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Dose-dependent osteoinductive effects of bFGF in rabbits

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Introduction

Growth factors promise to improve bone implant materials significantly. They lead to the induction of osteogenic and endothelial differentiation, bone matrix production, and neoangiogenesis when coated on biomaterials. This can help to promote and improve bone healing. Basic fibroblast growth factor (bFGF) is interesting in this concern due to the combined induction of bone healing and neoangiogenesis. This study evaluated bFGF-coated hydroxylapatite implants in the rabbit patellar groove model.

Material and Methods

Implants were press-fit fixed in the patellar groove of female ex-breeder "German Giant" rabbits (2.5-3 kg) with closed growth plates to ensure normal bone healing. Two experimental groups with either 10µg or 100µg (n=5 per group) were compared with uncoated control implants in the opposite knee. The model allowed reproducible measurement of bone labelling and histomorphometry.

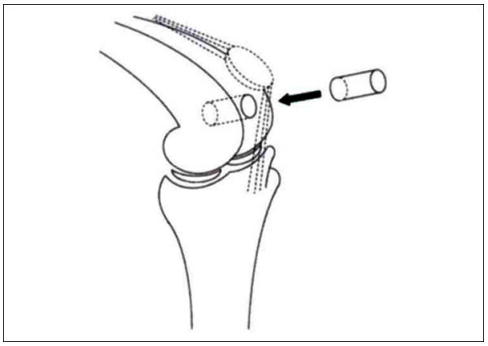

Fig. 1

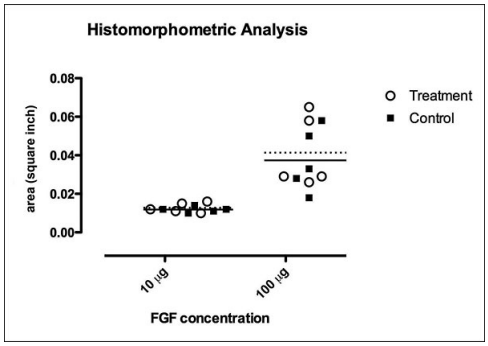

Fig. 2: Histomorphometric analysis of the alizarine marking. Area values were measured in standardized images. Left: 10microg bFGF and negative control group; Right: 100microg bFGF and negative control group. Dotted (treated side) and straigt (control side) lines represent the means.

Results

We observed an unexpected ineffectiveness compared to the control groups with no significant difference of bone growth. Similar results were reported from other research groups for osteoinductive growth factors. However all samples from the 100µg experiment (control and coated implant) showed significantly stronger 19-25 day label than both 10µg groups (control and coated implant).

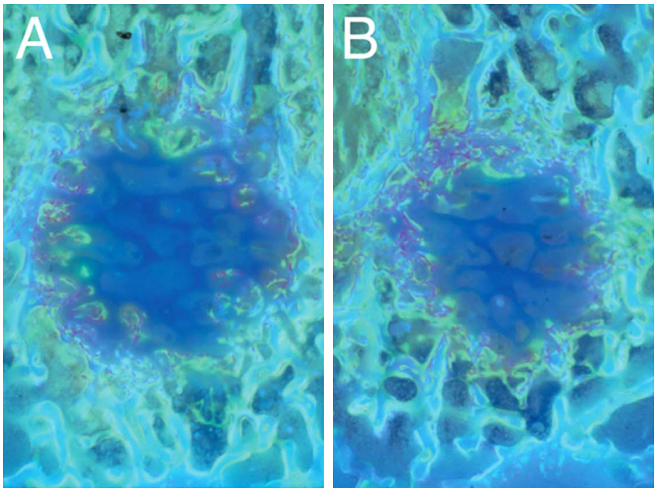

Fig. 3a-b: Fluorescence light examination: Examples of each group (sample slice in the depth of -2400micron measured from the cartilage surface). The red alizarine complexone marking can be clearly seen. Earlier sequence markings are stronger in the 10microg samples. A: 10microg bFGF; B: control 10microg group, opposite knee.

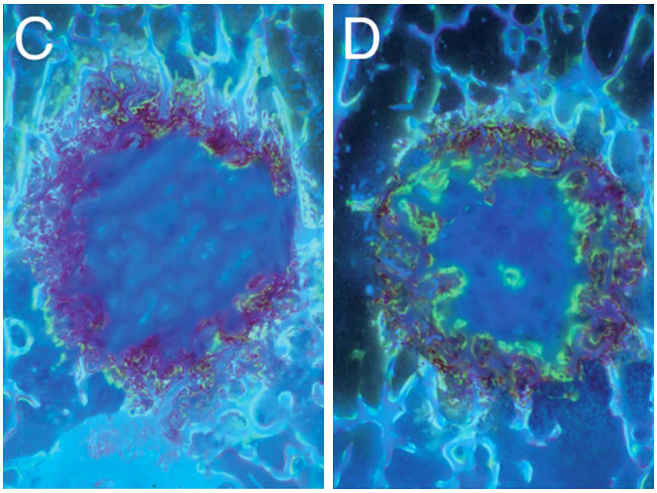

Fig. 3c-d: Fluorescence light examination: Examples of each group (sample slice in the depth of -2400micron measured from the cartilage surface). The red alizarine complexone marking can be clearly seen. Earlier sequence markings are stronger in the 10microg samples. C: 100microg bFGF; D: control 100microg, opposite knee.

Conclusions

Based on these results and within the limits of this study, it may be concluded that the possibility of a systemic effect by bFGF coatings exist.

This Poster was submitted by Dr. med. Dr. med. dent. Guy Florian Draenert.

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Poster Faksimile:

Osteoinduction by b-FGF indicates systemic effect in rabbits

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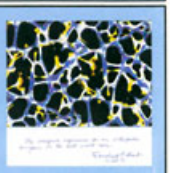
INTRODUCTION

Growth factors promise to improve bone implant materials significantly. They lead to the induction of osteogenic and endothelial differentiation, bone matrix production, and neoangiogenesis when coated on biomaterials. This can help to promote and improve bone healing. Basic fibroblast growth factor (bFGF) is interesting in this concern due to the combined induction of bone healing and neoangiogenesis.

TCP & BMP-7 in dog femur defect after 14 months



OBJECTIVES

This study evaluated bFGF-coated hydroxylapatite implants in the rabbit patellar groove model.

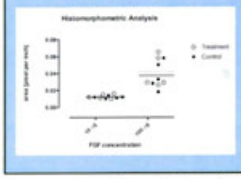
METHODS

Hydroxylapatite implants were press-fit fixed in the patellar groove of female ex-breeder "German Giant" rabbits (2.5-3 kg) with closed growth plates to ensure normal bone healing.

Two experimental groups with either 10µg or 100µg (n=5 per group) were compared with uncoated control implants in the opposite knee. The model allowed reproducible measurement of bone labelling and histomorphometry.

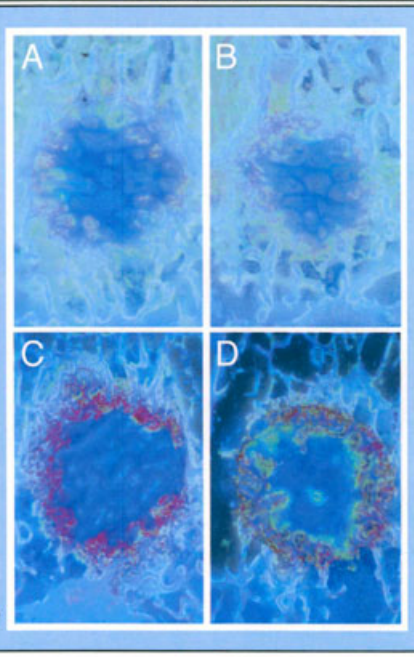
RESULTS

We observed an unexpected ineffectiveness compared to the control groups with no significant difference of bone growth between the experiment and the control sample after 35 days.



However all samples from the 100µg experiment (control D and coated implant C) showed significantly stronger 19-25 day label than both 10µg groups (control B and coated implant A).

RESULTS



CONCLUSION

Based on these results and within the limits of this study, it may be concluded that the possibility of a systemic effect by bFGF coatings exist.
Whether this effect is due to an indirect systemic mechanism and whether other growth factors show similar properties is an open issue.

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