

## FOUNDATION KNOWLEDGE FOR THE GENERAL DENTIST

This document is intended to provide communities of interest with information concerning the content domain underlying the Integrated National Board Dental Examination (INBDE) that is under development by the Joint Commission on National Dental Examinations (JCNDE). This document outlines the foundational knowledge, cognitive skills, and abilities necessary for the safe, entry-level practice of general dentistry. Knowledge in each area is applied by the dentist to aid in the prevention, diagnosis, and management of oral disease and to promote and maintain oral health.

Information in this document can be used to help serve a variety of purposes, including the following:

- understand the content basis for the INBDE
- understand how and where existing dental disciplines and clinical science areas fit within this framework
- inform dental program curriculum development
- inform development of examination questions using this framework (INBDE test constructors, faculty members)

Specific areas of application appear in the clinical content areas adopted by the JCNDE. These clinical content areas—involving Diagnosis and Treatment Planning, Oral Health Management, and Practice and Profession—are described in other documents appearing on the JCNDE website ([www.ada.org/jcnde/inbde](http://www.ada.org/jcnde/inbde)).

The Foundation Knowledge areas were derived from "The Scientific Foundations for Future Physicians," a 2009 report created by a committee formed between the Association of American Medical Colleges and the Howard Hughes Medical Institute. The Committee was comprised of 24 prominent educators, scientists, and physicians. The JCNDE used this report as a starting point for development of the INBDE. The 10 foundation knowledge areas that serve as the basis of the integrated examination were adjusted to properly reflect the cognitive skills requirements for an entry level dentist.

Within this document, each Foundation Knowledge (FK) area is presented as follows:

- Statement describing the general content associated with the FK area
- Examples of dental disciplines relevant to the FK area
- Examples of clinical dental science areas relevant to the FK area
- Major topics and subtopics within each FK area, including relevant disciplines and detailed examples

In each case, the examples provided are intended to serve as a helpful reference; these examples are not intended to be fully comprehensive of the area under discussion.

## Foundation Knowledge Area One (FK1)

### Molecular, Biochemical, Cellular, and Systems-Level Development, Structure, and Function

***Foundation Knowledge Area 1 (FK1) focuses on application of knowledge of molecular, biochemical, cellular, and systems-level development, structure and function, to aid in the prevention, diagnosis, and management of oral disease and to promote and maintain oral health.***

**Examples of Relevant Disciplines:** Gross and Head and Neck Anatomy, Regional Anatomy, Dental Anatomy, Gnathology, Occlusion (including TMJ), General and Oral Histology, Embryology, Physiology, Cell Biology, Biochemistry, Molecular Biology, Genetics, Neuroscience, Nutrition, Oral Biology, General and Systemic Pathology, Cancer Biology, etc.

**Examples of Relevant Clinical Science areas:** Periodontology, Oral and Maxillofacial Surgery, Occlusion, TMD, Ergonomics, Prosthodontics, Pediatric Dentistry, Orthodontics, Implant Dentistry, Forensic Dentistry, Oral Medicine, Oral Pathology, Clinical Nutrition, etc.

**1.1** Structure and function of the normal cell and basic types of tissues comprising the human body.

**Relevant Disciplines:** Gross and Head and Neck Anatomy, General and Oral Histology, Dental Anatomy, Occlusion, TMJ, etc.

**Examples:**

- structure of the human body in general and the craniofacial region in particular
- structure and function of salivary glands, including the production, secretion, content and the function of saliva
- development and structure of the deciduous and permanent teeth
- development and structure of periodontal tissues
- development, structure and function of the major muscles of mastication and facial expression
- development, structure and function of the temporomandibular joint and its supporting and accessory structures.
- anatomical and functional relationships of landmarks of the oral cavity and contiguous regions
- structure and function of oral mucosa
- structure, function, and metabolism of collagen, proteoglycans and other proteins in connective and mineralized tissue
- calcium and phosphorus metabolism, the formation of biological hydroxyapatite and its role in the mineralization of hard tissues (e.g., bone and teeth)

**1.2** Structure and function of cell membranes and the mechanism of neurosynaptic transmission.

**Relevant Disciplines:** Membrane and Cell Biology, Biochemistry, Molecular Biology, Physiology, Neuroscience, etc.

**Examples:**

- local and central mechanisms of pain modulation
- the role of ion channels in neurotransmission, sodium channel function and mechanism of action of local anesthetics
- function of specific neurotransmitters in a variety of physiological and pathologic conditions
- the role of dopamine in Parkinson's disease
- structure and function of sensory and motor pathways of the central nervous system as they relate to normal functioning of the body in general, and of the craniofacial region in particular
- innervation and anesthesia of the oral cavity
- relationships between sensory and motor innervations and the functions of the orofacial complex (mastication, salivation, orofacial somatosensation, pain, taste and smell)

**1.3** Mechanisms of intra and intercellular communications and their role in health and disease.

**Relevant Disciplines:** Biochemistry, Cell Biology, etc.

**Examples:**

- mechanism of neurotransmitter and hormone signaling – i.e., pain, hormones like of insulin, thyroxin, neurotransmitters like acetylcholine, adrenaline, etc., through their cell surface receptor
- role of second messengers in muscle contraction (with implications on myofacial pain), cardiostimulation (with implications for local anesthesia), in glycogen breakdown in the liver (with implications to diabetes and nutrition), of stimulation of bone growth and breakdown (with implications for understanding implant behavior), etc.
- role of intra and intercellular signaling during osteointegration of implants
- role of cell signaling in sensitivity to drugs or bacterial toxins

**1.4** Health maintenance through the regulation of major biochemical energy production pathways and the synthesis/degradation of macromolecules. Impact of dysregulation in disease on the management of oral health.

**Relevant Disciplines:** Biochemistry, Cell Biology, Membrane Biology, Physiology, Molecular Pathology, Nutrition, Sports Medicine, etc.

**Examples:**

- major anabolic and catabolic pathways for proteins, carbohydrates, and lipids and how energy for all activities of the body is derived
- mechanisms of biologic energy transduction
- the role of insulin in regulation of glucose and lipid metabolism, and the pathogenesis of types I and II diabetes mellitus

**1.5** Atomic and molecular characteristics of biological constituents to predict normal and pathological function

**Relevant Disciplines:** Biochemistry, Cell Biology, Genetics, etc.

**Examples:**

- the role of nucleic acids, DNA and RNA, in heredity and metabolic regulation
- the role of enzymes in bodily functions

**1.6** Mechanisms that regulate cell division and cell death, to explain normal and abnormal growth and development.

**Relevant Disciplines:** Cell Biology, Physiology, Molecular Biology, Pathology, Cancer Biology, etc.

**Examples:**

- how abnormalities in regulation of cell division and cell death result in cancer
- the role of growth factors and their receptors in uncontrolled tissue proliferation
- the role of oncogenes in the context of normal growth factor-initiated signal transduction and how this information is used to treat cancer (e.g., antibodies to EGFR in breast cancer; tyrosine kinase inhibitors in leukemia)

**1.7** Biological systems and their interactions to explain how the human body functions in health and disease.

**Relevant Disciplines:** Physiology, General and Systems Pathology, etc.

**Examples:**

- basic principles of nutrition, sources of vitamins, minerals, and their importance in oral and systemic health and disease
- how osteoporosis affects the structure and function of the maxillofacial complex
- gastric acid reflux and its impact on oral structures

**1.8** Principles of feedback control to explain how specific homeostatic systems maintain the internal environment and how perturbations in these systems may impact oral health.

**Relevant Disciplines:** Physiology, Systems Pathology, Oral Medicine, Pharmacology, etc..

**Examples:**

- the hydroelectrolytic balance of the body and consequences of fluid and

- hemodynamic disturbances
- how loss of fluids due to trauma or due to polypharmacy can lead to xerostomia

## Foundation Knowledge Area Two (FK2)

### Physics and Chemistry to Explain Normal Biology and Pathobiology

**Foundation Knowledge Area 2 (FK2) focuses on application of knowledge of physics and chemistry to explain normal biology and pathobiology, to aid in the prevention, diagnosis, and management of oral disease and to promote and maintain oral health.**

**Examples of Relevant Disciplines:** Physiology, Systems Pathology, and Pharmacology, etc.

**Examples of Clinical Science areas:** Oral Medicine, Oral Pathology, Periodontology, Diagnosis and Treatment Planning, History and Physical Examination, Emergency Care, Oral and Maxillofacial Surgery, Pediatric Dentistry, etc.

**2.1** Principles of blood gas exchange in the lung and peripheral tissue to understand how hemoglobin, oxygen, carbon dioxide and iron work together for normal cellular function.

**Relevant Disciplines:** Chemistry, Physiology, Systems Pathology, Oral Medicine, Pharmacology, etc.

**Examples:**

- diffusion to gas exchange in the lung
- normal blood chemistry and how blood chemistry assists diagnosis of common conditions such as anemia, diabetes, bleeding disorders, cyanosis, and acidosis

**2.2** Impact of atmospheric pressure and changes therein (e.g., high altitudes, in space, or underwater).

**Relevant Disciplines:** Physics, Chemistry, Physiology, Anatomy

**Examples:**

- oral/dental or facial pain, facial/cranial pressure change, changes in hearing or equilibrium as a result of inflammation in the Eustachian tube/middle ear during upper respiratory infection or similar conditions
- availability and/or solubility of blood gases (oxygen, nitrogen, carbon dioxide) under different atmospheric conditions

**2.3** The stability and dissolution of enamel and dentin as a result of factors and conditions within the oral environment, including: abrasion, attrition and erosion; changes in oral pH; exposure to physical or chemical substances, or to physical force (gritty/rough physical materials, stone powder, acidic food or drink, bulimia, bruxism, physical trauma, etc.).

**Relevant Disciplines:** Physics, Chemistry, Anatomy, Psychology, Behavioral Science

**Examples:**

- the buffering capacity of saliva
- stability and the critical pH at which enamel, hydroxyapatite, fluoroapatite dissolves
- forms of salivary calcium phosphates (di, tri-, octa and decacalcium phosphates) and their conversion as a function of oral pH and the implications for enamel dissolution and calculus formation
- supersaturation of saliva with respect to calcium phosphate salts
- salivary crystal growth inhibition by salivary proteins: statherin and acidic proline-rich proteins
- formation of calculus as a result of calcium phosphate precipitation
- composition of enamel and occlusal wear
- enamel erosion due to gastro esophageal reflux disease, bulimia, and patient behaviors such as the habitual consumption of soft drinks or citrus juices
- the relationship between abrasion, the physical characteristics of a toothbrush, and a patient's brushing technique
- the relationship between the physical properties of food containing gritty particles and dental abrasion or attrition.
- the relationship between the physical force used during bruxism/parafunctional habits and dental attrition
- enamel destruction and tooth fracture due to the physical forces associated with tongue jewelry (tongue piercing) of various kinds

**2.4** External forces resulting in hard and soft tissue trauma; tissue milieu factors that play a role in inflammation, erosion, overgrowth, or necrosis.

**Relevant Disciplines:** Physics, Anatomy

**Examples:**

- cranial architecture and bone strength as they relate to outcomes of blunt force impact from a particular direction
- contralateral subcondylar fracture as a potential outcome of blunt force induced fracture of the mandibular body
- probability and severity of tooth damage (e.g., pulp damage, fractured enamel, fractured dentin) as a function of the type and direction of physical impact.

**2.5** Ergonomic issues resulting in loss of productivity, musculoskeletal disorders, illnesses, injuries, or decreased work satisfaction (contingent on the intensity, frequency and duration of exposure).

**Relevant Disciplines:** Physics, Anatomy, Physiology, Behavioral Sciences, Psychology

**Examples:**

- Musculoskeletal Disorders (MSDs)
  - Signs and symptoms
  - Back, neck, and muscle issues

- Hand and wrist issues
- Risk factors
- Awkward posture
- Forceful exertions
- Repetitive motions
- Repetitive strain disorders
  - Signs and symptoms (caused by forceful or prolonged exertions of the hands and prolonged awkward postures)
  - Carpel Tunnel Syndrome
  - Cubital Tunnel Syndrome
  - Thoracic Outlet Syndrome
- Preventive Measures
  - Exercise
  - Chairside stretching
  - Operator positioning
  - Dental delivery systems and equipment selection
    - Rear, side, or over the patient delivery systems
    - Lighting and magnifications
    - Instruments (automatic and hand)
    - Gloves
    - Patient positioning
    - Appointment scheduling
  - Professional help
- Psychosocial factors



## Foundation Knowledge Area Three (FK3)

### Physics and Chemistry to Explain the Characteristics and Use of Technologies and Materials

***Foundation Knowledge Area 3 (FK3) focuses on application of knowledge of physics and chemistry to explain the characteristics and use of technologies and materials used in the prevention, diagnosis, and management of oral disease and to promote oral health.***

**Examples of Relevant Disciplines:** Basic Radiology, Dental Material Sciences, Biomaterials, Biophysics, etc.

**Examples of Relevant Clinical Science Areas:** Prosthodontics, Restorative Dentistry, Oral Diagnostics, Applied Biomaterials, Preventive Dentistry, Laser-Assisted Dentistry, Applied Pharmacology, Radiology, Implant Dentistry, Endodontics, Esthetic Dentistry, Cosmetic Dentistry, Radiation Oncology, Oral Oncology, etc.

**3.1** Principles of radiation, radiobiologic concepts, and the uses of radiation in the diagnosis and treatment of oral and systemic conditions

**Relevant Disciplines:** Basic and Oral Radiology, etc.

**Examples:**

- types of radiation and their impact on biologic systems
- safeguards against radiation exposure
- radiographic techniques for optimal diagnosis

**3.2** Dental material properties, biocompatibility, and performance, and the interaction among these in working with oral structures in health and disease.

**Relevant Disciplines:** Dental Material Sciences, Biomaterials, Biophysics, Chemistry, Ethics, etc.

**Examples:**

- advantages and disadvantages of biomaterials used in dentistry
- compatibility of dental materials both with each other and with biologic systems
- dental materials and considerations involving substantivity or adhesion of chemicals, drugs, dental plaque, food, etc., to tissues in the mouth
- clinical decision making that incorporates consideration of the physical and chemical characteristics of various biomaterials and devices
- appropriately pairing of the physical and chemical qualities of biomaterials and devices with specific clinical situations
- discriminating between appropriate and inappropriate applications of materials and devices. (For example, the impact of aspirin acidity on oral mucosa or the

use of a complex, time-consuming or expensive treatment when simpler, quicker, and cheaper forms of effective treatment are available.)

**3.3** Principles of laser usage; the interaction of laser energy with biological tissues; uses of lasers to diagnose and manage oral conditions

**Relevant Disciplines:** Biophysics, Laser-Assisted Dentistry, etc.

**Examples:**

- benefits and limitations of laser devices for detecting dental caries
- practical use of lasers for surgical procedures involving soft and hard tissues
- safety considerations for the use of lasers

## Foundation Knowledge Area Four (FK4)

### Principles of Genetic, Congenital, and Developmental Diseases and Conditions and their Clinical Features to Understand Patient Risk

***Foundation Knowledge Area 4 (FK4) focuses on the principles of genetic, congenital, and developmental diseases and conditions and their clinical features to understand patient risk in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.***

**Examples of Relevant Disciplines:** Genetics, Developmental Biology, Embryology, Craniofacial Biology, etc.

**Examples of Relevant Clinical Science areas:** Oral Medicine, Oral Pathology, Orthodontics, Pediatric Dentistry, Oral Diagnostics, Oral and Maxillofacial Surgery, Facial Prosthesis, Periodontology, Pediatric Dentistry, Radiology, Cariology, etc.

**4.1** Genetic transmission of inherited diseases and their clinical features to inform diagnosis and the management of oral health.

**Relevant Disciplines:** Genetics, Hereditary Medicine, Developmental Biology, Teratology, etc.

**Examples:**

- *Ectodermal dysplasia, Amelogenesis imperfecta, Hereditary hemorrhagic telangiectasia, neurofibromatosis, dentinogenesis imperfecta, osteogenesis imperfecta, basal cell nevus syndrome, various bleeding disorders, osteoporosis, and other hereditary conditions*

**4.2** Congenital (non-inherited) diseases and developmental conditions and their clinical features to inform the provision of oral health care.

**Relevant Disciplines:** Genetics, Developmental Biology, Teratology, etc.

**Examples:**

- *Sturge-Webber Angiomatosis* and other non-hereditary conditions
- anterior overjet and thumb-sucking

## Foundation Knowledge Area Five (FK5)

### Cellular and Molecular Bases of Immune and Non-Immune Host Defense Mechanisms

***Foundation Knowledge Area 5 (FK5) focuses on the application of knowledge of the cellular and molecular bases of immune and non-immune host defense mechanisms in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.***

**Examples of Relevant Disciplines:** Immunology, Immunopathology, Microbiology, Virology, etc.

**Examples of Relevant Clinical Science areas:** Oral Pathology, Periodontology, Preventive Dentistry, Pediatric Dentistry, Diagnosis and Treatment Planning, History and Physical Examination, Cariology, Implant Dentistry, Emergency Care, Oral Radiology, Endodontics, Oral and Maxillofacial Surgery, Clinical Laboratory Sciences, etc.

**5.1** Function and dysfunction of the immune system, of the mechanisms for distinction between self and non-self (tolerance and immune surveillance) to the maintenance of health and autoimmunity.

**Relevant Disciplines:** Immunology, Immunopathology, Immunobiology, Microbiology, Virology, etc.

**Examples:**

- the role of the immune system in the pathogenesis of periodontal disease
- the effect of immunization in the prevention of infectious diseases

**5.2** Differentiation of hematopoietic stem cells into distinct cell types and their subclasses in the immune system and its role for a coordinated host defense against pathogens (e.g., HIV, hepatitis viruses)

**Relevant Disciplines:** Immunopathology, Immunology, Hematology, etc.

**Examples:**

- synthesis and secretion of salivary antibodies and their use for diagnostic purposes.

**5.3** Mechanisms that defend against intracellular or extracellular microbes and the development of immunological prevention or treatment strategies.

**Relevant Disciplines:** Immunopathology, Immunobiology, Immunology, Microbiology, Virology, Mycology, Parasitology, etc.

**Examples:**

- the induction of antibody response to prevent influenza or hepatitis
- the development and successful use of vaccines against polio and measles
- the potential for use of vaccines for caries

## Foundation Knowledge Area Six (FK6)

### General and Disease-Specific Pathology to Assess Patient Risk

***Foundation Knowledge Area 6 (FK6) focuses on the application of knowledge of general and disease-specific pathology to assess patient risk in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.***

**Examples of Relevant Disciplines:** Cellular and Molecular Pathology, General and Systems Pathology, etc.

**Examples of Relevant Clinical Science areas:** Periodontology, Oral Pathology, Oral Medicine, Oral Oncology, Oral Cancer, Oral Diagnostics, Diagnosis and Treatment Planning, History and Physical Examination, Endodontics, Emergency Care, Oral Radiology, Oral and Maxillofacial Surgery, Clinical Laboratory Sciences, Prosthodontics, Craniofacial Prosthodontics, Applied Biomaterials, etc.

**6.1** Cellular responses to injury; the underlying etiology, biochemical, and molecular alterations; and the natural history of disease; in order to assess therapeutic intervention.

**Relevant Disciplines:** Cellular and Molecular Pathology, General Pathology, etc.

**Examples:**

- formation and removal of free radicals from cells and conditions under which tissue injury occurs due to lack of perfusion
- susceptibility of different cell types (cardiomyocytes, neurons) to the effects of anoxic injury caused by vascular compromise

**6.2** Vascular and leukocyte responses of inflammation and their cellular and soluble mediators to understand the prevention, causation, treatment and resolution of tissue injury.

**Relevant Disciplines:** Cellular and Molecular Pathology, General Pathology, Pharmacology, Immunopathology, etc.

**Examples:**

- the role that arachidonic acid-derived mediators play in various steps of acute inflammation and how the inflammatory process can be moderated by use of specific inhibitors of these mediators (COX inhibitors, aspirin)
- benefits of neutralizing various immune mediators (e.g., anti-TNF in rheumatoid arthritis) in the context of specific diseases
- benefits of regulated functions of the inflammatory response (e.g., the elimination of infectious agents)

**6.3** Interplay of platelets, vascular endothelium, leukocytes, and coagulation factors in

maintaining fluidity of blood, formation of thrombi, and causation of atherosclerosis as it relates to the management of oral health.

**Relevant Disciplines:** Cellular and Molecular Pathology, General Pathology, etc.

**Examples:**

- implications of the administration of local anesthesia with epinephrine to a severely atherosclerotic patient
- evaluation of patients for oral surgical procedures

**6.4** Impact of systemic conditions on the treatment of dental patients.

**Relevant Disciplines:** Systemic Pathology, Internal Medicine, Medically Complex Patient, etc.

**Examples:**

- joint replacement
- osteoporosis
- bacterial endocarditis
- diabetes
- AIDS

**6.5** Mechanisms, clinical features, and dental implications of the most commonly-encountered metabolic systemic diseases.

**Relevant Disciplines:** Systemic Pathology, Internal Medicine, Medically Complex Patients, etc.

**Examples:**

- Diabetes
- Hyper- and hypothyroidism

## Foundation Knowledge Area Seven (FK7)

### Biology of Microorganisms in Physiology and Pathology

**Foundation Knowledge Area 7 (FK7) focuses on the application of knowledge of the biology of microorganisms in physiology and pathology in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.**

**Examples of Relevant Disciplines:** Microbiology, Virology, Parasitology, Mycology, Oral Epidemiology, Oral Public Health, Statistics, etc.

**Examples of Relevant Clinical Science areas:** Cariology, Periodontology, Oral Pathology, Oral Malodor, Oral Medicine, Oral Diagnostics, Diagnosis and Treatment Planning, History and Physical Examination, Endodontics, Emergency Care, Oral Radiology, Oral and Maxillofacial Surgery, Applied Pharmacology, Applied Epidemiology, Preventive Dentistry, Community Dentistry, etc.

**7.1** Principles of host–pathogen and pathogen–population interactions and knowledge of pathogen structure, transmission, natural history, and pathogenesis to the prevention, diagnosis, and treatment of infectious disease.

**Relevant Disciplines:** Microbiology, Virology, Parasitology, Mycology, Pharmacology, Oral Biology, Pulp Biology, etc.

**Examples:**

- mechanisms by which bacteria increase their drug resistance susceptibility
- use of anti-virals in the treatment of Herpes simplex infection
- emergence of antibiotic resistant bacteria
- components the oral microflora
- components of and formation of dental plaque
- the role of specific bacterial groups in the production of periodontal disease
- the role of bacteria in production of dental caries, pulpal and periapical pathology

**7.2** Principles of epidemiology to achieving and maintaining the oral health of communities and individuals.

**Relevant Disciplines:** Epidemiology, Public Health, Preventive Medicine, Preventive Dentistry, etc.

**Examples:**

- evaluate potential effectiveness of fluoride, varnishes, brushing, flossing, mouthwashes to prevent caries, periodontal disease and oral malodor
- evaluate patterns of health and disease to better manage community oral health
- apply the principles of universal precautions in preventing the transmission of



infectious diseases

**7.3** Principles of symbiosis (commensalisms, mutualism, and parasitism) to the maintenance of oral health and prevention of disease.

**Relevant Disciplines:** Parasitology, Microbiology, Pharmacology, Immunopathology, etc.

**Examples:**

- the protective effect of normal oral flora and its perturbation after antibiotic treatment or immunosuppressive therapy

## Foundation Knowledge Area Eight (FK8)

### Pharmacology

***Foundation Knowledge Area 8 (FK8) focuses on the application of knowledge of pharmacology in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.***

**Examples of Relevant Disciplines:** Basic and Applied Pharmacology, Biomedical Research, Evidence Based Dentistry, Public Health Policy, etc.

**Examples of Relevant Clinical Science areas:** Clinical Pharmacology, Cariology, Periodontology, Endodontics, Oral and Maxillofacial Surgery, Pediatric Dentistry, Preventive Dentistry, Applied Epidemiology, Community Dentistry, etc.

**8.1** Pathologic processes and basic principles of pharmacokinetics and pharmacodynamics for major classes of drugs and over-the-counter products to guide safe and effective treatment.

**Relevant Disciplines:** Basic and Applied Pharmacology, Cancer Biology, etc.

**Examples:**

- explain modes of action of the major classes of antimicrobial drugs
- apply therapeutic strategies help minimize or prevent drug resistance
- understand the use of multiple drugs with different mechanisms of action for cancer chemotherapy

**8.2** Optimal drug therapy for oral conditions based on an understanding of pertinent research, relevant dental literature, and regulatory processes.

**Relevant Disciplines:** Clinical and Applied Pharmacology, Public Health Policy, Evidence Based Dentistry, Biomedical Research, etc.

**Examples:**

- explain the limitations of the claims for therapeutic efficacy and safety as reported by oral product/pharmaceutical manufacturers
- understand the process by which drugs become approved and withdrawn in the United States

## Foundation Knowledge Area Nine (FK9)

### Behavioral Sciences, Ethics, and Jurisprudence

***Foundation Knowledge Area 9 (FK9) focuses on the application of knowledge of sociology, psychology, ethics, and other behavioral sciences in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.***

**Examples of Relevant Disciplines:** Sociology, Psychology, Philosophy and Ethics, Cultural Competence, Ergonomics, Applied Nutrition, Communication Skills, Emotional Intelligence and other Behavioral Sciences, etc.

**Examples of Relevant Clinical Science areas:** all major clinical disciplines where patient interaction is anticipated including Speech Therapy and Clinical Nutrition, Nicotine Replacement Therapy, and Practice Management including Access to Care and Patient Education and Compliance.

**9.1** Principles of sociology, psychology, and ethics in making decisions regarding the management of oral health care for culturally diverse populations of patients.

**Relevant Disciplines:** Sociology, Psychology, Ethics, Cultural Competence, Emotional Intelligence, Communication Skills, Community Health, Public Health, etc.

**Examples:**

- understand patient responses to treatment recommendations based on beliefs associated with cultural or ethnic background
- assess community-based interventions for prevention of oral disease

**9.2** Principles of sociology, psychology and ethics in making decisions and communicating effectively in the management of oral health care for the child, adult, geriatric, or special needs patient.

**Relevant Disciplines:** Sociology, Psychology, Ethics, Communication Skills, Child Psychology, Geriatric Medicine, Patients with Special Needs, Applied Nutrition, Speech Therapy, etc.

**Examples:**

- use of behavior modification techniques in treatment of young children
- use of appropriate methods for tobacco cessation education
- use of appropriate methods for dietary counseling

**9.3** Principles of sociology, psychology, and ethics in managing fear and anxiety and acute and chronic pain in the delivery of oral health care.

**Relevant Disciplines:** Sociology, Psychology, Ethics, Applied Pharmacology, Psychotherapy, etc.

**Examples:**

- management of pain and anxiety in patients with history of substance abuse
- understand the implications of transference and projection in the doctor-patient relationship

**9.4** Principles of sociology, psychology, and ethics in understanding and influencing health behavior in individuals and communities.

**Relevant Disciplines:** Sociology, Psychology, Ethics, Public Health, Community Health, Medical and Dental Informatics, etc.

**Examples:**

- develop effective strategies for achieving water fluoridation in a community
- understand reasons for avoidance of professional dental care

**9.5** Principles of psychology, ethics and related principles of practice management in making decisions regarding delivery of care and choice of instrumentation, materials, and treatment.

**Relevant Disciplines:** Psychology, Ethics, Evidence Based Dentistry, Critical Thinking, Communication Skills, etc.).

**Examples:**

- the choice of forceps to extract a tooth, selection of an elevator, or periodontal instrument, of a restorative material, crown, implant, or partial denture. These choices are based on pure or applied knowledge, ethics and psychology.
- the choice of a device or instrument when appropriate and their misuse for profit. For instance, the purchase of a sophisticated instrument and their over use even when not indicated, simply to profit.
- the ethical dilemma and moral obligation following injury of soft tissue during treatment due to accident or misuse of an instrument.

## Foundation Knowledge Area Ten (FK10)

### Research Methodology and Analysis, and Informatics Tools

***Foundation Knowledge Area 10 (FK10) focuses on the application of research methodology and analysis, and informatics tools in the prevention, diagnosis, and management of oral disease and the promotion and maintenance of oral health.***

**Examples of Relevant Disciplines:** Statistics, Public Health Dentistry, Descriptive and Analytical Epidemiology, Dental and Health Informatics, Evidence-Based Dentistry, Applied Research, etc.

**Examples of Relevant Clinical Science areas:** All major disciplines associated with practicing dentistry including Practice Management.

**10.1** Basic mathematical tools and concepts, including functions, graphs and modeling, measurement and scale, and quantitative knowledge, in order to understand the specialized functions of membranes, cells, tissues, organs, and the human organism, especially those related to the head and neck, in both health and disease.

**Relevant Disciplines:** Basic Algebra, Basic Mathematics, Analytical and Descriptive Epidemiology, Statistics, Critical Evaluation of the Scientific Literature, Evidence Based Dentistry, etc.

**Examples:**

- interpret and apply graphical representations of drug levels as a function of dosage and pharmacokinetics
- explain the impact of diet, salivation and swallowing on salivary pH
- analyze skeletal growth and development patterns in children

**10.2** Principles and logic of epidemiology and the analysis of statistical data in the evaluation of oral disease risk, etiology, and prognosis.

**Relevant Disciplines:** Evidence-Based Dentistry, Epidemiology, Statistics, Preventive Dentistry, Health Promotion, Public Health Dentistry, Community Dentistry, etc.

**Examples include:**

- understand the relative risk and attributable risk as useful guides to clinical and public oral health decision making with regard to caries, periodontal disease and oral cancer prevention
- understand the ability of a diagnostic test to discriminate between high and low risk of disease given the prevalence of the disease

**10.3** Principles of information systems, use, and limitations, and their application to information retrieval and clinical problem solving.

**Relevant Disciplines:** Dental Informatics, Health Informatics, Descriptive and Analytical Epidemiology, Evidence-Based Dentistry, Library Sciences, etc.

**Examples:**

- understand and be able to access search capability of bibliographic databases (Cochrane Data Base, PubMed, and others), using at least two Boolean connectors, on a clinical topic
- utilize an electronic health record system to manage oral health care
- understand and apply the levels of evidence in the scientific literature
- understand how to formulate a PICO (Patient, Intervention, Comparison, Outcome) question for a problem in oral health

**10.4** Biomedical and health informatics, including data quality, analysis, and visualization, and its application to diagnosis, therapeutics, and characterization of populations and subpopulations.

**Relevant Disciplines:** Dental Informatics, Evidence-Based Dentistry and Medicine, Health Informatics, etc.

**Examples:**

- the role of informatics in health care quality
- the role of informatics in health policy

**10.5** Elements of the scientific process, such as inference, critical analysis of research design, and appreciation of the difference between association and causation, to interpret the findings, applications, and limitations of observational and experimental research in clinical decision-making using original research articles as well as review articles.

**Relevant Databases:** Evidence-Based Dentistry, Applied Research, etc.

**Examples:**

- the value of evidence from observational versus experimental studies in determining the efficacy of therapeutic interventions