4.4 Composition of Enteral Nutrition: pH

There were no new randomized controlled trials since the 2015 update and hence there are no changes to the following summary of evidence.

Question: Do acidified feeds (low pH) compared to standard feeds result in better outcomes in the critically ill adult patient?

Summary of evidence: There were 3 level 2 studies that were reviewed. In one recent study (Kruger 2006), there were two acidified feeds groups i.e. pH 3.5 and 4.8 that were compared to the standard formula (pH 6.8).

Mortality: One study (Heyland 1999) found that acidified feeds were associated with a trend towards an increase in mortality (p =0.10), whereas there were no differences in mortality between the groups in the other two studies (Tulamiat 2005 and Kruger 2006).

Infections: There were no difference in infections between the groups in one study (Tulamiat 2005 p = 0.7) and a trend towards a reduction in infections was seen in the patients receiving the acidified feeds (Heyland RR 0.40, p = 0.19).

LOS and Ventilator days: There were no differences between the groups in the two studies that reported on these outcomes (Heyland, Kruger 2006)

Other complications: There was no difference in the incidence of GI bleeds between groups in any of the three studies.

Conclusions:

1) Low pH feeds, when compared to standard formula, have no effect on clinical outcomes in the critically ill adult.

Level 1 study: if all of the following are fulfilled: concealed randomization, blinded outcome adjudication and an intention to treat analysis.
Level 2 study: If any one of the above characteristics are unfulfilled.

Table 1. Randomized studies evaluating acidified feeds in critically ill patients

Study	Population	Methods (score)	Intervention	Mortality # (%)†		Infections # (%)‡		LOS days		Ventilator days		Other	
				Acid feeds	Standard	Acid feeds	Standard	Acid feeds	Standard	Acid feed	Standard	Acid feeds	Standard
1) Heyland 1999	Critically ill ventilated patients from 8 ICUs N = 120	C.Random: yes ITT: no Blinding: double (12)	Acidified feeds, vital HN + HCL pH 3.5 vs standard feeds, Vital HN (pH 6.5)	15/49 (31)	7/26 (15)	3/49 (6)	7/46 (15)	3.0	12.0	7.8	8.5	GI bleeds 2/49 (4)	0/46 (0)
2) Tulamait 2005	Patients recovering from prolonged ventilation N =30	C.Random: yes ITT: no Blinding: double (10)	Acidified feeds, pH 4.5 (added potassium sorbate) vs standard feeds	1/16 (6)	2/13 (15)	3/16 (19)	1/13 (8)	NR	NR	NR	NR	GI bleeds 0/16 (0)	1/14 (7)
3) Kruger unpublished 2006*	Patients from 4 mixed ICUs N = 67	C.Random: not sure ITT: yes Blinding: double (10)	Acidified feeds pH 3.5 vs. 4.5 vs. 6.8 (standard) Isocaloric, isonitrogenous	ICU pH 3.5 group 2/23 (9) pH 4.5 group 1/23 (4) pH 6.8 group 1/21 (4)		NR		ICU pH 3.5 group 7.5 ± 5.4 pH 4.5 group 8.2 ± 4.5 pH 6.8 group 9.3 ± 3.9		NR		GI bleeds pH 3.5 group 0/23 pH 4.5 group 0/23 pH 6.8 group 0/21 Gastric colonization and contamination of feeding delivery system was significantly lower in the acidified group	

C.Random: concealed randomization
ITT: Intent to treat
NR: Not reported
ICU: Intensive care unit
LOS: length of stay

† presumed ICU mortality unless otherwise specified
‡ refers to the # of patients with infections unless specified
* data obtained from author
GI: gastric intestinal

Table 2. Excluded Articles

Count	Reason excluded	Reference
1	Not a RCT	Spilker CA, Hinthorn DR, Pingleton SK. Intermittent enteral feeding in mechanically ventilated patients. The effect on gastric pH and gastric cultures. Chest 1996;110(1):243-8.