Dietary NaCl Induces Low-Grade Hyperchloremic Metabolic Acidosis In Healthy Humans.

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Background: We previously demonstrated that typical American net acid-producing diets induce a low-grade metabolic acidosis of severity proportional to the diet net acid load as indexed by the steady-state renal net acid excretion rate (RNAE). We now investigate whether a sodium (Na) chloride (Cl) containing diet likewise induces a low-grade metabolic acidosis of severity proportional to the sodium chloride content of the diet as indexed by the steady-state Na and Cl excretion rates.

Methods: In the steady-state pre-intervention periods of our previously reported studies comprising 77 healthy subjects, we averaged in each subject 3-6 values of blood hydrogen ion concentration ([H]b), plasma bicarbonate concentration ([HCO3]p), the partial pressure of carbon dioxide (PCO2), the excretion rates of Na (UNaV), Cl (UClV), RNAE, and renal function as measured by creatinine clearance (CrCl), and performed multivariate analyses.

Results: Dietary chloride strongly correlated positively with dietary sodium ($p<0.001$), and was an independent predictor of blood hydrogen ion concentration and plasma bicarbonate concentration, after adjustment for dietary net acid load, blood PCO2 and renal function, as demonstrated in the table below:

	UClV	RNAE	CrCl	Blood PCO_2	β-RNAE/ β-UClV	Intercept	R^2	*p*
$[HCO3]_p$								
b	**-0.012**	**-0.025**						
β	**-0.272**	**-0.459**			**1.7**	**+27.6**	**0.37**	**<0.001**
p	**0.007**	**<0.001**						
b	**-0.009**	**-0.011**		**+0.460**				
β	**-0.202**	**-0.203**		**+0.627**	**1.0**	**+7.8**	**0.68**	**<0.001**
p	**0.006**	**0.01**		**<0.001**				
b	**-0.010**	**-0.007**	**+0.024**	**+0.411**				
β	**-0.213**	**-0.141**	**+0.405**	**+0.718**	**0.7**	**+7.4**	**0.56**	**<0.001**
p	**0.03**	**0.17**	**<0.001**	**<0.001**				
$[H]_b$								
b	**+0.009**	**+0.021**						
β	**+0.224**	**+0.404**			**1.8**	**+37.2**	**0.28**	**<0.001**
p	**0.037**	**<0.001**						
b	**+0.011**	**+0.028**		**+0.251**				
β	**+0.265**	**+0.554**		**+0.368**	**2.1**	**+26.5**	**0.38**	**<0.001**
p	**0.009**	**<0.001**		**<0.001**				
b	**+0.010**	**+0.023**	**-0.027**	**+0.312**				
β	**+0.195**	**+0.399**	**-0.404**	**+0.484**	**2.0**	**+27.1**	**0.41**	**<0.001**
p	**0.089**	**0.001**	**0.002**	**<0.001**				

b=nonstandardized regression coefficient; **β**=standardized regression coefficient.

Conclusion: These data provide the first evidence that, in healthy humans, the diet loads of NaCl and net acid independently predict systemic acid-base status, with increasing degrees of low-grade hyperchloremic metabolic acidosis as the loads increase. Over their respective ranges of variation, NaCl has approximately 50-100% of the acidosis-producing effect of the diet net acid load (see column 6; β-RNAE/ β-UClV).