

A blue-tinted panoramic X-ray of a human mouth, showing the upper and lower dental arches. The teeth are clearly visible, and the overall image has a clinical, scientific feel.

ORAL HEALTH CARE PRODUCTS AND DENTAL BIOMATERIALS

The market for oral health care products and dental biomaterials continues to grow at a rapid pace. The latest advances in the field are based on the development of biomimetic materials that can hold up to hostile oral environments where pH, salivary flow, and mechanical loading fluctuate rapidly. Examples of these innovations include remineralization products such as toothpastes and varnishes containing calcium phosphate, smart materials capable of differential responses to changes in temperature and pH, nanostructured materials with the capacity to modify the surface properties of other materials, antimicrobial peptides, biomaterials with immunomodulatory properties, and tissue engineering. iFyber provides expertise in the various applied areas critical to this field, including knowledge of dentistry, synthetic and analytical chemistry, materials science chemical engineering, nanotechnology, micro and molecular biology, and cell biology.

PRODUCT DESIGN

Designing oral health care products is a multifaceted endeavor, requiring a holistic mindset with respect to the selection of individual components making up the target product and considering the final application. iFyber carefully considers all material interfaces – often at the molecular level – during characterization and product development without losing sight of the end goal. In addition, iFyber is focused on assisting medical device manufacturers work through the regulated design control process from feasibility, through verification, validation, and into manufacturing and commercialization.

IN VITRO TESTING

Materials components of oral health care products are exposed to chemical, thermal, mechanical, and biological challenges in the oral environment, which can impact the final design. Due to the harsh environment in the oral cavity, dental biomaterials must be thoroughly evaluated to ensure that they are safe and efficacious for each application. iFyber can generate data packages for all segments of the development processes, from front-end biomaterial design input testing for specifications, through animal and clinical study evaluations of a biomaterial in its end product application.

REPRESENTATIVE PROJECTS

- Design of microspheres containing triple antibiotics for periodontitis
 - *In vitro* biofilm testing of chlorhexidine varnish
 - Development of 3D *in vitro* oral mucosa models and osteo-mucosal engineered constructs
 - Synthesis and characterization of 3D-printed porous titanium (Ti) alloy
 - Evaluation of surface alterations to polyetheretherketone (PEEK) and titanium and effects on human gingival fibroblasts
 - Development concentrated growth factor (CGF) compounds and periodontal ligament stem cell-derived conditioned medium for periodontal regeneration
 - Dentin matrix protein extraction and dentin processing (demineralization, deproteination) for tissue engineering
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APPLICATION AREAS

HARD TISSUE APPLICATIONS (Enamel, Dentin, Bone)

- Composites, ceramics, and dental cements – GIC, MTA
- Luting agents, Bonding agents
- Dental implants
- GBR/GTR membranes
- Sealant materials
- Calcium hydroxide cavity liners
- Fluoride-containing varnishes
- Bleaching agents
- Bioactive glass and ceramics
- Bone graft substitutes

ORAL HEALTH APPLICATIONS

- Toothpastes
- Varnishes
- Gums
- Remineralization products
- Silver diamine fluoride (SDF)

SOFT TISSUE APPLICATIONS (Oral Mucosa)

- Tissue scaffolds
 - Resorbable materials
 - Development of next-generation products
 - Materials w/ an active ingredient incorporated
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FUNCTIONAL TESTING

- Anticarcinogenic activity
 - Oral biofilm eradication and inhibition (in vitro and ex vivo) performed using high throughput methods for rapid and relevant prototyping
 - Antimicrobial profile: static and dynamic testing in high throughput well-plate assays. MIC, time kill, zone of inhibition, checkerboard assays
 - Testing according to ISO-7405/ANSI/ADA Specification 41
 - o Direct and indirect cytotoxicity
 - o Cell attachment
 - o Cell proliferation
 - o Osteoinduction and osteoconduction
 - o Differentiation of stem cells
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iFyber is a preclinical research organization offering customized services to companies that operate at the interface of chemistry, microbiology, and materials science. iFyber is unique. 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
- An extension of your quality, regulatory, and R&D teams