Supplementary Table 1. Baseline characteristics by quintiles of animal protein to potassium ratio

	HPFS		NHS I		NHS II	
	Quintile 1	Quintile 5	Quintile 1	Quintile 5	Quintile 1	Quintile 5
APKR, g/mEq	0.43(0.09)	1.06(0.18)	0.44(0.08)	0.98(0.15)	0.45(0.11)	1.11(0.17)
Age, years	55.9(10.0)	53.4(9.6)	54.5(7.0)	51.8(7.1)	37.4(4.6)	36.0(4.7)
BMI, kg/mq	24.7(3.1)	26.0(3.5)	24.3(4.3)	26.0(5.2)	23.1(4.3)	25.4(5.8)
History of diabetes, %	2	3	2	4	1	1
History of hypertension, %	21	22	24	25	6	7
Thiazide use, %	8	9	14	14	2	2
Calcium supplements use, %	31	21	61	55	37	32
Dietary calcium, mg/day	796(289)	754(298)	681(222)	688(256)	823(261)	899(333)
Supplemental calcium, mg/day	144(317)	85.1(246)	402(453)	341(428)	165(317)	116(256)
Magnesium, mg/day	422(105)	322(70)	335(82)	276(63)	369(95)	294(68)
Fructose, g/day	35.6(14.5)	21.1(9.8)	28.3(10.9)	17.8(8.2)	30.6(12.7)	19.8(10.7)
Oxalate, mg/day	198(234)	121(109)	148(129)	103(81)	204(190)	109(88)
Phytate, mg/day	1,337(612)	774(274)	907(393)	592(200)	1,029(343)	682(182)
Alcohol intake, g/day	10.6(16.0)	10.8(14.9)	6.5(11.7)	5.9(10.6)	3.9(7.5)	2.5(5.3)
Fluid intake, L/day	2.0(0.8)	1.8(0.8)	2.1(0.7)	1.9(0.7)	2.2(0.9)	2.0(0.8)
Dairy protein, g/day	13.4(8.2)	15.7(9.4)	12.4(6.6)	15.3(8.5)	15.1(7.8)	19.8(10.0)
Non-dairy animal protein, g/day	30.4(12.4)	65.6(18.5)	31.9(9.8)	59.9(15.1)	28.7(12.5)	59.7(15.8)
Vegetable protein, g/day	32.3(8.6)	21.5(4.6)	24.3(5.2)	17.7(3.5)	29.1(7.2)	19.9(3.8)
Dietary potassium, mg/day	3,988(793)	3,056(534)	3,395(653)	2,696(480)	3,357(655)	2,696(464)

Values are means(SD) or percentages.

Supplementary Table 2. Quintiles of vegetable protein intake and risk of kidney stones

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	p-value for trend
HPFS						
Median (g/day)	18.8	21.6	24.2	27.1	32.3	
Range	< 20.0	20.0, 22.9	23.0, 25.5	25.6, 29.1	> 29.1	
Cases	408	454	417	363	321	
Person-time	132,151	133,570	134,896	134,499	134,370	
Age-adjusted HR	1.00 (Ref.)	1.11 (0.97, 1.26)	1.01 (0.88, 1.16)	0.90 (0.78, 1.04)	0.79 (0.68, 0.91)	< 0.001
Multivariate-adjusted HR	1.00 (Ref.)	1.18 (1.01, 1.37)	1.14 (0.97, 1.37)	1.11 (0.91, 1.35)	1.05 (0.84, 1.33)	0.91
NHS I						
Median (g/day)	15.3	18.1	20.0	22.0	25.4	
Range	< 16.9	16.9, 19.0	19.1, 20.9	21.0, 23.3	> 23.3	
Cases	325	274	253	260	219	
Person-time	197,621	203,135	203,844	204,229	201,612	
Age-adjusted HR	1.00 (Ref.)	0.81 (0.69, 0.95)	0.76 (0.64, 0.90)	0.78 (0.66, 0.92)	0.68 (0.57, 0.80)	< 0.001
Multivariate-adjusted HR	1.00 (Ref.)	0.86 (0.72, 1.03)	0.87 (0.71, 1.06)	0.96 (0.77, 1.19)	0.89 (0.69, 1.16)	0.69
NHS II						
Median (g/day)	16.7	19.9	22.0	24.4	28.4	
Range	< 18.5	18.5, 21.0	21.1, 23.2	23.3, 25.9	> 25.9	
Cases	723	616	630	542	503	
Person-time	283,167	285,398	287,122	286,960	286,209	
Age-adjusted HR	1.00 (Ref.)	0.85 (0.76, 0.95)	0.87 (0.78, 0.97)	0.75 (0.67, 0.84)	0.70 (0.63, 0.79)	< 0.001
Multivariate-adjusted HR	1.00 (Ref.)	0.94 (0.83, 1.07)	1.05 (0.91, 1.20)	0.98 (0.84, 1.14)	1.02 (0.85, 1.22)	0.64
Pooled cohorts						
Age-adjusted HR	1.00 (Ref.)	0.91 (0.76, 1.10)	0.88 (0.76, 1.02)	0.81 (0.72, 0.91)	0.72 (0.66, 0.78)	< 0.001
Multivariate-adjusted HR	1.00 (Ref.)	0.99 (0.83, 1.17)	1.02 (0.88, 1.18)	1.01 (0.93, 1.10)	1.00 (0.88, 1.13)	0.84

Multivariate models adjusted for age, BMI, history of diabetes, history of hypertension, use of thiazides, supplemental calcium, intakes of fluid, sodium, potassium, fructose, oxalate, phytate, alcohol and for all the other sources of protein. Medians refer to the first time period; however dietary variables were updated over the course of the study.

Supplementary Table 3. Quintiles of NEAP and risk of kidney stones

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	p-value for trend
HPFS						
Median (mEq/day)	30.0	38.3	44.6	51.6	63.8	
Range	< 34.5	34.5, 41.3	41.4, 47.7	47.8, 55.9	> 55.9	
Cases	257	319	359	452	576	
Person-time	132,320	132,966	133,850	135,554	135,985	
Age-adjusted HR	1.00 (Ref.)	1.18 (1.00, 1.39)	1.27 (1.08, 1.49)	1.53 (1.31, 1.79)	1.90 (1.63, 2.21)	< 0.001
Multivariate-adjusted HR (1)	1.00 (Ref.)	1.20 (1.02, 1.43)	1.29 (1.09, 1.53)	1.50 (1.26, 1.77)	1.74 (1.46, 2.08)	< 0.001
Multivariate-adjusted HR (2)	1.00 (Ref.)	1.09 (0.91, 1.31)	1.09 (0.89, 1.34)	1.18 (0.94, 1.49)	1.26 (0.96, 1.67)	0.09
NHS I						
Median (mEq/day)	28.0	35.4	41.1	47.6	58.3	
Range	< 31.5	31.5, 37.7	37.8, 43.5	43.6, 51.1	> 51.1	
Cases	193	222	223	321	372	
Person-time	201,927	202,014	202,137	202,072	202,291	
Age-adjusted HR	1.00 (Ref.)	1.13 (0.93, 1.37)	1.13 (0.93, 1.37)	1.63 (1.35, 1.98)	1.87 (1.55, 2.24)	< 0.001
Multivariate-adjusted HR (1)	1.00 (Ref.)	1.11 (0.91, 1.35)	1.07 (0.87, 1.31)	1.47 (1.20, 1.79)	1.55 (1.25, 1.92)	< 0.001
Multivariate-adjusted HR (2)	1.00 (Ref.)	1.03 (0.83, 1.27)	0.94 (0.73, 1.19)	1.19 (0.91, 1.56)	1.10 (0.79, 1.52)	0.42
NHS II						
Median (mEq/day)	32.4	41.2	47.7	55.2	68.1	
Range	< 37.2	37.2, 44.1	44.2, 50.8	50.9, 59.9	> 59.9	
Cases	507	500	629	644	734	
Person-time	284,628	284,794	284,936	286,295	287,683	
Age-adjusted HR	1.00 (Ref.)	1.00 (0.88, 1.13)	1.28 (1.14, 1.44)	1.35 (1.19, 1.51)	1.58 (1.40, 1.78)	< 0.001
Multivariate-adjusted HR (1)	1.00 (Ref.)	0.98 (0.86, 1.11)	1.20 (1.06, 1.35)	1.18 (1.04, 1.34)	1.26 (1.10, 1.44)	< 0.001
Multivariate-adjusted HR (2)	1.00 (Ref.)	0.96 (0.84, 1.11)	1.19 (1.02, 1.38)	1.17 (0.98, 1.39)	1.24 (1.00, 1.53)	0.04
Pooled cohorts						
Age-adjusted HR	1.00 (Ref.)	1.08 (0.97, 1.20)	1.25 (1.15, 1.36)	1.47 (1.31, 1.65)	1.75 (1.55, 1.99)	< 0.001
Multivariate-adjusted HR (1)	1.00 (Ref.)	1.08 (0.95, 1.23)	1.20 (1.09, 1.31)	1.36 (1.15, 1.60)	1.49 (1.21, 1.84)	< 0.001
Multivariate-adjusted HR (2)	1.00 (Ref.)	1.01 (0.92, 1.12)	1.09 (0.96, 1.24)	1.18 (1.07, 1.30)	1.22 (1.05, 1.41)	0.006

Multivariate model 1 adjusted for age, BMI, history of diabetes, history of hypertension, use of thiazides, supplemental calcium, intakes of fluid, calcium, sodium, fructose, oxalate, phytate and alcohol. Multivariate model 2 further adjusted for all types of protein and potassium intake; in these models NEAP values represent interaction terms. Medians refer to the first time period; however dietary variables were updated over the course of the study.

Supplementary Table 4. Pooled adjusted mean values and 95% confidence intervals of 24-h urine components by quintile of dairy protein

	Quintile 1 (n = 1,227)	Quintile 2 (n = 1,225)	Quintile 3 (n = 1,225)	Quintile 4 (n = 1,226)	Quintile 5 (n = 1,226)	p-value for trend
Median (g/day)	5.6	10.0	13.1	17.3	25.6	—
Creatinine, g	1.4 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.3)	1.3 (1.3, 1.4)	0.09
Calcium, mg	180 (173, 187)	185 (178, 191)	195 (189, 202)	195 (188, 202)	204 (198, 211)	< 0.001
Oxalate, mg	34.1 (33.3, 34.9)	33.0 (32.3, 33.8)	33.0 (32.3, 33.8)	32.9 (32.2, 33.7)	32.7 (31.9, 33.5)	0.011
Citrate, mg	675 (655, 696)	674 (655, 694)	703 (683, 722)	706 (687, 726)	711 (690, 731)	0.002
Uric acid, mg	535 (526, 545)	526 (517, 535)	520 (511, 529)	533 (523, 542)	523 (514, 533)	0.17
Sodium, mEq	145 (141, 149)	151 (147, 154)	148 (144, 152)	152 (149, 156)	151 (147, 155)	0.021
Potassium, mEq	61.8 (60.4, 63.1)	63.5 (62.2, 64.8)	63.6 (62.3, 65.0)	65.2 (639, 66.2)	66.0 (64.6, 67.4)	< 0.001
Magnesium, mg	107 (104, 110)	106 (103, 108)	109 (106, 112)	111 (108, 113)	111 (108, 114)	0.001
Phosphate, mg	823 (807, 839)	847 (832, 862)	855 (840, 870)	878 (863, 892)	900 (884, 915)	< 0.001
Sulfate, mmol	18.0 (17.6, 18.4)	18.4 (18.1, 18.8)	18.7 (18.3, 19.0)	19.3 (19.0, 19.7)	19.6 (19.2, 20.0)	< 0.001
Ammonium, mmol	28.7 (27.7, 29.7)	29.5 (28.5, 30.4)	29.7 (28.8, 30.6)	29.3 (28.4, 30.2)	29.4 (28.4, 30.3)	0.56
pH, U	6.05 (6.02, 6.09)	6.02 (5.99, 6.05)	6.02 (5.99, 6.06)	6.03 (6.00, 6.07)	6.01 (5.98, 6.05)	0.10
Volume, mL	1,833 (1,783, 1,883)	1,842 (1,794, 1,890)	1,862 (1,814, 1,910)	1,905 (1,857, 1,953)	1,830 (1,780, 1,883)	0.80
SS CaOx						
- Pharmacal	1.62 (1.46, 1.79)	1.52 (1.36, 1.68)	1.61 (1.45, 1.77)	1.54 (1.38, 1.70)	1.63 (1.46, 1.79)	0.91
- Litholink	5.22 (4.89, 5.54)	5.37 (5.07, 5.68)	5.58 (5.28, 5.88)	5.39 (5.09, 5.69)	5.65 (5.34, 5.96)	0.08
SS CaP						
- Pharmacal	1.35 (1.17, 1.53)	1.31 (1.13, 1.49)	1.37 (1.19, 1.55)	1.37 (1.19, 1.55)	1.51 (1.32, 1.69)	0.016
- Litholink	1.02 (0.92, 1.11)	0.99 (0.90, 1.08)	1.11 (1.02, 1.20)	1.12 (1.03, 1.21)	1.18 (1.09, 1.27)	0.003
SS UA						
- Pharmacal	1.74 (1.50, 1.98)	1.74 (1.50, 1.98)	1.78 (1.54, 2.02)	1.73 (1.49, 1.97)	1.75 (1.51, 2.00)	0.89
- Litholink	0.66 (0.58, 0.73)	0.71 (0.65, 0.78)	0.67 (0.60, 0.73)	0.69 (0.62, 0.75)	0.68 (0.61, 0.75)	0.86

Models adjusted for age, BMI, history of kidney stones, history of diabetes, history of hypertension, total fluid intake, use of thiazides, supplemental calcium, intake of all the other types of protein, intake of potassium, study cohort, urine creatinine and sodium. Ammonium data only available for NHS II Litholink collection. CaOx, calcium oxalate; CaP, calcium phosphate (brushite); SS, supersaturation; UA, uric acid.

Pharmacal results are reported as relative supersaturations, whereas Litholink results as supersaturations. Medians refer to the first time period; however dietary variables were updated over the course of the study.

Supplementary Table 5. Pooled adjusted mean values and 95% confidence intervals of 24-h urine components by quintile of non-dairy animal protein

	Quintile 1 (n = 1,225)	Quintile 2 (n = 1,227)	Quintile 3 (n = 1,225)	Quintile 4 (n = 1,227)	Quintile 5 (n = 1,225)	p-value for trend
Median (g/day)	24.3	33.8	41.3	49.1	64.7	—
Creatinine, g	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	0.26
Calcium, mg	187 (181, 194)	193 (187, 200)	192 (186, 198)	192 (185, 198)	195 (189, 202)	0.11
Oxalate, mg	33.3 (32.5, 34.1)	32.9 (32.2, 33.7)	32.9 (32.1, 33.6)	32.8 (32.1, 33.5)	33.8 (33.1, 34.6)	0.29
Citrate, mg	720 (700, 740)	696 (676, 716)	707 (687, 726)	680 (661, 699)	666 (646, 686)	< 0.001
Uric acid, mg	514 (505, 524)	525 (515, 534)	525 (515, 534)	537 (527, 546)	538 (528, 547)	< 0.001
Sodium, mEq	141 (138, 145)	147 (143, 151)	152 (148, 156)	150 (146, 154)	156 (153, 160)	< 0.001
Potassium, mEq	65.8 (64.4, 67.1)	64.6 (63.2, 65.9)	63.5 (62.2, 64.8)	63.3 (62.0, 64.6)	62.9 (61.6, 64.3)	< 0.001
Magnesium, mg	112 (109, 115)	109 (106, 111)	107 (104, 109)	107 (104, 109)	110 (107, 112)	0.12
Phosphate, mg	845 (829, 860)	856 (841, 87)	846 (832, 861)	872 (857, 886)	883 (868, 898)	< 0.001
Sulfate, mmol	17.8 (17.4, 18.2)	18.5 (18.1, 18.9)	18.6 (18.2, 18.9)	19.1 (18.8, 19.5)	20.1 (19.7, 20.4)	< 0.001
Ammonium, mmol	28.3 (27.4, 29.2)	29.3 (28.4, 30.2)	28.4 (27.5, 29.3)	30.2 (29.3, 31.1)	30.3 (29.4, 31.3)	< 0.001
pH, U	6.09 (6.05, 6.12)	6.05 (6.02, 6.09)	6.05 (6.02, 6.08)	6.00 (5.96, 6.03)	5.96 (5.92, 5.99)	< 0.001
Volume, mL	1,869 (1,820, 1,918)	1,839 (1,791, 1,888)	1,851 (1,803, 1,899)	1,840 (1,793, 1,887)	1,873 (1,825, 1,922)	0.89
SS CaOx						
- Pharmacal	1.57 (1.40, 1.73)	1.60 (1.43, 1.76)	1.55 (1.39, 1.71)	1.58 (1.42, 1.74)	1.63 (1.46, 1.79)	0.42
- Litholink	5.18 (4.88, 5.48)	5.42 (5.12, 5.71)	5.56 5.27, 5.84)	5.50 (5.20, 5.81)	5.56 (5.23, 5.48)	0.08
SS CaP						
- Pharmacal	1.47 (1.29, 1.65)	1.49 (1.31, 1.67)	1.33 (1.15, 1.50)	1.31 (1.13, 1.49)	1.31 (1.13, 1.49)	0.001
- Litholink	1.04 (0.95, 1.13)	1.10 (.01, 1.18)	1.16 (1.07, .24)	1.10 (1.01, 1.19)	1.02 (0.93, 1.11)	0.70
SS UA						
- Pharmacal	1.61 (1.37, 1.85)	1.60 (1.36, 1.84)	1.71 (1.47, 1.95)	1.87 (1.63, 2.11)	1.95 (1.71, 2.20)	< 0.001
- Litholink	0.61 (0.55, 0.68)	0.71 (0.65, 0.78)	0.65 (0.59, 0.72)	0.69 (0.62, 0.76)	0.74 (0.67, 0.81)	0.02

Models adjusted for age, BMI, history of kidney stones, history of diabetes, history of hypertension, total fluid intake, use of thiazides, supplemental calcium, intake of all the other types of protein, intake of potassium, study cohort, urine creatinine and sodium. Ammonium data only available for NHS II Litholink collection. CaOx, calcium oxalate; CaP, calcium phosphate (brushite); SS, supersaturation; UA, uric acid.

Pharmacal results are reported as relative supersaturations, whereas Litholink results as supersaturations. Medians refer to the first time period; however dietary variables were updated over the course of the study.

Supplementary Table 6. Pooled adjusted mean values and 95% confidence intervals of 24-h urine components by quintile of animal protein to potassium ratio

	Quintile 1 (n = 1,225)	Quintile 2 (n = 1,227)	Quintile 3 (n = 1,225)	Quintile 4 (n = 1,227)	Quintile 5 (n = 1,225)	p-value for trend
Median (g/mEq)	0.43	0.57	0.66	0.77	0.97	—
Creatinine, g	1.4 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.4)	1.3 (1.3, 1.3)	0.19
Calcium, mg	192 (183, 202)	191 (184, 198)	192 (185, 198)	193 (186, 200)	192 (182, 201)	0.87
Oxalate, mg	33.7 (32.6, 34.8)	33.4 (32.6, 34.2)	32.7 (32.0, 33.5)	32.6 (31.8, 33.5)	33.5 (32.4, 34.6)	0.85
Citrate, mg	730 (701, 760)	715 (693, 737)	680 (660, 700)	691 (669, 713)	660 (632, 689)	0.003
Uric acid, mg	531 (517, 545)	529 (519, 539)	528 (519, 537)	523 (513, 534)	526 (513, 540)	0.53
Sodium, mEq	147 (141, 153)	150 (146, 154)	149 (145, 153)	149 (145, 153)	151 (146, 157)	0.46
Potassium, mEq	68.0 (66.0, 70.0)	66.5 (65.0, 68.0)	64.3 (62.9, 65.6)	62.6 (61.1, 64.1)	59.1 (57.2, 61.0)	< 0.001
Magnesium, mg	115 (111, 119)	110 (107, 113)	107 (104, 109)	106 (103, 109)	107 (103, 110)	0.041
Phosphate, mg	859 (836, 881)	861 (844, 877)	866 (851, 881)	854 (837, 871)	866 (844, 888)	0.84
Sulfate, mmol	18.7 (18.1, 19.2)	18.9 (18.5, 19.3)	18.9 (18.5, 19.3)	18.6 (18.2, 19.0)	19.0 (18.5, 19.5)	0.57
Ammonium, mmol	28.7 (27.2, 30.1)	28.5 (27.5, 29.5)	29.3 (28.5, 30.2)	29.3 (28.3, 30.2)	30.9 (29.4, 32.4)	0.06
pH, U	6.11 (6.06, 6.16)	6.07 (6.04, 6.11)	6.02 (5.99, 6.06)	5.99 (5.96, 6.03)	5.95 (5.90, 6.00)	< 0.001
Volume, mL	1,932 (1,859, 2,004)	1,888 (1,835, 1,941)	1,833 (1,785, 1,881)	1,838 (1,785, 1,891)	1,792 (1,722, 2,004)	0.05
SS CaOx						
- Pharmacal	1.62 (1.43, 1.82)	1.63 (1.46, 1.80)	1.56 (1.39, 1.72)	1.52 (.35, 1.68)	1.61 (1.43, 1.80)	0.99
- Litholink	4.96 (4.49, 5.44)	5.28 (4.96, 5.61)	5.65 (5.36, 5.95)	5.69 (5.35, 6.02)	5.66 (5.18, 6.15)	0.12
SS CaP						
- Pharmacal	1.45 (1.23, 1.67)	1.44 (1.25, 1.63)	1.44 (1.25, 1.62)	1.30 (1.12, 1.48)	1.29 (1.08, 1.49)	0.09
- Litholink	1.08 (0.94, 1.22)	1.15 (1.05, 1.24)	1.12 (1.04, 1.21)	1.07 (0.97, 1.17)	1.02 0.88, 1.16)	0.42
SS UA						
- Pharmacal	1.70 (1.41, 2.00)	1.67 (1.42, 1.93)	1.72 (1.47, 1.96)	1.77 (1.52, 2.02)	1.90 (1.62, 2.18)	0.11
- Litholink	0.53 (0.42, 0.63)	0.58 (0.51, 0.65)	0.70 (0.64, 0.77)	0.74 (0.66, 0.81)	0.85 (0.74, 0.95)	< 0.001

Models adjusted for age, BMI, history of kidney stones, history of diabetes, history of hypertension, total fluid intake, use of thiazides, supplemental calcium, intake of protein and potassium, study cohort, urine creatinine and sodium. Ammonium data only available for NHS II Litholink collection. CaOx, calcium oxalate; CaP, calcium phosphate (brushite); SS, supersaturation; UA, uric acid. Pharmacal results are

reported as relative supersaturations, whereas Litholink results as supersaturations. Medians refer to the first time period; however dietary variables were updated over the course of the study.