DIETARY ACID LOAD AND SERUM BICARBONATE IN PATIENTS WITH CHRONIC KIDNEY DISEASE STAGE 3 AND 4.

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Introduction Metabolic acidosis is a common complication in patients with Chronic Kidney Disease (CKD) and has been shown to be a risk factor for CKD progression. Diet appears affect acid-base status by the balance between the intake of acid-inducing foods which are rich in animal proteins (meats, eggs, cheese) and base-inducing foods, specially fruits and vegetables.

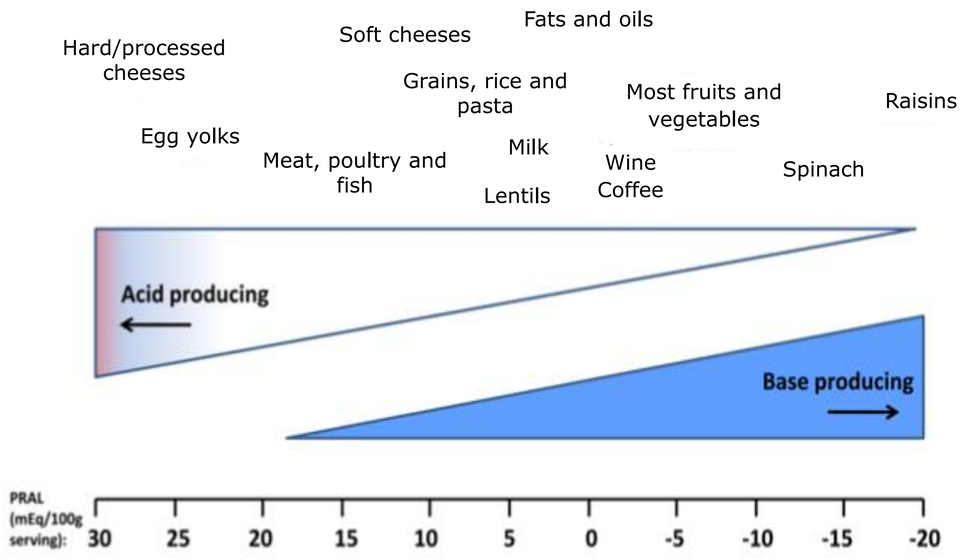

Figure 1 - Estimated acid-producing potential of selected foods.

Scialla & Anderson, 2013

Objective As definitive evidence is lacking for optimal evidence-based clinical practice guidelines the aim of the study was to investigated the association between dietary acid load (DAL) and serum bicarbonate in pre-dialysis CKD patients.

Methods Cross-sectional study was conducted in 100 patients with CKD stages 3-4. Serum bicarbonate (HCO3) was measured as well as the urine pH. The DAL was estimated from 3-day food records using Potential Renal Acid Load (PRAL):

PRAL (mEq/d) = 0,49 x protein (g) + 0,037 x phosphorus (mg) – 0,0205 x potassium (mg) – 0,0125 x calcium (mg) – 0,026 x magnesium (mg).

Food records was also used to estimate the net endogenous acid production (NEAP): NEAP = 54.5 * (protein/potassium) – 10.2 and the dietary protein intake (animal and plant-based protein). Pearson and Spearman's correlation was used to measure associations between variables, considering $p < 0.05$.

Results In the overall study population, the mean age was 57 years (28 to 69 years), 53% were female, the median estimated glomerual filtration rate (eGFR) was 30 mL/min/1.73 m^2.

In this study we observed that high levels of PRAL was associated with lower serum bicarbonate ($r = -0.20$; $p<0.05$). However a significant difference was not found between NEAP and HCO3. The median HCO3 and urine pH was 25.4 (23.2, 27.6) mEq/L and 5.5 (5.3, 6.2), respectively. We did not find a significant association between HCO3 and eGFR neither between HCO3 and pH urine.

Table 1 – The median (1st-3rd tertiles) level of PRAL, NEAP and protein intake from 3-day food records.

PRAL mEq/day	NEAP mEq/day	Protein g/day	Protein g/kg/day
8.3	55.1	56.8	0.8
(1.6, 15.6)	(41.8, 75.7)	(42.7, 75.3)	(0.6, 1.0)

Median intake of protein from animal sources was 41.3 (28.4, 59.5) g/day and from plant sources was 13.9 (10.1, 19.4) g/day resulting in 25% the median percentage of total protein from plant sources. PRAL was correlated with the total daily protein intake ($r = 0.64$, $p<0.001$) as we expected and the NEAP became progressively more positive as the dietary plant-to-animal ratio declined ($r = -0.43$, $p<0.001$).

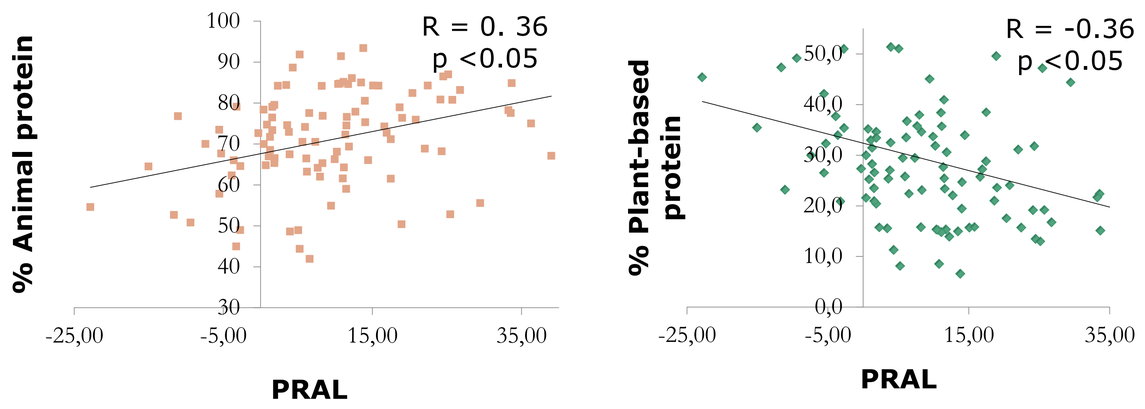

Figure 2– Spearman´s correlation between dietary acid load with % animal protein intake and % plant-based protein.

Conclusion Our main finding suggests that PRAL, as estimated from dietary records, is associated with serum bicarbonate among pre-dialysis patients consuming their usual diets. Besides that, the replacement of animal protein for plant protein sources can contribute to reduce the DAL. Ongoing trials testing the benefits and harms of lowering dietary acid load will hopefully facilitate more evidence-based treatment of metabolic acidosis in the future.

Reference Scialla JJ, Anderson CA. Dietary acid load: a novel nutritional target in chronic kidney disease? Adv Chronic Kidney Dis. 2013 Mar;20(2):141-9.

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54 ERA
366--MP
CKD - Pathophysiology & progression II
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DOI: 10.3252/pso.eu.54ERA.2017
ePosters supported by F. Hoffmann- La Roche Ltd.