

An empirical model linking physico-chemical biomaterial characteristics to intra-oral bone formation

Created on: 08-06-2023 - Last modified on: 08-06-2023

SCOPE OF THE METHOD

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| The Method relates to | Animal health, Human health |
| The Method is situated in | Basic Research |
| Type of method | In silico |
| This method makes use of | Animal derived cells / tissues / organs |
| Species from which cells/tissues/organs are derived | bilateral sinus lift procedures in rabbits |
| Type of cells/tissues/organs | Intra-oral bone region |

DESCRIPTION

Method keywords

Empirical modeling
intra-oral bone formation
calcium phosphate
physico-chemical
biomaterials

Scientific area keywords

Bone tissue engineering
Intra-oral bone regeneration
insilico medicine
physico-chemical characterization
scaffold design

Method description

This empirical model is used to assess the weighted value of driving biomaterials properties in the intra-oral bone regeneration process. We used partial least square regression (PLSR) to construct empirical models that relate combinations of (quantified) biomaterial characteristics to intra-oral bone regeneration outcomes across diverse types of bone biomaterials. This computational method uses linear correlation to reduce the dispersion of a multi-variate data set by identifying the most important information from the original data set.

Lab equipment

Any characterization method that provides a quantified physico-chemical specification of scaffolds (e.g. mechanical characterization, surface roughness analysis, macroporosity measurement, etc.).

Method status

Internally validated

PROS, CONS & FUTURE POTENTIAL

Advantages

The model provides a way to identify driving biomaterial properties and morphological cues of the intra-oral bone healing process as well as predict the bone regeneration potential of new biomaterials based on their physico-chemical characteristics.

Challenges

The model should be fed with the quantified characteristics of scaffolds obtained from high-quality characterizations.

Modifications

More samples with a wider range of physico-chemical characteristics would further increase the robustness of the model.

Future & Other applications

Biological agents (drugs, growth factors, etc.) could be drawn into the analysis in future research. The interplay between physico-chemical biomaterial factors and biological ones could also be assessed quantitatively for the intra-oral bone biomaterials. This model can be also applied to other areas of tissue engineering.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

References

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Associated documents

Other remarks

Designing the optimized bone graft for intra-oral applications involves many parameters that directly affect the bone regeneration rate in the defect site. Thus, in order to obtain the optimal scaffold design for a specific application, more insight should be achieved into the influence of biomaterials characteristics on the regeneration process.

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