mantz<sup>2</sup> Laura Luque<sup>3</sup> Paul Okunieff<sup>4</sup>

1. 21st Century Oncology, Scottsdale, AZ.  
2. 21st Century Oncology, Ft. Myers, FL.  
3. Entrinsic Health Solutions, Inc., Norwood, MA.  
4. Department of Radiation Oncology, University of Florida, Gainesville, FL

### INTRODUCTION

Gastrointestinal symptoms are a near-universal problem among patients treated for cancer. Gastrointestinal toxicity can manifest as diarrhea, nausea, vomiting, bloating, pain, weight loss and/or dehydration.

In addition to reducing quality of life, gastrointestinal toxicity and other symptoms in cancer patients can lead to premature discontinuation of therapy and/or dose reductions of chemotherapy and radiation, impacting efficacy of treatment.

In preclinical studies the amino acid mixture has shown to promote tightening of the mucosal barrier, proliferation of crypt cells, increase villous height and absorption of fluid, electrolytes and nutrients following radiation.

### OBJECTIVE

If these pre-clinical effects translate to humans exposed to radiation or other forms of cancer therapy, they could provide a safe and logical treatment for symptoms of gastrointestinal toxicity and dehydration in oncology patients.

The objective of this pragmatic study, featuring a retrospective analysis of prospectively collected data, was to determine if consumption of the amino acid mixture is associated with a decrease in patient-reported symptoms of gastrointestinal toxicity during radiotherapy and/or chemotherapy.

### METHODS

Patients were eligible to receive a 16-day supply of the amino acid formulation if they developed gastrointestinal toxicity during chemotherapy and/or radiotherapy. Patients completed a questionnaire before starting the beverage and again 16 days later.

Tumor and treatment characteristics were reported, as were type and severity of gastrointestinal symptoms, other adverse effects (weight loss, dehydration, malaise) and current weight.

Changes in symptom severity and in a composite score were determined for diarrhea, nausea, dehydration, weight loss, and malaise.

### CONCLUSIONS

Use of an amino acid formulation was strongly associated with reduced gastrointestinal toxicity in patients undergoing cancer therapy. Additional clinical studies to evaluate beneficial effects of this medical food are warranted.

### RESULTS

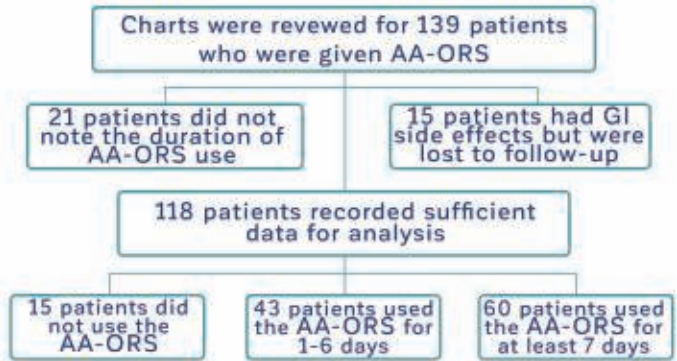


Figure 1. Study design and flow chart.

Table 1. Type and severity of initial symptoms

	Total	AA-ORS consumption group		
		0 days	1-6 days	≥ 7 days
Number	118	15	43	60
Males	56	7	24	25
Females	62	8	19	35
Age in years (min, max)	71 (24, >89)	68 (24, >89)	70 (42, >89)	72 (41, >89)
Severity of initially reported symptoms**				
Severe	34 (29%)	4 (20%)	13 (27%)	17 (31%)
Moderate	64 (54%)	15 (75%)	21 (43%)	28 (52%)
Mild	31 (26%)	7 (35%)	15 (31%)	9 (17%)

A 78% improvement in the composite symptom score was reported in patients who used the formulation for >7 days, compared to 46% improvement in those who used it for 1-6 days and 7% improvement in those who did not use it at all. Among the individual symptoms, statistically significant improvements were noted for diarrhea, dehydration and weight maintenance.

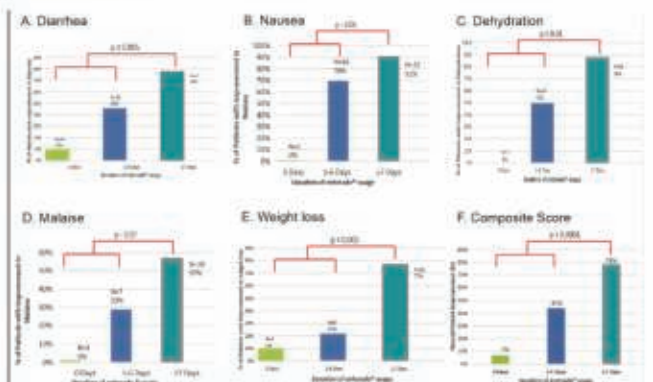


Figure 2. Effects of different durations of the AA-ORS use on gastrointestinal symptoms in cancer patients. The percents of patients reporting improvement in diarrhea (A), nausea (B), dehydration (C), malaise (D) and weight maintenance (E) were obtained from symptom inventories in patient charts. The composite score (F) reflects collective improvement in all five of these symptoms. Sample sizes for diarrhea and the composite score were sufficient for 3-way analyses, which yielded  $p < 0.005$  for diarrhea and  $p < 0.0001$  for the composite score.

### REFERENCES

Krook JE, Moertel CG, Gunderson LL, et al: Effective surgical adjuvant therapy for high-risk rectal carcinoma. *N Engl J Med* 324:709-15, 1991  
 -Miller RC, Martenson JA, Sargent DJ, et al: Acute treatment-related diarrhea during postoperative adjuvant therapy for high-risk rectal carcinoma. *Int J Radiat Oncol Biol Phys* 41:593-8, 1998  
 -O'Connell MJ, Martenson JA, Wieand HS, et al: Improving adjuvant therapy for rectal cancer by combining protected-infusion fluorouracil with radiation therapy after curative surgery. *N Engl J Med* 331:502-7, 1994  
 -Yin L, Vijayapal P, Menon R, et al: An amino acid mixture mitigates radiation-induced gastrointestinal toxicity. *Health Phys* 106:734-44, 2014.  
 -Yin L, Gupta R, Vaught L, et al: An amino acid-based oral rehydration solution (AA-ORS) enhanced intestinal epithelial proliferation in mice exposed to radiation. *Sci Rep* 6:37220, 2016