ArCir – Dynamique project

Post-doc recruitment

A post-doctoral position is available (from 01 January 2015, 18 month) at the Laboratory/Group of Research on Biomaterials (GRB, Inserm U1008, University Lille 2) located in Lille, France. This position is opened in the framework of the "Regional concerted initiative actions of research" of region Nord-Pas de Calais, France. The acronym of the project is BioCerMed: Anti-infection & Anti-cancer Functionalized Bioceramics Implants for Medical application.

Scientific background of the project

Despite the progress in bone cancer surgery and chemotherapy, those methods compared with historical controls show only a modest improvement in overall survival due to failure of removing all residual cancer cells at surgical margin and the extreme side-effect from the adjuvant postoperative treatment. Calcium phosphate bioceramics could be ideally applied not only as a bone regeneration scaffold but also "carrying" the well-chosen anticancer weapons to eliminate residual cancer cells. The project proposes to associate degradable polymer drug carrier system with bioceramic bone substitute materials (calcium phosphate-polymer composite) to load anticancer drugs for supply extended drug release. The choice of appropriate drug delivery system can place drug at the right location, for the desired duration and at the efficient concentration. Therefore, main objective will be developing biodegradable hydrogelgel as drug carrier to retain anticancer molecule. Such carrier system then could be incorporated into the macroporous structure of bioceramic bone void filler to form a bioceramic composite. In addition, the project also concerns comprehensive biological evaluation on its biocompatibility, anticancer efficacy and *in vivo* implant experiment *etc*. No existing anticancer bone substitute biomaterials in the world market so far, if ever the final product has been proved efficacious, it can fill the gap of market besides that in cancer therapeutic field.

Several international patents already protect the Project

Subsequently a Non-Disclosure Agreement will be signed

Summary of the task

The method of impregnation process system (hydrogel / active molecule/ bioceramics) will be optimized, a study measuring the reproducibility of adsorbed amount of active molecule will be conducted. will The distribution of hydrogel in the bioceramic will be demonstrated by SEM observations.

Study of the release of active molecule: The kinetics of bioactive molecules release hydrogel-bioceramic composite will be evaluated in different environments (approximate *in vivo* conditions) and under different conditions (similar to that of the implantation site). These studies will determine, through mathematical modeling, the kinetics of release of the therapeutic molecule.

Biological evaluation: Once finalizing the composite material (bioceramic and hydrogel), the biological evaluation will be conducted to investigate the cytocompatibility (proliferation, cell adhesion and vitality, mineralization, *etc*) of composite material. Further study will then need to demonstrate the activity of the biomaterial on human bone tumor cells. It is important to show that the presence of hydrogel system do not interfere with the proliferation of osteoblastic cells after the release of the molecule (e.g. cisplatin).

Animal experimentation: Animal testing may be performed on a rat or dog model. The U1008 has all the infrastructure to carry out these studies. This study will prove the efficacy and safety of this new product by investigation of histological section for inflammatory reaction, *etc*.

Qualifications required

The recruit must have competence in cell biological techniques and manipulation of hydrogel material for tissue engineering use in general. Preliminary experiences in evaluating biomaterials biocompatibility *in vitro* and *in vivo* will be appreciated.

A high performance (oral and written) in English language is required.

Salary: ~ 2050 € net/month for 18 months; from 01 January 2015.

To apply: send an E-mail and a motivation letter with a CV mentioning some contacts, to Dr Nicolas BLANCHEMAIN.

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