**Intervention design**

Upon successful completion of screening participants provided written informed consent and were randomised to one of four treatment groups, according to age and gender. The four treatment groups were defined as follows: treatment group 1 received daily vitamin D$_3$ (15 μg) and probiotic (*Lactobacillus salivarius* $10^9$ cfu/5g sachets suspended in maltodextrin); group 2, daily vitamin D$_3$ and placebo probiotic (maltodextrin); group 3, daily vitamin D$_3$ placebo and probiotic; and group 4, daily vitamin D placebo and probiotic placebo. The vitamin D$_3$ and matching placebo were food grade and consumed in capsule form and were identical in appearance and taste, while the probiotic and probiotic/placebo (in powder form) was mixed with milk for consumption. The vitamin D$_3$ capsules and matching placebo capsules were produced by Banner Pharmacaps (Tilburg, The Netherlands). The vitamin D$_3$ content of the capsules was independently confirmed by laboratory analysis (Consultus Ltd, Glenmire, Co. Cork, Ireland). Fasting urine and blood samples were collected before and after a four week dietary intervention. The intervention was carried out in two phases, April 2007 (spring) and November 2007 (autumn).