

硫酸鈣對於成骨作用的影響

The effect of calcium sulfate on osteogenesis

中文摘要

在牙科及骨科的臨床工作中，只要是骨缺損的情況下都會使用到骨替代物，臨床上已証實有使用骨替代物會得到較好的骨外形及骨質密度。骨替代物有自體骨移植、同種之間骨移植、異種之間骨移植、人工合成骨粉四大類。其中人工骨粉的來源能夠綿延不絕而且沒有傳染病、排斥、人道及法律問題，因此近年來人工骨粉的研發日益重要。以生醫硫酸鈣製成的人工骨粉使用已有百年歷史，其效果相當良好，但作用機轉的研究卻不夠深入清楚。骨頭的改建機制十分複雜，受到許多因子的調控包括第一型膠原蛋白(Collagen type 1)是骨生成的基質，骨唾液酸蛋白(Bone sialoprotein)會引發骨礦化的形成，二聚醣(Biglycan)會與第四型骨型態發生蛋白(Bone morphogenic protein, BMP-4)結合促進骨生成，核心蛋白聚醣(Decorin)會與第一型膠原蛋白結合促進骨沉積，硫酸化的骨橋蛋白(Osteopontin)及骨唾液酸蛋白會促進骨生長。本研究即利用體外培養成骨細胞株(U2 osteosarcoma)與不同濃度的生醫硫酸鈣共同培養、觀察生醫硫酸鈣是否會讓成骨細胞分泌上述促進骨生成的蛋白質，觀察蛋白質的基因與其分泌量，另外目前已知骨唾液酸蛋白的基因調控是由 C-Jun、C-Fos 轉錄因子與其 promoter 結合後啟動，我們也同時分析硫酸鈣

是否會造成骨唾液酸蛋白質基因的啟動。

本研究結果顯示硫酸鈣可以增加骨唾液酸蛋白、骨橋蛋白、二聚醣、核心蛋白聚醣的分泌，同時也增加骨唾液酸蛋白、骨橋蛋白、二聚醣、第一型膠原蛋白的基因表現；我們發現硫酸鈣在八小時造成骨唾液酸蛋白的 C-Jun、C-Fos 表現量增加，而骨唾液酸蛋白的基因表現也在第一天時上升，所以推測硫酸鈣是藉由促進骨唾液酸蛋白、骨橋蛋白、第一型膠原蛋白、二聚醣、核心蛋白聚醣的分泌而促進骨生成，另外硫酸鈣也因為促進骨唾液酸蛋白的 C-Jun、C-Fos 在八小時分泌量增加而與骨唾液酸蛋白基因的 promoter 結合啟動骨唾液酸蛋白基因表現，造成觀察到第一天的骨唾液酸蛋白基因表現量增加。

因此硫酸鈣不僅可使骨生成的蛋白質分泌量增加還可能是藉由刺激轉錄因子的上升表現而啟動基因表現。

英文摘要

In dental and orthopedic work, we will use bone substitute under the bony defect situation, have already verified that use the substitute of bone to get better bone appearance and density on clinic. The substitute of bone has autogenous bone, allgrafts, xerografts and alloplastic materials four big classes of bone transplanting. Among them the source of the artificial bone I can be continuous and without cease

and having no infectious disease, racial, humanity and legal question, so the research and development of the artificial bone meal is increasingly important in recent years. Already to use had history of one hundred length of service in order to grow and cure the artificial bone meal made of calcium sulfate, its result is quite good, but the function mechanism research is not clearly deep enough. Rebuild of bone mechanism very complicated, include Collagen type 1 form scafford that bone turn into, Bone sialoprotein will initiate mineralization of bone, Biglycan bind to Bone morphogenic protein(BMP-4) and promote the bone formation, Decorin bind to collagen type 1 and promote the bone to deposit , sulfated Osteopontin and bone sialoprotein will promote the bone to grow. This research utilize osteoblast cell line (U 2 osteosarcoma) co-culture with calcium sulfate outside the body to observe that calcium sulfate can let osteoblast secrete described above protein that can promote bone formation , observe the gene of the protein and protein secreting amount, in addition we already know that the genetic regulation and control of the bone sialoprotein is by C-Jun, C-Fos transcription factor bind to its promoter , at the same time we analyze whether calcium sulfated will induce bone sialoprotein gene promoter .

Result of study this reveal calcium sulfate can increase secretion of bone sialoprotein, osteopontin,biglycan,decorin ,and increase gene expression of bone sialoprotein, osteopontin, biglycan , collagen type 1 at the same time; We find calcium sulfate cause C-Jun, C-Fos of bone sialoprotein displaying amount of protein increase in eight hour, and the genetic behavior of bone sialoprotein rose on the first day, infer calcium sulfate by promote secretion of bone sialoprotein, osteopontin,biglycan , collagen type 1,decorin and promote bone formation, in addition calcium sulfate promote C-Jun, C-Fos of bone sialoprotein , who secrete increase and bind with promoter of the bone sialoprotein gene in eight hour to move bone sialoprotein gene behave, cause, observe bone sialoprotein gene displaying amount for first day increase.

Calcium sulfate not only increase secreting amount of bone formation protein but also induce gene expression by rising transcription factor protein .