

# Oral Biology and Pathology (HDO)

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**Degrees awarded:** M.S. in **Basic Health Sciences** and Ph.D. in Oral Biology and Pathology

The graduate program in Oral Biology and Pathology, within the Health Sciences Center, offers a program of study and research leading to the M.S. and Ph.D. degrees. A separate track is available for dental graduates who wish to pursue a combined Ph.D.-General Dentistry or Clinical Specialty degree. Programs of study are also available to individuals with a Ph.D. or a clinical degree (dental or medical) desiring further postdoctoral research training or experience. The M.S. curriculum is of approximately two years' duration and is particularly suited for those dental graduates who wish to obtain further basic science training before entering or while obtaining a clinical specialty. The graduate program in Oral Biology and Pathology is also of particular interest to industrial-based scientists seeking additional training and advanced degrees. While the Department is interested in all aspects of oral biology, active programs of research presently being conducted include the following: development, metabolism, and control of the oral microflora on the teeth and various epithelial surfaces including those of the mouth, skin, and vagina; oral putrefaction, malodor, and gingivitis; pathogenesis of periodontitis; interrelationship between systemic and oral diseases; mechanisms and therapy of dentinal hypersensitivity; ultrastructure and metabolism of healthy and diseased periodontal tissues with an emphasis on remodeling and matrix metalloproteinases; chemistry and crystallography of the biological calcium phosphates; biology of epithelial growth and differentiation; epithelial gene therapy; mechanisms of epidermal and oral carcinogenesis; wound repair; sebocyte biology; biology of skin and mucosal grafting; acquired and innate immunity; inflammation and fibrosis. Further details may be obtained from the graduate program director.

## Facilities

The Department of Oral Biology and Pathology currently occupies 18,000

square feet of research space. Facilities include scanning electron microscope; computerized micro hardness tester; isotope counters and preparative and analytical ultracentrifuges; infrared, atomic absorption, ultraviolet/visible spectrophotometers; a mass spectrophotometer; an olfactometer; gas and high-pressure liquid chromatography systems; high-voltage, particle-free flow, and polyacrylamide gel electrophoresis systems; computer equipment of various types; fluorescence densitometer, spectrophotometer, and microscopes of various types; microdensitometer; automated colony counter; amino acid analyzer; 75-liter steam sterilizable fermenter; autoclaves and ethylene oxide sterilizer; tumor virus tissue culture facility; specialized anaerobic bacteriology, animal, and clinical laboratories; extensive tissue culture facilities especially for growth of keratinocytes, fibroblasts, and other cell types.

The Living Skin Bank, which will provide a core facility for the production of clinical-grade cell-based therapies, is housed in the Department of Oral Biology and Pathology, under the direction of Marcia Simon. Research operatories are available in the Dental Care Center for clinical research projects. Graduate students have access to the University central computer facility as well as high-speed Ethernet links connecting the Department to e-mail, Medline, and the Internet through servers located in the University Hospital.

## Admission

In addition to the minimum Graduate School requirements, the following are required:

A. A bachelor's degree and grade point average of 3.3 in the sciences and 3.0 overall are required for admission into either the M.S. or Ph.D. program in Oral Biology and Pathology;

B. In addition to original transcripts, applicants are required to submit three letters of recommendation and proof of satisfactory performance on the General

Aptitude and Advanced parts of the Graduate Record Examination (GRE);

C. All applicants are carefully screened by the credentials committee of the Department. Interviews and discussions are arranged with faculty members and graduate students where possible;

D. Formal approval for acceptance into the program is given by the Graduate School.

## Faculty

### Distinguished Professors

Kleinberg, Israel, *Chair*, D.D.S., 1952, University of Toronto, Canada; Ph.D., 1958, University of Durham, Newcastle upon Tyne, England: Identification of peptides and salivary factors involved in the growth and metabolism of oral mixed bacterial populations; pharmaceutical application of salivary components in the control of dental caries and oral malodor; mechanisms of dental plaque formation; control of microbial populations (oral, gastrointestinal, vaginal) with growth factors and growth inhibitors; new diagnostic techniques and therapeutics, technology transfer.

Golub, Lorne, M., D.M.D., 1963, M.Sc., 1965, University of Manitoba, Canada; Cert. Periodontics, 1968, Harvard School of Dental Medicine: Synthesis maturation and degradation of collagen in oral tissues; effect of inflammation on diabetes and collagen metabolism, on the flow and cellular and chemical constituents of gingival fluid, and relevance to diagnosis and management of the periodontal patient; therapeutic potential of tetracyclines as inhibitors of matrix metalloproteinases.

### Professors

London, Steve, D.D.S., 1981, Ph.D., 1987, University of Pennsylvania: Mucosal immunity, viral immunology, mucosal vaccine development, viral pathogenesis.

Ryan, Maria E., D.D.S., 1989, Ph.D., 1998, Stony Brook University; Cert. Periodontology, 1993, University of Connecticut: Connective tissue biology; the role of growth factors in connective tissue metabolism; diagnostic technology as it applies to preventative and therapeutic measures in dentistry; host modulatory therapies.

Simon, Marcia, *Graduate Program Director and Director of the Living Skin Bank*, Ph.D., 1981, Brandeis University: Biology of oral and cutaneous epithelial and mesenchymal cells, retinoid metabolism and the control of differentiations, wound healing, development and assessment of products for treatment of chemical and thermal burn injury.

#### Associate Professors

Ghazizadeh, Soosan, Ph.D., 1994, Stony Brook University: Epithelial stem cell biology; hair follicle development; immunological responses in gene therapy; cutaneous gene therapy.

London, Lucille, Ph.D., 1986, University of Pennsylvania: Mucosal immunity, pulmonary inflammation and fibrosis, acute respiratory distress syndrome, viral immunology, signal transduction.

Walker, Stephen G., M.Sc., 1987, University of Guelph, Canada; Ph.D., 1994, University of British Columbia, Canada: Analysis of the cell surface proteins and carbohydrates of *Treponema pectinovorum* and how these molecules interact with the environment (*T. pectinovorum* is an anaerobic spirochete that flourishes in the diseased periodontal pocket of humans and may contribute to periodontitis).

#### Assistant Professors

Trochesset, Denise, D.D.S., 1988, University of Minnesota; Certificate of General Practice Residency, 1989, VAMC, West Haven, CT; Certificate of Oral and Maxillofacial Pathology, 2002, New York Hospital Queens; Diplomate, The American Board of Oral and Maxillofacial Pathology, 2002: Clinical investigation of leukoplakic oral lesions; leukoplakic lesions and their relationship to alcohol and human papilloma virus.

#### Adjunct Professors

Cutler, Christopher, D.D.S., 1986, Emory University School of Dentistry, Ph.D., 1990, Emory University School of Medicine; Certificate of Periodontics, 1990, Emory University School of Post-graduate Dentistry: Innate immunity, inflammation, pathogenesis of chronic periodontitis, dendritic cells/langerhans cells, anaerobic microbiology, Porphyromonas gingivalis.

#### Professors Emeritus

Kaufman, Hershall W., D.M.D., 1963, Ph.D., 1967, University of Manitoba, Canada: Calcium phosphate chemistry as it relates to dental hypersensitivity, dental caries, and calculus formation and prevention; rheological properties of saliva and their relation to oral health; design, management, and statistical analysis of clinical research trials.

McNamara, Thomas F., Ph.D., 1959, Catholic University of America: Microbial etiology of dental caries and periodontal disease; immune mechanisms involved in dental pathogenesis; viral infection in oral microorganisms; significance of secretory IgA in caries prevention.

Pollock, Jerry J., M.Sc., 1966, University of Toronto, Canada; Ph.D., 1969, Weizmann Institute of Science, Rehovot, Israel: Salivary host defense systems; free radicals, antioxidants and nutritional therapy in dental and systemic disease.

Ramamurthy, Nungavarm S., *Research Professor*, M.V.Sc., 1965, University of Agra, India; Ph.D., 1970, University of Manitoba, Canada: Collagen synthesis and remodeling in health and systemic disease; leukocyte metabolism and chemotaxis in diabetes; regulation of mammalian metallo-proteinases (MMPS) and development of synthetic inhibitors for MMPS.

Sreebny, Leo M., D.D.S., 1945, M.S., 1950, Ph.D., 1954, University of Illinois: Studies of saliva in health and disease; relationship of salivary constituents to systemic diseases, especially Sjögren's syndrome and systemic lupus erythematosus.

Taichman, Lorne B., M.D., 1965, M.Sc., 1967, University of Toronto, Canada; Ph.D., 1971, University of Wisconsin: Biology of epithelial keratinocyte growth and differentiation; cutaneous and mucosal gene therapy; viral and nonviral methods for gene transfer; keratinocyte secretion.

#### Research Faculty

Gao, Jay G., Ph.D., 1989, Institute of Genetics, Fudan University, China Shanghai: Cutaneous and hepatic retinoid metabolism, regulation of lipolysis and lipogenesis.

Lee, His-Ming, Ph.D., 1996, Stony Brook University: Proteinase inhibitor in periodontal disease: serpinolytic inhibition by doxycycline.

Jasvir, Grewal, Ph.D., 1997, Post Graduate Institute of Medical Education and Research, Chandigarh, India: Studies on the kinetics of cellular immune response in experimental cysticercosis in pigs infected with *Taenia solium*.

Milroy, Codipilly, Ph.D., 1991, Stony Brook University: Basis of saliva viscosity and its relation to intra-oral adhesion phenomena.

#### Clinical Adjunct Faculty

Cooper, Barry, D.D.S.

Goren, Arthur, D.D.S.

Kittay, Irving, D.D.S.

Phelan, Joan, D.D.S.

Westbay, George, D.D.S.

Wolff, Mark, D.D.S., Ph.D.

Xu, Ling, D.D.S., Ph.D.

### Degree Requirements

In addition to the minimum degree requirements of the Graduate School, the following are required:

A. All students must complete all or part of the Oral Biology and Pathology Oral Systems course. M.S. students must, in addition, complete two graduate courses selected from offerings

within and outside the Department. Ph.D. students are generally required to complete four to six course offerings at the graduate level.

B. To advance to Ph.D. candidacy, the student must pass an advancement-to-candidacy examination. To do this, the student must prepare a detailed written proposal in the format of a National Institutes of Health research grant application. A public seminar is presented by the student to members of his or her advisory committee, the Department, and the University community at large, in which the student defends the proposal. This is followed by a further defense by the student before his or her advisory committee. A determination for advancement to candidacy is then made and forwarded to the Graduate School for official approval.

C. The candidacy examination is used to examine the student's ability to handle the intellectual and communicative processes involved in carrying out independent research.

D. An original research thesis is required for completion of both the M.S. and Ph.D. degrees. For the Ph.D. degree, the format of the thesis defense is similar to the advancement-to-candidacy examination in that the student defends his or her thesis in a public seminar followed by a second examination by the student's dissertation committee. For the M.S. degree, the student defends the thesis to the student's dissertation committee. A public defense of the thesis is not required. If recommended for approval, this determination is submitted to the Graduate School, which makes the final decision to award the degree.

E. Each student has the opportunity to engage in various aspects of the teaching program of the Department, and a major effort is made to assist students to attend and present papers at various scientific meetings.

## Courses

### HDO 500 Biology of the Oral Mineralized Tissues

This course deals with the basic chemistry, crystallography, ultrastructure, and metabolism of the calcium phosphates involved in the formation and physiological and pathological resorption of the various mineralized tissues found in or associated with the oral cavity (enamel, dentin, cementum, bone). Ectopic calculus formation will be examined.

*Prerequisites: HDO 560, 561, 562, and 563 or their equivalent*

*Fall and spring, 3 credits, ABCF grading*

### HDO 501 Oral Biology I

Deals with the molecular structure, biochemistry, and physiology and developmental anatomy of the systems constituting the oral apparatus. Covers the embryological development of the face and oral cavity, the biology of the oral mucous membranes, and the biology of the dental mineralized tissues. Thirty-one course hours.

*0 credit, ABCF grading*

### HDO 510 Salivary Metabolism and Secretion

Consideration is given to the normal and abnormal structure and function of the glandular systems found in the oral cavity. The composition, regulation, and functions of the secretions from the major and minor salivary glands will receive particular attention.

*Prerequisites: HDO 560, 561, 562, and 563 or their equivalent; permission of instructor*

*Fall and spring, 3 credits, ABCF grading*

### HDO 520 Oral Microbial Systems

Consideration is given to the structural composition, metabolism, and environmental relationships of the bacterial systems formed on and in association with the oral hard and soft tissues. Specific and mixed bacterial populations, such as those resident on extra-oral mucosal surfaces and the skin and their role in oral disease will be dealt with.

*Prerequisite: HDO 560, 561, 562, and 563 or their equivalent*

*Fall and spring, 3 credits, ABCF grading*

### HDO 530 Molecular Biology and Pathology of the Periodontium

This course deals with the ultrastructure and biochemical composition of the periodontal tissues, remodeling of the extracellular matrix with an emphasis on the role of metalloproteinases; the microbial interrelations with the organic and inorganic components of the periodontal tissues, the biochemical dynamics of gingival inflammation and wound healing, and the metabolic processes responsible for the composition and flow of gingival crevicular fluid.

*Prerequisites: HDO 560, 561, and 563 or their equivalent*

*Fall and spring, 3 credits, ABCF grading*

### HDO 535 Epithelial Keratinization and Differentiation

The course examines the growth and differentiation of stratified squamous epithelia. Particular emphasis is placed on molecular

events involved in the differentiation program. Consideration is also given to mechanisms involved in cutaneous disorders.

*Prerequisites: Permission of instructor; HBP 531 suggested; students must have had a background in cellular biochemistry molecular biology*

*Fall and spring, 2 credits, ABCF grading*

### HDO 550 Oral Diagnostics and Therapeutic Technology, Lectures, and Laboratory Techniques

Recent advances in the use and development of research technology for the early diagnosis and treatment monitoring of oral and systemic disease. Special attention is paid to the principles of technology transfer including patents and patenting; searching of online databases is a key component. The course includes relationships of dry mouth to salivary physiology, diabetes, and drug medications; salivary film measurements, wetting of oral surfaces, visco-elasticity and lubricity; the use of the Periotron and enzyme assays for the diagnosis of gingivitis and periodontal disease; instrumentation used in sensitive teeth measurement and evaluation of treatment effectiveness using oral compositions and iontophoresis; oral candidiasis and denture stomatitis and early detection and causes of dental caries; oral malodor measurements including use of the Halimeter and its use in the formulation of oral compositions. Application to clinical practice and clinical studies is covered.

*Prerequisites: HDO 560, 561, 562, and 563 or their equivalent; permission of instructor*

*Fall and spring, 3 credits, ABCF grading*

### HDO 560 Oral Biology and Pathology I

The first of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy and pathology of the various systems that constitute the oral apparatus. Covers the embryological development of the face and oral cavity and the biology and pathology of the oral mineralized tissues.

*Prerequisites: Undergraduate degree in basic science; permission of instructor*

*Fall and spring, 3 credits, ABCF grading*

### HDO 561 Oral Biology and Pathology II

The second of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy and pathology of the various systems that constitute the oral apparatus. Covers the biology and pathology of the periodontal structures and the microbiology of the oral cavity.

*Prerequisites: Undergraduate degree in basic science; permission of instructor*

*Fall and spring, 3 credits, ABCF grading*

### HDO 562 Oral Biology and Pathology III

This course is the third of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy, and pathology of the various systems that constitute the oral apparatus. The course consists of the following two units of instruction: (1) the biology and pathology of the salivary glands and their products and (2) the biology and pathology of

the periodontal structures.

*Prerequisites: Undergraduate degree in basic science; permission of instructor*  
*Fall and spring, 3 credits, ABCF grading*

### HDO 563 Oral Biology and Pathology IV

This course is the last of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy and pathology of the various systems that constitute the oral apparatus. Covers the biology and pathology of the oral sensory systems and the biology and pathology of oral motor systems.

*Prerequisites: Undergraduate degree in basic science; permission of instructor; admission to graduate Health Sciences Center program*

*3 credits, ABCF grading*

### HDO 590 Research Projects in Oral Biology and Pathology

Individual laboratory projects closely supervised by faculty members to be carried out in their research laboratories.

*Prerequisite: Enrollment in a master's or doctoral program*

*3 credits, ABCF grading*

*May be repeated once for credit*

### HDO 599 Graduate Research

Original investigations undertaken with supervision of a faculty member.

*1-12 credits, ABCF grading*

*May be repeated up to five times for credit*

### HDO 601 Oral Biology II

A continuation of HDO 501 covering the biology of the dental supporting tissues, the biology of the salivary glands and their products, and the microbiology of the oral cavity. Eighty-four course hours

*Prerequisites: HD 501*

*0 credit, ABCF grading*

### HDO 690 Oral Biology and Pathology Seminars

Research seminars by students, staff, and visiting scientists.

*Prerequisites: Permission of instructor*  
*Fall and spring, 1 credit, ABCF grading*

*May be repeated up to ten times for credit*

### HDO 695 Oral Biology and Pathology Teaching Practicum

Practice instruction in the teaching of oral biology and pathology at the undergraduate level carried out under faculty orientation and supervision.

*Prerequisite: Permission of instructor*  
*3 credits, ABCF grading*

### HDO 699 Thesis Research Oral Biology and Pathology

Dissertation research.

*Prerequisites: Advancement to candidacy*  
*Fall, spring, and summer, 1-9 credits,*

*ABCF grading*

*May be repeated for credit*

### HDO 700 Dissertation Research Off Campus –Domestic

*Prerequisite: Must be advanced to candidacy*

(G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Lab and Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

Fall, spring, summer, 1-9 credits,  
S/U grading  
May be repeated for credit

#### **HDO 701 Oral Biology III**

A continuation of HDO 601, covering the oral motor and sensory systems. Twenty-six course hours.

Prerequisites: HDO 601  
0 credit, ABCF grading

#### **HDO 702 Oral Pathology**

Covers the clinical and histopathologic manifestations of acquired, inherited, and neoplastic diseases of the human oral cavity. Includes benign and malignant tumors of bone, odontogenic, and non-odontogenic cysts and tumors, mucosal and salivary gland diseases, and oral manifestations of systemic diseases. Sixty-two course hours.

Prerequisites: HDO 601  
0 credit, ABCF grading

#### **HDO 703 Oral Pathology Conference I**

Clinicopathologic case presentations and development of differential diagnosis skills. Sixteen course hours.

Prerequisite: HD 702  
0 credit, ABCF grading

#### **HDO 704 Translational Oral Biology**

Covers the biochemical, physiological, microbiological, and electronic principles involved in a variety of techniques used as aids in the diagnosis of oral diseases. Thirty-seven course hours.

Prerequisite: HDO 601  
0 credit, ABCF grading

#### **HDO 705 Oral Medicine**

Introduces the principles of patient care related to stomatologic and dermatologic disease, neurologic abnormalities, hematologic disturbances, and the medically compromised patient. Sixteen course hours.

Prerequisites: HDO 701  
0 credit, ABCF grading

#### **HDO 707 Clinical Pharmacology**

Covers pharmacology in dental practice emphasizing clinical usage of antibiotics, sedatives, tranquilizers, and analgesics. Drug interactions and side effects are discussed. Eighteen course hours.

Prerequisite: HD 608  
0 credit, ABCF grading

#### **HDO 803 Oral Pathology Conference II**

Clinicopathologic case presentations and development of differential diagnosis skills. Eleven course hours.

Prerequisites: HDO 702, HDO 703  
0 credit, ABCF grading



#### **HDO 805 Summer Research**

Prerequisite: Admission to graduate  
Health Sciences Center program  
S/U grading

#### **HDO 821 Year IV Clinic: Oral Diagnostics**

The clinical continuation of HDO 704 in which the principals of oral diagnostics are applied to patient care. Thirty-six course hours.

Prerequisites: HDO 704  
0 credit, ABCF grading