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Comparison of arterial plasma amino acid concentrations in rats fed ad lib oral chow or parenteral nutrition via intravenous or gastric infusion

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In a rat ischemic acute renal failure model, glycine may be protective to the kidney while lysine and alanine may be nephrotoxic. We have hypothesized that the arterial amino acid plasma pattern, total arterial amino acid concentrations, creatinine clearance, and urine calcium excretion in rats given the same formula via IV or gastrostomy tube continuously would differ. Carotid arterial lines and either an IV or gastrostomy tube were placed in Sprague-Dawley rats who were given parenteral nutrition IV (n = 9), parenteral nutrition via gastrostomy tube (n = 7) or ad lib oral chow (n = 9). After 3 days, arterial blood was drawn during the IV of gastrostomy tube infusion. The ad lib oral chow group was in the absorptive phase. Gastrostomy tube and ad lib oral chow rats gained 5.4 ± 4.6 and 6.8 ± 15 g, respectively, but IV rats lost 12 ± 19 g. Glycine concentrations (nmol/mL) in the IV and gastrostomy tube groups were more than twice the ad lib oral chow group. Alanine and lysine concentrations were not different. Total arterial amino acis were greater in the IV than in the ad lib oral chow group and tended to be greater in the IV group compared to the gastrostomy tube ($p = 0.08$).

	Glycine	Alanine	Lysine	Total amino acids
IV	721 ± 209a	571 ± 74	612 ± 126	5239 ± 439a
Gastrostomy tube	607 ± 67a	556 ± 102	682 ± 110	4888 ± 275a
Ad lib oral chow	284 ± 57	457 ± 136	536 ± 140	3840 ± 705

P-value ≤ 0.05 = statistical significance; a = different from ad lib oral chow, b = different from gastrostomy tube.

	Urine volume ml	urine calcium mg/dL	Calcium excretion mg/d	Urine creatinine cont'd. mg/dL
IV	22 ± 9a,b	1.3 ± 0.8	11.6 ± 1.2	17 ± 12a,b
Gastrostomy tube	24 ± 4a	1.6 ± 1.2	11.6 ± 1.6	17 ± 7a
Ad lib oral chow	13 ± 7b	7.2 ± 6.8	10.8 ± 1.1	56 ± 42b

	s creatinine mg/dL	Creatinine clearance ml/min/100g
IV	0.4 ± 0.1	0.28 ± 0.17
Gastrostomy tube	0.5 ± 0.1	0.28 ± 0.14
Ad lib oral chow	0.4 ± 0.1	0.58 ± 0.77

P-value ≤ 0.05 = statistical significance; a = different from ad lib oral chow, b = different from gastrostomy tube.

We conclude that the total amino acid load presented to the kidney is great with IV than with ad lib chow and tends to be greater with IV than with gastrostomy tube infusion of the same parenteral nutrition formula. With parenteral nutrition, arterial glycine concentrations are greater than ad lib oral chow while arterial alanine and lysine concentrations are not different from ad lib oral chow.