I/5 Conclusions Part I

In conclusion, all novel bone substitute materials significantly affected cellular growth and the temporal expression of an array of bone-related genes and proteins. Since all novel materials facilitated the expression of these osteogenic markers at least as much as TCP, these biomaterials can be regarded as potential bone substitutes. Hence, their biocompatibilty has been demonstrated at a molecular level. In study A, surfaces of R1 and R1+SiO_2 had the most effect on osteoblastic differentiation inducing a greater expression of an array of osteogenic proteins than recorded for cells grown on TCP, thus suggesting that these materials may possess a higher potency to enhance osteogenesis than TCP. In study B and C, GB9 and GB9N induced the highest proliferation and cellular differentiation over the 21 days of incubation period suggesting that these materials may possess a higher potency for enhancing osteogenesis than TCP and thus rendering them promising bone substitute materials. Further exploration of the material dependent effects reported here will involve the study of cell adhesion mechanisms and the intracellular signal transduction events. These phenomena eventually lead to the differences in gene and protein expression of osteogenic markers as observed for the different bone substitute materials studied. Thereby, the mechanisms by which some of these rapidly resorbable bone substitute materials induce enhanced osteoblastic differentiation can be elucidated. Equally important will be the correlation between *in vitro* data with *in vivo* phenomena, by focusing on the detection of the same bone matrix proteins in the tissue surrounding the present bone substitute materials subsequent to implantation. Such measurements can be made on the same specimens as those used for quantifying the bone-biomaterial contact. Grant support to address these issues has been applied for.