Science Bridges China Research Profile

Name: **Dr Aileen Crawford**

Position: **Lecturer in Oral Science and Tissue Engineering**

Institute/division: **University of Sheffield (School of Clinical Dentistry)**

Email: **a.crawford@sheffield.ac.uk**

Tel: **+44 114 271 7939**

SUMMARY OF MY RELEVANT RESEARCH AREAS:

Biomaterials for use as devices and scaffolds or cell delivery for tissue engineering/regenerative medicine methodologies to repair/regenerate and reconstruct skeletal tissues (cartilage, bone and ligament) in orthopaedic indications and tissues of the head and neck (e.g. maxillofacial reconstruction, cleft palate).

生物材料在设备，支架或细胞提供等用于组织工程和再生医药的科学中的应用。在整形外科中用于指标显示或头部和颈部的组织（如颌面部重建，腭裂）而修复，再生或重建骨骼组织（包括软骨，骨骼和韧带）。

Primary Research interests:

The list below is representative of the primary research interests of our biomaterials research cluster at the School of Clinical Dentistry, Sheffield.

1. Bioengineering of cartilage and bone for orthopaedic and maxillofacial reconstruction/repair
2. Bioengineering periodontal ligament.
3. Novel biomaterials (synthetic and natural) for use as devices and cell-carriers/scaffolds for skeletal tissue repair.
4. Biofunctionalisation of biomaterials ('Smart' scaffolds) to enhance cell migration, attachment, differentiation, matrix formation and mechanical properties.
5. Development of appropriate scaffold 3D architecture to maximize tissue formation/regeneration.
6. Investigation and assessment of mesenchymal stem cell sources/niches and primary tissue cells for skeletal tissue repair.
7. Bioenngineered skeletal and oral tissues as model systems for testing potential therapeutic agents and oral healthcare products.
8. Utility of bioreactors in tissue engineering.
9. Design and development of custom maxillofacial, cranial and dental prosthetic implants.
10. Novel and modified bioceramics and glass-ionomer cements for bone tissue repair.

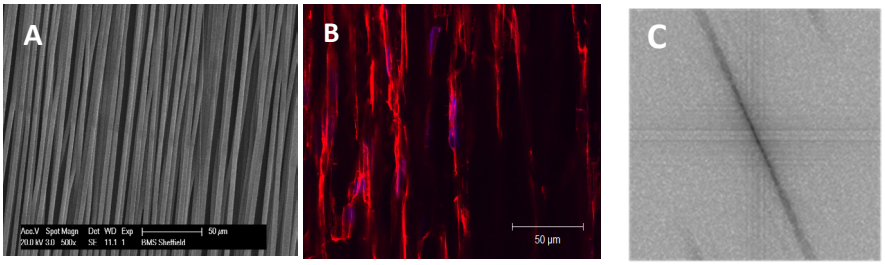
Topics in which you would like to develop collaborative research:

- **Imaging techniques (microcomputer tomography, magnetic resonance imaging).**
- **Rapid precise prototyping/solid freeform fabrication.**
- **Custom shaped scaffolds for bioengineering bone and cartilage grafts for maxillofacial reconstruction.**
- **Novel biomaterials (as devices or cell-carriers/scaffolds) for cartilage, bone and ligament repair.**
- **Biofunctional modifications to enhance cell migration, attachment and tissue formation.**
- **Custom prostheses for medical and dental devices in patients, and clinical applications for glass-ceramics.**
- **Novel and modified bioceramics for bone tissue repair (to include nanostructured materials).**
- **Novel glass-ionomer cements.**
- **Animal models of cleft palate, bone repair.**

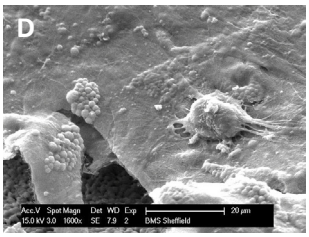
Relevant existing collaborations (academic/clinical/commercial) inside or outside China.

Academic and clinical collaborations:
University of Sheffield, UK:Polymer Centre and Dept of Materials (polymer synthesis, scaffold fabrication).
Maxillofacial, and orthopaedic surgeons, specialist dental clinicians (Dental and Medical Schools).
University of Leeds,UK: Leeds Institute for Molecular Medicine (stem cell projects), Dept of mechanical engineering (tribological and mechanical testing of engineered tissue).
University of Minho, Portugal: 3B's Research Group, (natural polymer scaffolds).
Interdepartmental Research Center E. Piaggio, University of Pisa, Italy
Commercial collaborations:
Various small/medium sized enterprises in UK and Europe in biomaterial fabrication, orthopaedic implants/devices and bioreactor development.

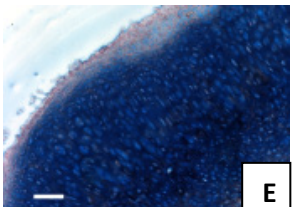
Relevant graphics, figures, pictures:



Aligned fibres of PLLA (A),
Cultured human periodontal ligament cells on the fibres (B)
FTT showing degree of fibre alignment (C)



SEM image of mineralised matrix formed on a hydroxyapatite-based scaffold (D)



Section of hyaline cartilage tissue bioengineered on spider silk (E).

Publications and other outputs relevant to your interest in this programm

De Maria C, Giusti S, Mazzei D, Crawford A, Ahluwalia A. Squeeze Pressure Bioreactor: A Hydrodynamic Bioreactor for Noncontact Stimulation of Cartilage Constructs. *Tissue Engineering Part C-Methods*. 2011:17(7);757-764.

Oliveira JT, Crawford A, Mundy JL, Sol, PC, Correlo VM , Bhattacharya M, Neves NM, Hatton PV, Reis RL. Novel Melt-Processable Chitosan-Polybutylene Succinate Fibre Scaffolds for Cartilage Tissue Engineering. *J Biomaterials Science-Polymer Edition* 2011:22(4-6);773-788.

Alves da Silva M, Crawford A, Mundy J, Martins A, Araújo JV, Hatton PV, Reis RL, Neves N. Evaluation of extracellular matrix formation in PCL and SPCL nanofibre meshes when seeded with bovine articular chondrocytes. *Tissue Engineering Part A.* 2009:15; 377-385.

Jones EA, Crawford A, English A, Henshaw K, Mundy J, Corscadden D, Chapman T, Emery P, Hatton PV, McGonagle, D. Synovial Fluid mesenchymal stem cells in health and early osteoarthritis: Detection and functional evaluation at the single-cell level. *Arthritis & Rheumatism.*2008:58; 1731-1740. [this paper describes tissue engineered cartilage tissues produced using this novel stem cell source].

Collett J, Crawford A, Hatton PV, Geoghegan M, Rimmer S. Thermally responsive polymeric hydrogel-brushes: synthesis, physical properties and use for the culture of chondrocytes. *J.R Soc. Interface.* 2007:4; 117-126.

Hatton PV, Hurrell-Gillingham K, Brook IM. Biocompatability of glass-ionomer bone cements. *J Dentistry*. 2006:598-601.
Fraser SA, Crawford A, Frazer A, Hollander AP, Brook IM, & Hatton PV. Localisation of type VI collagen in tissue engineered cartilage on polymer scaffolds. Tissue Engineering 2006:12;569-577.