

Supplement to: Vitamin K – an update

Part 1: Basic nutritional facts

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| Reference | Subjects | Diseases | Significant results |
|--|---|--|---|
| concentration of undercarboxylated osteocalcin compared to carboxylated osteocalcin (ucOC/cOC) in the blood serum | | | |
| VAN SUMMEREN et al., 2008 [74] | n = 54 healthy subjects n = 55 arthritis patients total: 70 % ♀, 6–18 years | osteopenia | higher ucOC/cOC values and lower bone density in patients compared to healthy children and adolescents |
| VILLÁFAN-BARNAL et al., 2014 [75] | n = 160 50 % ♀, 50 ± 7 years n = 80 type 2 diabetics 50 % ♀, 52 ± 9 years | osteoporosis | higher ucOC/cOC values, fasting plasma glucose and insulin resistance parameters (HOMA-IR) in diabetics; cut-off point ucOC/cOC = 0.3 (≈ 23 % ucOC) |
| concentration of dephosphorylated undercarboxylated matrix gla protein (dp-ucMGP) in blood plasma | | | |
| CRANENBURG et al., 2010 [35] | n = 75 healthy subjects 59 % ♀, 25–80 years n = 146 patients 52 % ♀, 44–80 years n = 17 coumarin users 20–45 years | 51 rheumatism 50 aortic stenosis 45 hemodialysis | in the case of healthy subjects, there is a correlation between dp-ucMGP and age; higher dp-ucMGP values in patients of comparable age and in persons on anticoagulation therapy compared to healthy subjects; highest dp-ucMGP values in patients with aortic stenosis and hemodialysis |
| SCHURGERS et al., 2010 [76] | no control group n = 107 patients 60 % ♂, 67 ± 13 years | chronic kidney disease | dp-ucMGP elevated depending on age, coumarin therapy and severity of the disease (stages 4 and 5); correlation between dp-ucMGP and aortic calcification |
| UELAND et al., 2010 [77] | n = 93 healthy subjects 52 % ♀, 65 ± 5 years n = 147 patients 55 % ♂, 74 ± 10 years | aortic stenosis | higher dp-ucMGP values in people with calcified aortic valves; correlation between dp-ucMGP and heart function/mortality |
| UELAND et al., 2011 [78] | n = 33 healthy subjects n = 198 patients total sample: 78 % ♂, 56 ± 12 years | chronic heart failure (coronary heart disease and cardiomyopathy) | higher dp-ucMGP values for cardiac patients; correlation between dp-ucMGP and systolic/diastolic dysfunction; dp-ucMGP correlates with the severity of the disease and provides prognostic information regarding mortality |
| DALMEIJER et al., 2013 [79] | n = 100 healthy subjects n = 100 healthy subjects with CAC 100 % ♀, 67 ± 5 years | coronary artery calcification (CAC) | correlation between vitamin K intake and ucOC/cOC, between ucOC/cOC and dp-ucMGP, and between dp-ucMGP and level of calcification (p = 0.06) |

Tab. 3: Case control studies on the biomarkers ucOC/cOC and dp-ucMGP

| Reference | Subjects | Diseases | Significant results |
|--|---|---|---|
| concentration of undercarboxylated osteocalcin compared to carboxylated osteocalcin (ucOC/cOC) in the blood serum | | | |
| VAN SUMMEREN et al., 2009 [80] | n = 55 healthy children 60 % ♀, 6–10 years | 45 µg/d of MK-7 or placebo for 8 weeks | in the treatment group, reduction in ucOC/cOC (–33.3%) and increase in the MK-7 level – without any effect on the coagulation factors |
| BRUGÈ et al., 2011 [81] | n = 12 healthy subjects 67 % ♀, 37 ± 3 years | 0, 45, or 90 µg/d of MK-7 in olive oil for 2 weeks | dose-dependent increase in MK-7 level; reduction in ucOC and increase in cOC after 90 µg/day of MK-7 |
| concentration of ucOC/cOC in blood serum and of dp-ucMGP in blood plasma | | | |
| DALMEIJER et al., 2012 [82] | n = 60 healthy subjects 60 % ♀, 40–65 years | 180 or 360 µg/d of MK-7 or placebo over 12 weeks | in the treatment group, dose-dependent reduction in ucOC/Oc of 60% and 74%, and reduction of dp-ucMGP of 31% and 46% respectively |
| concentration of dephosphorylated undercarboxylated matrix gla protein (dp-ucMGP) | | | |
| WESTENFELD et al., 2012 [14] | n = 53 healthy subjects 62 % ♀, 35–77 years n = 50 dialysis patients 70 % ♂, 30–88 years | 45, 135, or 360 µg/day of MK-7 over 6 weeks in patients with kidney failure and vascular calcification | 4.5 times higher dp-ucMGP values in patients compared to healthy subjects; dose and time-dependent reduction of dp-ucMGP of 17.9, 36.7, and 61.1%; positive effects in 77% (45 µg/day) to 93% (360 µg/day) of dialysis patients |
| CALUWÉ et al., 2014 [83] | n = 165 dialysis patients 50 % ♀, 24–93 years | 360, 720, or 1,080 µg of MK-7 three days a week for a period of 2 months | inverse correlation between MK-7 dosages and dp-ucMGP levels: reductions of 17, 33, and 47% |
| THEUWISSEN et al., 2014 [39] | n = 42 healthy children 6–10 years n = 68 healthy adults 20–40 years | 45 µg/d MK-7 over 8 weeks, 90 µg/d MK-7 over 7 weeks | reduction in dp-ucMGP concentrations through supplementation, with the strongest effects occurring in people with the highest baseline values for dp-ucMGP |
| KNAPEN et al., 2015 [84] | n = 56 healthy subjects 46 % ♀ (postmenopausal) 56 ± 5 years | 56 µg/day of MK-7 in 2 yogurt drinks ^a or placebo for 12 weeks | in the treatment group, the dp-ucMGP level was reduced by 24%; simultaneous 33% reduction in the ucOC concentration |
| KURNATOWSKA et al., 2015 [85] | n = 42 kidney failure sufferers not requiring dialysis 51 % ♂, 18–70 years | 90 µg/d MK-7 plus 10 µg/d vitamin D ₃ or placebo (vitamin D ₃) over 270 ± 12 days | in the treatment group, reduction of the dp-ucMGP concentration with less thickening of the carotid artery at the same time; no effect on the degree of calcification in the coronary arteries |

Tab. 4: : **Interventional studies (RCT) on the biomarkers ucOC/cOC and dp-ucMGP**

^a Also added to the yogurt were n3 fatty acids, vitamin D₃, vitamin C, calcium and magnesium (15% of the DRI).