Renal conservation of calcium in Gambian compared to British older adults

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Ethnic groups vary in their risk of age-related osteoporosis. There are ethnic differences in the metabolism of the bone forming minerals, calcium (Ca) and phosphate (P), with differences in renal Ca excretion, even at similar intakes and rates of absorption. We have previously reported a lower urinary Ca excretion in Black Gambian (G) compared to Caucasian British (B) subjects[1]. These ethnic groups are known to differ in their dietary Ca intake and vitamin D (VD) status. We have investigated ethnic differences in urinary Ca excretion while allowing for other known predictors of renal Ca handling, including dietary Ca.

Subjects were healthy older (60–75 years) G ($n = 61$) and B ($n = 60$) men and women. Blood and timed 2 h urine samples were collected after an overnight fast. Dietary intake was assessed with country specific food diaries and food composition tables. Anthropometry was performed. Blood ionised Ca (iCa), plasma (p) total Ca (pCa), P (pP), 25-hydroxy VD (25VD), 1,25-dihydroxy VD (1,25VD), parathyroid hormone (PTH), and urinary (u) Ca (uCa), creatinine (uCr), and uP were analysed[1]. The fractional excretion of Ca (FECa) and the tubular maximum of Ca (TmCa) were calculated[2].

Multiple regression was performed to investigate the effect of predictors of renal Ca handling. Ethnicity was used as an independent binary variable to test for differences between ethnic groups in a regression model. Data were transformed to natural logarithms to allow for the expression of ethnic differences (Δ) between G and B subjects as a %[3].

G subjects had significantly lower body weight [ΔG–B: $-31(-37, -25)$%; $P < 0.001$], pCa [ΔG–B: $-5(-7, -2)$%; $P < 0.001$], and higher 25VD [ΔG–B: $+35(+22, +48)$%; $P < 0.001$], PTH [ΔG–B: $+62(+38, +85)$%; $P < 0.001$] and 1,25VD [ΔG–B: $+48(+38, +58)$%; $P < 0.001$]. Markers of bone turnover were higher in G compared to B subjects ($P < 0.001$).

There were significant ethnic differences in renal Ca handling as measured by uCa (μmol/minute); uCa/uCr (μmol/μmol); FECa (%); and TmCa (mmol/L) ($P < 0.001$). The *p*-value and the effect size of these ethnic differences were similar after including dietary Ca (mg/day), or dietary Ca:P ratio (mg/mg) in the model (see table).

	G ($n = 61$)		B ($n = 60$)		G – B, % differences			
	Mean	SE	Mean	SE	Mean	95 % CI	*P*[u]	*P*[a]
Dietary Ca, mg/d	303	17	1152	34	-139	$-153, -126$	<0.001	–
uCa, μmol/minute	0.9	0.1	2	0.3	-138	$-191, -85$	<0.001	0.003
uCa/uCr μmol/μmol	0.15	0.02	0.34	0.02	-121	$-154, -88$	<0.001	<0.001
FECa, %	0.50	0.07	1.21	0.07	-132	$-165, -99$	<0.001	0.001
TmCa, mmol/L	2.23	0.06	1.89	0.02	$+14$	$+8, +20$	<0.001	0.003

* Significance of regression coefficient of ethnicity, indicated by P[u] (univariate model); P[a] (model adjusted for dietary Ca).

In a multiple regression analysis without ethnicity, the significant predictors of uCa/uCr were: dietary Ca, diastolic blood pressure, iCa, pP, P1NP, CTX and uP. However, in a model including ethnicity, dietary Ca was no longer a significant predictor of uCa/uCr; whereas diastolic BP, iCa, pP, P1NP, CTX and uP remained significant predictors of uCa/uCr. Ethnicity was a significant predictor of uCa/uCr in the multivariate model ([ΔG–B: $-133(-175, -107)$%; $P < 0.001$]).

These data suggest that G subjects have higher renal Ca conservation than B counterparts. The ethnic differences remained in the presence of other known predictors of renal Ca handling.

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2. Kent G, Bhagat C, Garcia-Webb *et al.* (1987) *Clinical Chimica Acta* **166**, 155–161.
3. Cole (2000) *Statist. Med* **19**, 3109–3125.