iFYBER BIOMATERIALS

DESIGN, PROTOTYPING, PHYSIOCHEMICAL CHARACTERIZATION AND *IN VITRO* TESTING – A FULL SUITE OF RESEARCH SERVICES.

WHAT ARE BIOMATERIALS?

Biomaterials are specially designed materials that are used on or within the body. Devices engineered with these materials can interact with the body's repair mechanisms. This helps the body to heal itself and allow us to lead longer healthier lives. By stimulating a desired reaction in the body, biomaterials can be used to augment a broad variety of important processes for improved healing such as tissue remodeling, bone regeneration, hemostasis, and cell signaling, to name a few. Development and study within the diverse field of biomaterials requires an equally diverse team of scientists and engineers to successfully navigate the complexities of the materials and associated biomedical applications. iFyber provides expertise in a range of applied areas that are important to the field of biomaterials; these include synthetic chemistry, analytical chemistry, polymers, chemical engineering, nanotechnology, micro and molecular biology and cell biology.

DESIGN.

Biomaterials design is a multifaceted endeavor, requiring a holistic mindset with respect to the end application and selection of the individual components making up the end product. iFyber digs deep into the biomaterial – often times at the molecular level – without loosing sight of the end application. Representative design projects include: design and production of nitric oxide releasing polymers for wound healing applications, design of diagnostic probes for important biomarkers, development of new hemostatic coatings for fibrous substrates.

PHYSIOCHEMICAL CHARACTERIZATION.

iFyber provides expertise and a range of assays that can be tailored to each material and intended application. If necessary, unique methods are developed based on our clients' specific needs. iFyber utilizes a broad set of analytical techniques to answer challenging questions regarding the make up of a given biomaterial. Specific examples include: use of NMR spectroscopy to determine the fate of a biomaterial within a device during the manufacturing process and the use of EPR spectroscopy to assess the effects of gamma/e-beam sterilization on biomaterials.

IN VITRO TESTING.

Due to the complex environment in the body, biomaterials must be thoroughly evaluated to ensure they are safe while meeting the specific requirements for each application, such as mechanical properties, resorption rate, therapeutic ion release, antimicrobial activity, and biocompatibility. iFyber has the capacity to study the front end biomaterial inputs as well as specific function of the biomaterial in a end product. A particular focus area for iFyber relates to biomaterials and infection, which can be a major clinical threat.

For more information on iFyber's services: www.ifyber.com | info@ifyber.com | 607.330.2307

APPLICATION AREAS

HARD TISSUE APPLICATIONS

- Dental implants and dental cements – GIC, resin
- Artificial bone grafts
- Resorbable bone pins, screws and plates
- Orthopedic cements
- Medical device casings
- Artificial replacement joints
- Bioactive glass and ceramics
- Bone graft substitutes

DRUG DELIVERY

- Drug loading efficiency
- Drug release profile
- Efficacy
- Full suite of microbiological testing available

SOFT TISSUE APPLICATIONS

- Tissue scaffolds
- Resorbable implants
- Artificial ligaments
- Synthetic spinal disc
- Silicone implants
- Minimally invasive medical devices
- Nanomaterials
- Composites/hybrids
- Development of next generation products - materials with an active ingredient

PHYSIOCHEMICAL CHARACTERIZATION OF BIOMATERIALS AND BIOMEDICAL DEVICES

- Physical characterization
  - Composition
  - Thermal analysis, thermal transitions and decompositions TGA/DSC
  - Surface area and particle size
  - Porosity, pore size and interconnectivity
  - Mechanical properties – compressive strength, elastic modulus
  - Molecular weight (e.g., GPC, MALDI)
  - Can be carried out before and after *in vitro* experiment to identify how these properties change over time when placed in the body
  - Determinate impacts of sterilization on biomaterials
- Chemical characterization/makeup through various spectroscopic techniques: NMR, Mass Spec, EPR, Raman, FTIR.

FUNCTIONAL AND BIOCOMPATIBILITY TESTING OF BIOMATERIALS AND DEVICES

FUNCTIONAL TESTING

- Biofilm eradication and inhibition (*in vitro* and *ex vivo*)
  - High throughput screening for rapid and relevant prototyping
- Antimicrobial activity
  - Antimicrobial profile (e.g., Static and Dynamic testing in high throughput well plate assays, MIC, Time Kill, Zone of Inhibition, Checkerboard assays
  - Hemostasis/Coagulation
- Stability and degradation profile
- Accelerated degradation studies
- Therapeutic ion release (e.g., Ag+, Ca2+, Zn2+, PO43-)
- Bioactivity testing – HCA formation, immersion solutions analyzed with ICP, HCA formation confirmed with XRD, SEM & FTIR
- Testing according to ISO or ASTM standards
- Tissue functional testing
  - *in vitro* wound healing (e.g., scratch test, cell migration, etc.)
  - Cell attachment
  - Cell in-growth and proliferation (e.g., osteoinduction)

BIOCOMPATIBILITY TESTING

- Testing according to ISO-10993
  - Cytotoxicity (MTT Assay, LIVE/DEAD Staining, TUNEL Apoptosis Assay, etc.)
  - Genotoxicity
  - Hemocompatibility

iFyber is a preclinical contract research organization offering customized services to companies that operate at the interface of chemistry, microbiology and material science. iFyber is unique. Unlike other CROs or testing labs we pride ourselves on providing access to top scientists and creatively solving problems with quick turnaround times.

THINK OF IFYBER AS:

- Consultants with a laboratory to back up ideas with data
- An academic lab, solving R&D problems on corporate or start-up timelines
- A testing lab that develops new methods tailored to clients' products and services

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