

**MINISTRY OF HEALTH OF UKRAINE  
ODESA NATIONAL MEDICAL UNIVERSITY**

**BASICS OF  
CLINICAL AND LABORATORY  
DIAGNOSTICS OF DENTAL DISEASES**

**Methodological Guidelines for Practical Trainings  
in the Academic Subject  
“Pediatric Therapeutic Dentistry”**

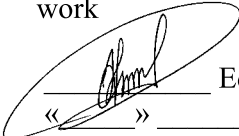


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**ODESA NATIONAL MEDICAL UNIVERSITY**

**CONFIRMED** by  
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work



Eduard BURIACHKIVSKYI

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The methodical guidelines were compiled by scientists of the Department of Pediatric Dentistry of the Faculty of Dentistry of ONMedU. They contain four practical trainings for the fifth year students of semester IX of the Faculty of Dentistry studying the discipline “Pediatric therapeutic dentistry” and correspond to the current program in pediatric dentistry.

For students of higher educational institutions studying specialty “Dentistry”.

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# Practical Training No. 1

**Topic:** The main modern diagnostic methods in dentistry.

**Purpose:** advanced mastery of the discipline by improving theoretical knowledge and professional competencies of applicants in the study of diagnostics of the dental status of adults and children.

**Basic definitions:** main clinical symptoms and syndromes in various clinical variants of main dental diseases in adults and children. Differential diagnosis of main dental diseases in adults and children. Making a preliminary and final diagnosis.

**Equipment:** multimedia projector, laptop, data from clinical examination methods.

## Plan

1. Organizational actions: greetings, checking the attendees, announcing the topic, the purpose of the lesson, motivating higher education applicants to study the topic.
2. Control of the basic level of knowledge.
3. Questions (test tasks) to check basic knowledge on the topic of the training.
4. Discussion of theoretical questions.
5. Topics of reports/abstracts.
6. Summing up: teacher's marking, emphasizing the positive and negative aspects of the lesson, announcing the topic of the next lesson.
7. List of recommended references (main, additional, electronic information resources).

## CONTROL OF BASIC KNOWLEDGE

General questioning of students, communication with adults and children's parents to collect anamnesis, clinical examination of adults and children, clinical examination plan making, discussion on diagnosis justification. Control of knowledge and skills of basic examination in a pediatric dentistry clinic.

## **QUESTIONS (TEST TASKS) TO CHECK BASIC KNOWLEDGE ON THE TOPIC OF THE TRAINING**

1. What is diagnosis?
2. What is semiotics?
3. Name the classification of patient examination methods.
4. What are the main methods of the patient examination?
5. What additional methods of the patient examination do you know?

### **DISCUSSION OF THEORETICAL QUESTIONS**

*Diagnosis* is a branch of clinical medicine that studies the successive stages of the disease recognition process. In a narrower sense, it is the process of recognizing a disease and accessing the individual, biological and social characteristics of a patient, including a targeted medical examination, analysis of the results and their generalization in the form of a diagnosis. Diagnosis includes three interrelated sections: semiotics, methods of examination of the patient and methodological foundations of diagnostics.

*Semiotics* is the study of disease symptoms and their diagnostic value. A symptom is any sign of a disease that can be recognized, regardless of the method.

Depending on the method of detection, site and degree of manifestation, and diagnostic significance, symptoms are divided into subjective and objective; general and local; overt and covert (hidden). According to the diagnostic significance, symptoms are divided into nonspecific, specific and pathognomonic (characteristic of only one disease). In dental practice, pathognomonic symptoms are rare, specific and nonspecific symptoms occur more often, that are common to some or many dental diseases (for example, bleeding gums, bad breath, etc.). To make a diagnosis, *syndromes* are also used — a pathogenetically determined set of symptoms that reflect the general picture of the disease.

To detect the individual symptoms of a disease, *diagnostic examination methods* are used — techniques, methods, technical and laboratory tools used by a doctor when examining a patient to determine a disease or a special physiological state of the organism.

With the help of examination methods, the symptoms of some diseases are identified, which is the basis for a correct, accurate diagnosis and adequate treatment.

*The methods of patients' examination* in therapeutic and pediatric dentistry and other fields of clinical medicine are divided into:

- basic (clinical) and
- additional (special clinical and laboratory ones).

*The main methods* consist of subjective (interviewing the patient) and objective examination of the patient. |

*The interview* should begin with establishing a trusting contact with the patient, determining his or her neuropsychiatric status, intelligence, and on this basis analyzing complaints, anamnestic data, etc. From the very beginning of the conversation with the patient, the doctor needs to gain his or her trust and establish an “intrinsic relation” with the patient.

During the interview, the doctor ascertains the *patient’s complaints*, collects *medical and life history data*.

*Anamnesis* is one of the most important methods of examination that allows the doctor to get an idea of the patient, his or her development, life, work, onset of the disease, the nature of the disease and the damage to a particular organ or system of the body, and to identify some symptoms from the patient’s own words or those who know him or her.

The purpose of *objective examination methods* is to identify symptoms (signs) of the disease that were not detected during the interview or to confirm the data obtained from the patient. It should begin with determining the general condition, consciousness of the patient, physiognomy, etc. With the help of the senses: sight, hearing, smell, touch, the doctor conducts an external examination of the skin and mucous membranes, musculoskeletal system, examination of the chest and respiratory system, cardiovascular system, abdominal organs, nervous and endocrine systems. A thorough examination of the patient’s local status, taking into account general changes in the body, allows the dentist to diagnose the disease, identify etiological factors and establish its pathogenetic mechanisms. The objective method of examination allows to get a fairly complete picture of the external picture of the disease, the psycho-emotional state of the patient and his general attitude to the disease.

*Additional methods* of examination of the patient include special clinical methods of examination of the oral cavity (temperature diagnostics, index evaluation of the hygienic state of the oral cavity, periodontal indices, etc.); functional methods of examination (electro-odonto-diagnosis, luminescent diagnosis, determination of periodontal capillary stability, re-periodontography, etc.); laboratory methods (clinical and biochemical parameters of blood, urine, saliva, oral and gingival fluid), microbiological, allergic, radiological methods of examination (contact radiography, bite rheography, extraoral X-ray, panoramic X-ray, orthopantomogram, CT, etc.)

The results of additional (paraclinical) examination methods provide sufficient information about the internal picture of the disease. |

Applying the methodological foundations of diagnostics, the doctor analyzes and synthesizes data obtained using basic (clinical), additional (paraclinical) and laboratory research methods, establishes the diagnosis of the disease in a particular patient and prescribes appropriate treatment.

### **Main (Clinical) Methods of Examination**

*Complaints.* When investigating complaints, attention is paid to the presence of chalk-like spots, pigmentation or enamel destruction, bleeding from the gums, dental plaque, and other symptoms. Most often, patients complain of pain, which can be spontaneous or arise from various stimuli (mechanical, chemical, physical). Finding out only the fact of pain does not determine the diagnosis, because pain can occur in various dental diseases (caries, pulpitis, periodontitis), periodontal diseases or oral mucosa.

Uncomplicated caries and some non-carious dental lesions are characterized by causative pain from temperature and chemical irritants, which quickly disappear after the irritant ceases.

Inflammation of the pulp is characterized by spontaneous paroxysmal, nocturnal pain with long or short light intervals. When exposed to an irritant, irradiating pain that does not disappear for a long time is provoked.

Periodontal apical inflammation is manifested by constant, aching, throbbing pain, which sharply increases when biting on a tooth.

Periodontal inflammation is characterized by bleeding from the gums, aching pain, itching in the gums, the presence of dental plaque, bad breath, possible tooth exposure and teeth mobility.

In diseases of the oral mucosa (OM), patients complain of spontaneous or causal pain and the presence of lesion elements — vesicles, spots, erosions, ulcers, etc.

Along with the symptoms associated with lesions of the teeth, periodontal tissues and OM, patients often complain of a deterioration in the general condition of the body as a whole or dysfunction of some organs and systems. These complaints must also be taken into account when analyzing the data obtained in order to establish their pathogenetic relationship with lesions of the oral cavity.

It is important for the patient to state his or her main complaints as fully and specifically as possible, and it is more advisable to conduct the questioning actively, directing the patient's story in the right direction with



additional questions. At the same time, the doctor must adhere to the rules of medical ethics and deontology so that a careless word or question does not injure the patient's psyche, inspire carcinophobia, etc.

In most cases, a properly conducted interview allows you to predict the diagnosis to some extent, which must be confirmed by objective research methods.

However, one should not overestimate the role of the patient's interview, because each patient perceives and remembers the manifestations of the disease depending on their state of mind. Some people notice and point out to the doctor even minor deviations from the norm, sometimes exaggerating them, while others do not attach much importance to changes in the body. In this regard, it is worth emphasizing the importance of a trusting doctor-patient relationship, which is the basis for the patient's questioning.

*History of the disease.* It is important to find out when the first signs of the disease appeared, whether the patient consulted a doctor; how often during the year and at what time the disease exacerbations occurred, and why by patient's opinion. If the patient has been treated before, it should be found out whether the patient has completed the therapy course, what medications used and the result of it. In addition, possible factors that the patient believes may have caused the disease are identified.

*Life history.* A carefully collected life history, taking into account the patient's age, gender, occupation, etc., is important for determining the etiology and pathogenesis of the disease and for clarifying the diagnosis.

In the patient's life history, attention is paid to living conditions, occupational hazards, place of birth and permanent residence (endemic fluorosis zone, Chernobyl zone).

The nature of the diet is clarified: regularity, variety, the presence of carbohydrates in the diet, evaluating the consistency of food, etc.

It is necessary to find out how the patient adheres to the rules of oral care, whether he or she has bad habits (smoking, alcohol, drugs, etc.).

It is important to determine the general condition of the patient: the presence of concomitant and hereditary diseases, allergies to any medications, food, etc. In chronological order, the patient's past illnesses, injuries, surgical interventions are identified, and the characteristic features of the disease and the effectiveness of treatment are indicated.

Special attention is paid to diseases such as tuberculosis, syphilis, hepatitis, neoplasms, possible contact with HIV-infected patients and men-

tal diseases. It is necessary to clarify the presence of immune disorders and pathologic conditions in the patient. If necessary, the patient's interview is supplemented with a written opinion of the internist (gastroenterologist, endocrinologist, cardiologist, neurologist, etc.).

*Allergic anamnesis.* In connection with the increasing number of diseases based on hypersensitivity to medications (antibiotics, sulfonamides, anti-inflammatory drugs, etc.), special attention should be paid to this in the process of collecting anamnesis. A detailed allergic history will help to clarify the diagnosis to some extent, and it must be taken into account when prescribing medications.

Finding out the cause of the disease, its intensification or cessation, nature (aching, pulsating), duration (paroxysmal, constant), time of onset (night, day), concentration (localized, radiating) of pain allows you to obtain initial data for diagnosis.

*Objective condition of the patient.* An objective examination of the patient is carried out using basic clinical and additional examination methods. The main clinical examination methods include examination, palpation, percussion, etc. The first stage of the objective examination of the patient is an examination, which is carried out to identify visible changes in the maxillofacial area and elements of damage to OM.

*External examination.* External examination begins during the patient's visit. The doctor pays attention to the general appearance of the patient, his constitutional features, facial expression, skin color, etc.; determines his psychological state (depressed mood, agitation, increased irritability, isolation), etc.

A logically correct objective examination should begin with an examination of the face, moving on to the oral cavity and directly to the lesion, and then, if necessary, examine other organs and systems, primarily the visible surfaces of the mucous membranes and skin.

*Local status.* The patient is examined by a dentist<sup>1</sup> in a chair, the patient's head should be well fixed on the headrest. Attention is paid to the symmetry and proportionality of the face, skin condition, degree of mouth opening, palpation of regional lymph nodes.

Violation of facial symmetry is possible in inflammatory diseases, traumatic or neoplastic processes.

The condition of the facial skin is evaluated by its color (pale, pink, red, earthy, cyanotic), moisture (normal, moderately moist, moist, dry), elasticity and turgor, integrity, presence of pathological elements of the lesion (hemorrhages, rashes, scars, etc.).

Palpation of the regional lymph nodes is important. Their increase is associated with the presence of chronic foci of infection in the periapical tissues of the teeth, periodontal tissues, mucous membrane, ENT organs, etc.

The lymph nodes are examined in the following sequence: occipital, parotid, submandibular, submandibular, superficial cervical. During palpation, the doctor receives information about the size, shape, consistency of the lymph nodes, their tenderness, and the relationship with the surrounding tissues. In the normal state, lymph nodes are the size of small peas, single, soft-elastic, mobile, painless.

It is determined how freely and painlessly the oral cavity opens, whether there is a crunch in the mandibular joint, and the symmetry of the corners of the mouth. Normally, the maximum opening of the mouth should be within 5 cm. The nature of mouth opening is defined as free, difficult, limited.

*Examination of the vestibule* of the oral cavity begins with an examination of the lips: skin, red border, mucous membrane. Their color, moisture content, muscle tone are noted. Changes in the color of the red border often indicate diseases of the internal organs. It is necessary to pay attention to the presence of lesions.

Evaluation of the depth of the vestibule (normal — 5–10 mm, deep — more than 10 mm, shallow — less than 5 mm), the level of attachment of the frenulum of the lips, tongue (normal attachment, high, low; frenulum short, wide, narrow, deformed, no changes).

*Evaluation of the state of the bite of the teeth.* The relationship of the teeth of the upper and lower jaws can be used to judge the functional value of the masticatory apparatus, that is, the bite — the nature of the closure of the teeth. Depending on the position of the teeth in the central occlusion, physiological and pathological types of bites are distinguished. There are 4 forms of physiological occlusion: orthognathic, straight, biproglossal and opisthognathic. Pathological occlusions include distal, medial, deep, open, and oblique bites. They are characterized by disorders of the relationship between the dentition, which lead to a disorder of chewing function, speech, and contribute to the development of various diseases of the teeth and periodontium.

*The dental examination* is performed using a dental mirror, probe, tweezers and, if necessary, an excavator.

*When examining the teeth,* the mirror is taken in the left hand and the probe in the right. It is recommended to start the dental examination with the

last molar on the right side of the upper jaw, gradually moving to the central teeth and then to the left side. On the lower jaw, the examination begins with the last molar on the left and ends with the last molar on the right. Following the examination sequence allows you to examine all teeth without exception. At the same time, attention is paid to the number of teeth, their shape, color, size, presence of carious cavities, fillings, prostheses, etc. Normally, tooth enamel has a white-gray-yellow color and a peculiar shine. Changes in the color of certain areas of the tooth crown (white chalky shade, gray, dark gray, brown) indicate the presence of a pathological process in the hard tissues.

Determining the number of teeth and the timing of their eruption is of particular importance for pediatric dentistry and allows us to evaluate the condition of the body and determine the treatment plan. This includes the absence of some teeth and extra teeth, as well as abnormalities in their shape, position, retention, etc. The shape and size of the crowns of the teeth is determined by the constitutional and sexual characteristics of the person. Abnormalities in the shape and size of the tooth may be a sign of some inflammatory diseases, for example, Hutchinson-Fournier teeth may indicate the presence of late congenital syphilis.

If the discoloration is caused by pigmented dental plaque, it can be removed from the surface of the tooth crown with an excavator. A large amount of tartar may indicate periodontal disease and mineral metabolism disorders. With the death of the pulp, the hard tissues of the tooth crown additionally lose their natural luster. Changes in the color of the tooth (from pink to gray-blue) can occur in case of trauma with hemorrhage into the pulp, as well as in case of improper endodontic treatment. In the absence of a clearly visible reason for the discoloration of the crown, it is necessary to conduct an additional examination (radiography, electroodonto-diagnosis, etc.) with a thorough examination of the condition of the tooth and the surrounding tissues.

After the examination, the *teeth are probed*. The probe examines every surface of the tooth crown (especially the contact surfaces, where the so-called “hidden” carious cavities are often localized). Check all fissures, pits, depressions, pigmented areas, etc. If the integrity of the enamel is not compromised, the probe slides freely over the tooth surface without getting stuck in the depressions and folds of the enamel. If there is a demineralization area, the doctor feels the roughness of the enamel surface during probing, and the patient may experience slight pain.

Examination of the carious cavity allows to determine the localization of the most painful areas (bottom, enamel-dentin junction) and the degree

of softening of the hard tissues lining the cavity. Probing the bottom of the carious cavity also allows you to determine its proximity to the tooth cavity and determine the viability of the pulp. Moreover, in such conditions, the probe should be used very carefully, because even light pressure on the projection of the pulp horn causes severe pain, and in the presence of a very thin dentinal membrane, perforation of the tooth cavity and damage to the pulp may occur.

If there are fillings in the teeth, their functional integrity is evaluated by the following clinical tests: anatomical shape, marginal adhesion of the filling to the surrounding hard tissues of the teeth, condition of the contact point, condition and degree of abrasion of the filling surface, matching its color to the color of the tooth tissue, presence of secondary caries.

Dentures in the oral cavity are evaluated based on their cosmetic data and functional condition. Dentures should be securely fixed on the teeth (removable ones should not be balanced), restore chewing function, and not irritate the surrounding oral tissues.

*Tooth percussion* is performed with the handle of the instrument by gently tapping the tooth crown in the vertical and horizontal directions (vertical or horizontal percussion). The painful reaction during percussion indicates the presence of an inflammatory process in the periodontium: with vertical percussion — in its apical (apical) part, and with horizontal percussion — in the marginal part. Comparative percussion should be performed.

At the same time as examining the tooth, the condition of the surrounding tissues is examined. Normally, the gum margin has a pale pink color and tightly covers the neck of the tooth. Depending on a particular pathological process, the gums swell and bleed when probed or touched with an instrument. When probing the gums in the area of the tooth neck with a button probe, gingival or periodontal pockets can be detected. In case of chronic periodontitis, fistulas may occur on the gums, usually located closer to the projection of the apex of the tooth root, although they may also be located near adjacent teeth and on the skin surface. Around the fistula, there is cyanosis of the gums and sometimes the growth of granulations.

*Palpation* is the feeling of an organ or a separate part of the body. In the oral cavity, it is performed with the index finger, sometimes with the thumb or fingers of the right hand. Palpation is used to determine the condition of the gums, areas of tenderness, compaction, infiltration, mucosal defects, etc. For example, palpation of the gums may reveal their soreness, the presence of periodontal pockets, exudation, etc. To compare the sensations obtained during palpation of the affected area, palpation is first per-

formed on a symmetrical healthy area of the oral cavity, and then the affected area is examined. A distinction is made between superficial and deep palpation, with the latter revealing pathological changes in the depth of the soft tissues of the cheek, tongue, etc. When palpating the lymph nodes, both superficial and deep palpation are used, giving the patient's head the appropriate position.

Tooth mobility is determined with the help of tweezers. Its branches cover the crown of the tooth on the vestibular and lingual sides and are moved in different directions. Normally, the tooth has a slight (almost imperceptible) physiological mobility. In case of periodontal tissue damage, resorption or atrophy of the alveolar ridge of the jaw, the teeth acquire significant (pathological) mobility, which is evaluated by the direction and degree of deviation of the tooth from its normal position.

There are three degrees of tooth mobility:

I — the tooth deviates in the vestibular-oral direction within the width of its cutting edge (1–2 mm);

II — in addition to the indicated degree of mobility of the first degree, mobility in the medio-distal direction is noted;

III — in addition to the mobility indicated in grades I and II, the tooth is visually mobile in the vertical direction.

*Examination of periodontal tissues.* Simultaneously with the examination of teeth, the periodontium is examined — a complex of tissues that surround and hold the tooth in the jaw (gums, periodontium, root cement, alveolar bone). When examining periodontal tissues, attention is paid to color, consistency, hypertrophy, atrophy, gum swelling, etc.

Normally, the gums are pale pink in color, tightly covering the necks of the teeth. A gingival sulcus is noted at the point of attachment of the gums to the tooth; in case of development of inflammatory periodontal diseases, gingival or periodontal pockets appear. For their detection and further examination, a periodontal probe is used — a button-shaped probe that has a colored (dark) strip at a distance of 3.5–5.5 mm from the tip. It is used to determine the depth and configuration of pockets near each (vestibular, lingual, medial, distal) surface of the tooth crown. In the absence of a special periodontal probe, the depth of the pockets is determined using a graduated probe, which has the appropriate millimeter marks for measuring the depth of the pockets.

The method of palpation provides additional information about the condition of the gum and periodontal pockets. Pressing the gums with a finger, the exudate is squeezed out of the pockets and its amount and nature (serous, purulent, etc.) are evaluated.

Note the presence and types of dental plaque (supragingival, subgingival, mineralized, unmineralized).

Using additional special methods of examination (see below), the state of inflammatory changes in the gums, the nature of the exudate in periodontal pockets, etc. are evaluated.

*Examination of oral mucosa.* It is recommended to examine oral mucosa in daylight to avoid diagnostic errors (under artificial lighting, you may not notice some of its color features, lesions, etc.) The oral mucosa is divided into several sections, which have their own peculiarities of anatomical structure, tissue structure and function. Usually, the mucous membrane of the lip (with a red border), cheek, gums, hard and soft palate, tongue, and floor of the oral cavity is distinguished. Each of these parts of the mucosa requires a thorough examination, and if necessary, additional examination.

When examining the mucous membrane itself, attention is paid to its color, structure, turgor, anatomical features, etc. A healthy mucous membrane has a color ranging from a delicate pale pink in the gum area to a redder or even darker red on the transitional folds and palatal rims. Examining the mucous membrane, the doctor detects certain elements of the lesion, which are then examined in more detail. The detected lesions are evaluated: their genesis (primary or secondary), localization, growth pattern and their grouping, stage of development, etc. In characterizing the lesion elements, their size, shape, color, depth, bottom, edges, density, tenderness, secretion, and lymph node status are specified. In addition, functional and laboratory tests are performed to clarify the nature of the elements, if necessary.

Particular attention is paid to the condition of mucous membrane (MM) of the oral cavity and tongue: color, moisture, edema, plaque, and pathological elements of the lesion are evaluated.

It should be emphasized that the success of the diagnosis of OM diseases largely depends on the correct recognition of the lesion elements. Pathological elements of the lesion are divided into primary, which occur directly on the unchanged mucosa, and secondary, which are formed as a result of the transformation of the primary.

*Primary morphologic lesions* are divided into lesions that do not change the relief of MM (vascular, pigmented/spotted) and lesions that change the relief of MM (cavitary, hollow, infiltrative).

*A spot (macula)* is a limited area of the skin or MM with altered color, but without disturbance of the relief. There are vascular, pigmented, and artificial spots. Spots can also be distinguished on the mucous membrane

as a result of its keratinization, when it becomes whitish-gray (keratotic spots in the initial stage of leukoplakia).

*Vascular spots* occur as a result of short-term or long-term vascular dilation due to inflammation (hypertrophic spots) or a violation of the integrity of the vascular wall (hemorrhagic spots). Inflammatory spots have different shades: bright red, pink — in case of acute inflammation and dilation of arterial vessels; red-blue — in case of chronic inflammation and dilation of venous vessels.

*Hemorrhagic spots* are caused by rupture, increased vascular permeability, and blood flow into the surrounding connective tissue. The color of such spots depends on the degree of decay of the blood pigment and can be red, bluish-red, greenish, yellow, etc. Unlike hyperemic spots, hemorrhages do not disappear during diascopy. Their size varies: *petechiae* — speckled single hemorrhages — are 1–2 mm in size, *purpura* — up to 1 cm in diameter, *ecchymoses* — more than 1 cm in diameter.

*Pigmented* (dyschromic) spots occur as a result of excessive pigment accumulation (hyperpigmentation) or, conversely, in the case of complete disappearance or reduction (depigmentation) of pigment. Such hyperpigmented spots can be congenital (nevi) or acquired by poisoning with heavy metal salts. Acquired pigmentation is of endogenous (in case of endocrine or infectious diseases) and exogenous origin. Pigment spots on MM are persistent and are localized mainly on the gums and the red border of the lips.

*A knot (papula)* is a cavityless, often infiltrative, dense morphologic element up to 5 mm in size, which rises above the level of the skin or MM. The size of a papule can range from the size of a millet grain (miliary) to a coin. The outlines of the papules are polygonal or rounded, the surface is flat, conical or hemispherical, and the color is most often red with various shades.

*A tubercle (tuberculum)* is an infiltrative hemispherical cavity-free elemental lesion, 5–7 mm in size, with a stagnant red or cyanotic red color, elevated above the skin level. The infiltrate involves all layers of MM.

*A node (nodus)* is a limited, hazelnut to chicken egg-sized or larger spherical mass located in the submucosal layer of MM, of various colors and densities. The formation of nodules can be the result of inflammation, tumor growth, and deposition of calcium and cholesterol in the tissue.

*A bubble (vesicula)* is a limited round cavity with a size from a millet grain to a pea. It is formed in the spinous layer of the epithelium and has a serous or hemorrhagic content. The vesicle eruption can be observed both on an unchanged and on a hyperemic and edematous base.



*A blister (bulla)* is a cavity element of considerable size (up to a chicken egg) filled with fluid. It is formed intra- or subepithelial. It consists of a cover, bottom, and exudate. The exudate can be serous or hemorrhagic. The cover of the subepithelial blister is thick, so it exists on MM longer than the intraepithelial blister, whose cover is thin and quickly ruptures. Blisters on the mucous membrane quickly rupture with constant trauma.

*Pustules (pustula)* — a limited accumulation of purulent exudate. They occur only on the skin. Pustules can be primary and secondary. Primary pustules develop on unchanged skin and are immediately filled with whitish-yellow purulent exudate. Secondary pustules arise from vesicles and blisters.

*Abscess (abscessus)* is a cavity filled with purulent contents. It occurs as a result of the breakdown of pathologically altered tissue and the merger of small pustules into one inflammatory focus. When localized in the mucosa and submucosa, the abscess usually has clear outlines.

*A cyst (cystis)* is a cavity that has a wall and contents. Cysts can be of epithelial origin and retentive. The latter occur due to blockage of the excretory ducts of small salivary glands. Epithelial cysts have a connective tissue wall lined with epithelium. The contents of the cyst are serous, seropurulent or bloody. Retentive cysts are located on the lips, MM of the cheeks, filled with clear contents that become purulent when infected.

*Urticaria (urtica)* — a hollow, clearly defined, flat, doughy mass elevated above the level of the skin or mucous membrane, which occurs due to transient edema of the papillary layer of MM (are very rare in diseases of oral mucosa (OM)).

*Erosion (erosio)* is a defect in the surface layer of the epithelium. Since the lesion is shallow, no trace remains after its healing. Erosion occurs after a blister rupture, destruction of papules, or traumatic injury. When a blister ruptures, erosion follows its contour. In case of erosion fusion, large erosive surfaces with scalloped contours are formed. Erosive surfaces can appear on OM without prior vesicle formation, for example, erosive papules in syphilis, erosive ulcerative form of lichen planus and lupus erythematosus. The formation of such erosions is the result of trauma to the easily damaged inflamed mucosa.

*Aphtha* is a superficial epithelial defect of round or oval shape, 0.3–0.6 cm in diameter, located on an inflamed area. The aphtha is covered with fibrinous effusion, which gives it a white or yellow hue. The periphery of the aphtha is surrounded by a bright red rim.

*Ulcer (ulcus)* is a defect of MM within the connective tissue layer. It heals with the formation of a deep scar. Since the formation of ulcers is characteristic of a number of pathological processes, to facilitate differential diagnosis, the nature of the lesion is determined: the depth, shape of the ulcer, the condition of its edges and surrounding tissues, etc.

*A fissure (rhagas)* is a linear tear in the mucous membrane of the red border of the lips that occurs when they are inflamed. Most often, cracks are observed in places of natural folds or in areas that are subject to trauma and stretching.

There are superficial and deep cracks. A superficial fissure is localized within the epithelium and heals without a scar. A deep crack extends to the connective tissue of the lamina propria and heals with the formation of a scar.

*A scale (squama)* is a plate consisting of desquamated keratinized epithelial cells. Scales occur as a result of hyperkeratosis and parakeratosis, usually at the sites of reverse development of spots, papules, tubercles. They come in different colors and sizes. They can also develop primarily: in mild leukoplakia, exfoliative cheilitis, ichthyosis. For the diagnosis of lesions with the formation of scales, their location, thickness, color, size, and consistency are important.

*The crust (crusta)* is formed due to the drying of the exudate that comes out after the breakthrough of a blister, vesicle, pustule.

The color of the crusts depends on the nature of the exudate. In case of drying of serous exudate, grayish-yellow crusts are formed, and hemorrhagic exudate — bloody-brown. Forcible removal of the crust exposes an erosive or ulcerative surface, and after its natural removal, a regeneration area, scar, or cicatricial atrophy.

*A scar (cicatrix)* is an area of connective tissue that replaces a defect in MM that has occurred as a result of its damage or pathological process. The scar consists mainly of collagen fibers and is covered with a thin layer of epithelium, which lacks epithelial protrusions. The shape and depth of scars vary.

*Vegetations (vegetationes)* is an overgrowth of papillae of the epithelium or mucous membrane with a simultaneous thickening of the spinous layer. Vegetations are often formed on the surface of chronic erosions, ulcers or papules. On examination, these are soft hair-like (vegetative vesicles, hairy leukoplakia) or tuberculated growths with signs of keratinization (warty leukoplakia).

*Lichenification (lichenificato)* is a change in the skin and red border of the lips, characterized by a sharp manifestation of the skin pattern, moder-

ate hyperemia of the red border, when it becomes dry, compacted, and flakes off with small scales. Lichenification occurs as a result of acanthosis, papillomatosis, and chronic inflammatory infiltration of the superficial dermis.

Changes in the epithelium of OM that occur as a result of various pathologies and processes can be divided into three types: corneal disorders, exudative changes, and hypertrophy. Disorders of cornification include para-, hyper-, and dyskeratosis.

*Parakeratosis* is an incomplete keratinization associated with the loss of the ability of epithelial cells to produce keratohyalin. The granular layer is absent, the stratum corneum thickens, and its cells contain rod-shaped nuclei. Clinically, this is manifested by clouding of the mucosal epithelium.

*Hyperkeratosis* is an excessive thickening of the stratum corneum. Sometimes the stratum corneum is formed by several dozen rows of keratinized cells. Hyperkeratosis occurs as a result of excessive keratin formation, when the granular and spinous layers thicken, or due to delayed exfoliation, when the granular and sometimes spinous layers are thinner than usual.

*Dyskeratosis* is a disorder of the keratinization process of individual epithelial cells. The bones are enlarged, become rounded; the nuclei are intensely colored, the cytoplasm is eosinophilic, slightly granular. Such cells lose intercellular contacts and are randomly located in most layers of the epithelium. Benign dyskeratosis is characterized by the formation of round bodies and grains in the stratum corneum. In malignant dyskeratosis, immature cells are keratinized and atypical cells appear, which is characteristic of Bowen's disease and squamous cell carcinoma.

*Vacuolar dystrophy* is the accumulation of fluid inside the cells of the spiny and basal layers. The size of the cells increases; the nucleus is pushed to the periphery, changes in shape and size, and then disintegrates to form a single-cell cavity. If several such cavities merge, larger cavities are formed.

*Spongiosis, or intercellular edema*, is the accumulation of fluid in the intercellular spaces of the spinous layer. Serous exudate enters the intercellular spaces of the epithelium of the connective tissue of OM. The exudate stretches and then breaks the intercellular connections, filling the cavities that are formed.

*Ballooning dystrophy* is a focal change in the cells of the spinous layer, which are enlarged, rounded, and look like balls or balloons. As a result of collisional necrosis of such an area of the epithelium, cavities filled with

exudate are formed, where homogeneous balloon-like cells resembling balloons float.

*Acantholysis* is the melting of intercellular junctions, which causes the loss of connections between epithelial cells and the formation of gaps between them, and subsequently blisters. Epithelial cells that have lost their connection become smaller, rounded, have larger nuclei, and float freely. These cells are called acantholytic cells or Tzanck cells.

*Acantosis (epithelial hypertrophy)* is a thickening of the epithelial layer of the mucous membrane — a thickening of the interpapillary epithelial outgrowths due to proliferation of the basal and spinous layers.

*Papillomatosis* is an overgrowth of intraepithelial connective tissue papillae and their growth into the epithelial layer.

The main clinical examination methods (examination and palpation) of oral mucosa help to characterize the pathological elements of the lesion, namely: their localization, size, shape, depth. Palpation helps to determine the painfulness of the lesion elements, their density, mobility, relation to the surrounding soft tissues, the relief of the edges and bottom of the ulcers, the condition of the lymph nodes, etc.

Sometimes additional research methods are used to determine the diagnosis (special clinical, functional, laboratory, etc.).

## **TOPICS OF REPORTS/ABSTRACTS**

1. Peculiarities of taking anamnesis in adults and children from different regions of Ukraine, depending on age and the presence of risk factors.
2. Features of instrumental examination of teeth of temporary and permanent bite in adults and children of different ages.
3. Examination of periodontal tissues in adults and children of prepubertal age.
4. Examination of MM in adults and children of different ages.

## **LIST OF RECOMMENDED REFERENCES**

### *Main*

1. Periodontal and oral mucosa diseases: textbook. Vol. 2 / A. V. Borysenko, L. V. Lynovytska, O. F. Nesyn et al. ; edited by A. V. Borysenko. — Kyiv : AUS Medicine Publishing, 2018. — p. 349–373. (In Ukrainian)

2. Pediatric therapeutic dentistry / L. A. Khomenko, A. V. Savychuk, Ye. I. Ostapko et al. Kyiv : Book-plus, 2012. — p. 5–11. (In Ukrainian)

3. Stomatology : textbook : in 2 books. / M. M. Rozhko, Z. B. Popovych, V. D. Kuroiedova et al. ; edited by M. M. Rozhko. — Kyiv : AUS Medicine Publishing, 2020. Book 1. — P. 684–712. (In Ukrainian)

#### *Additional*

1. Oral mucosa diseases : a textbook / M. Yu. Antonenko, O. F. Nesyn, S. A. Shnayder [et. al.]; ed. by A. V. Borysenko — Odesa: Print house, 2015. — P. 24–48. (In Ukrainian)

2. Tyldesley W. R. Oral diagnosis : a handbook of modern diagnostic techniques used to investigate clinical problems in dentistry / W. R. Tyldesley. — Pergamon Press Oxford; New York, 1978. — 153 p. (In English)

#### *Electronic information resources*

1. Gomez J. Detection and diagnosis of the early caries lesion // BMC Oral Health. 2015. Vol. 15 (Suppl 1). — P. S3. doi: 10.1186/1472-6831-15-S1-S3. (In English)

2. Wavelength-dependent fibre-optic transillumination of small approximal caries lesions: the use of a dye, and a comparison to bitewing radiography / J. Vaarkamp, J. ten Bosch, E. H. Verdonschot, M. C. Huysmans // Caries Res. — 1997. — Vol. 31(3). — P. 232–237. doi: 10.1159/000262405. (In English)

3. Yang J, Dutra V. Utility of radiology, laser fluorescence, and transillumination // Dent Clin North Am. — 2005 Oct. — Vol. 49 (4). — P. 739–752. doi: 10.1016/j.cden.2005.05.010. PMID: 16150314. (In English)

## Practical Training No. 2

**Topic:** Main modern laboratory research methods in dentistry.

**Purpose:** advanced mastery of the discipline by improving theoretical knowledge and professional competencies of applicants in the study of modern laboratory methods of research of adults and children.

**Basic definitions:** leading clinical symptoms and syndromes in various clinical variants of main dental diseases in adults and children. Confirmation of the preliminary diagnosis with the help of modern laboratory research methods. Establishing the final diagnosis.

**Equipment:** multimedia projector, laptop, data from clinical examination methods.

### Plan

1. Organizational actions: greetings, checking the attendees, announcing the topic, the purpose of the lesson, motivating higher education applicants to study the topic.
2. Control of the basic level of knowledge.
3. Questions (test tasks) to check basic knowledge on the topic of the training.
4. Discussion of theoretical questions.
5. Topics of reports/abstracts.
6. Summing up: giving marks by the teacher, emphasizing the positive and negative aspects of the lesson, announcing the topic of the next training.
7. List of recommended references (main, additional, electronic information resources).

### CONTROL OF THE BASIC LEVEL OF KNOWLEDGE

Written work of applicants, communication with adults and children's parents to collect anamnesis, clinical examination of adults and children, preparation of a laboratory examination plan, discussion on the justification and confirmation of the diagnosis. Control of knowledge and skills of basic examination in pediatric dentistry.

## **QUESTIONS (TEST TASKS) TO CHECK BASIC KNOWLEDGE ON THE TOPIC OF THE TRAINING**

1. What laboratory methods are used in the clinic of pediatric therapeutic dentistry?

### **DISCUSSION OF THEORETICAL QUESTIONS**

#### **Laboratory Research Methods in the Clinic of Pediatric Therapeutic Dentistry**

The laboratory stage of diagnosing diseases of the oral cavity plays an important role in making the final diagnosis.

The following methods are used as laboratory methods:

— determination of the state of the oral fluid (amount of saliva secreted, rate of saliva secretion, pH value, buffer capacity, mineral composition, etc.);

— determination of biochemical parameters of oral fluid (indicators of pro- and antioxidant system, free radical oxidation, content of a number of enzymes, etc);

— cytological — to determine the nature of the cellular material, identify specific cells or pathogens, the method of determining the electrokinetic activity of buccal epithelial cells is used;

— microbiological and mycological (from elements of lesions, from oral fluid) to determine the nature of the microenvironment of a specific biological niche (oral cavity, periodontal pocket, salivary gland duct, etc.), identify pathogens and determine sensitivity to antibacterial agents;

— virological — to identify traditional pathogens of oral mucosa diseases;

— immunochemical tests, including indirect enzyme-linked immunosorbent assay for determining the titers of specific antibodies to bacteria, fungi, and viruses in blood serum and saliva;

— DNA polymerase chain reaction (PCR) — for high value detection of pathogenic DNA in the test material;

— immunological — for determining indicators of local and general immunity.

#### **Biochemical Methods for Oral Fluid Research**

Oral fluid consists of saliva, mucous gland secretions, and gingival fluid. Saliva, the main component of oral fluid, is a secretion of the salivary glands (parotid, submandibular, sublingual, and minor) and an important biological environment of the oral cavity, so its properties and

chemical composition significantly affect the condition of the teeth and MM. The composition and properties of the oral fluid are determined by the functioning of the salivary glands, individual characteristics, age, diet, condition of the oral organs and hygienic care, and general health. Saliva performs a number of functions: digestive, mineralizing, protective, buffering, excretory, regulatory.

*The amount of saliva secreted* is an extremely important indicator. The effectiveness of the protective and cleansing functions of saliva, the degree of reduction of sugar concentration, as well as the speed of the remineralization process, which takes place using minerals dissolved in saliva, directly depend on the amount of saliva secreted.

During the day, 1.5–2.0 liters of saliva are secreted with a total weight of all salivary glands of 5–6 g. The normal level of saliva secretion is approximately 1.0 ml/min. A decrease in the amount of saliva below this level may be one of the reasons for the weakening of tooth protection and slowing down the processes of mineralization and remineralization, which creates favorable conditions for the development of caries (E. Laurisch, 2003).

*The pH value of saliva* can be determined by using indicator paper (e. g. Neutralit) or special instruments. The active concentration of sodium ions and pH can be determined by the potentiometric method using a pH meter (pH-121) and an ionometer (EV-74) (V. K. Leontiev et al., 1999). Average saliva pH values normally fluctuate about 7.0. A decrease in saliva pH is a risk factor for caries formation (Ie. V. Borovsky, P. L. Leus, 1979).

*Buffer capacity.* Saliva contains several buffer systems that protect the hard tissues of the tooth from the effects of acids from food or pathogenic bacteria formed in the course of life. Research results show that a high buffer capacity minimizes the negative effects of acids formed during the decomposition of sugars on hard tooth tissues.

The easiest way to determine the buffer capacity is to use the Dentbuff test (Vivadent).

Another way to determine the buffer capacity is the Krasse method, which is as follows: 1 ml of saliva is mixed with 3 ml of a 0.005 N solution of hydrochloric acid (pH 3.0), the resulting mixture is incubated for 5 minutes, and then the pH value is determined. The buffer capacity is estimated as follows:

- $\text{pH} > 6$  — high buffer capacity;
- $5 < \text{pH} < 6$  — normal buffer capacity;
- $\text{pH} < 5$  — low buffer capacity.



*Low-molecular-weight organic components of saliva* are represented by urea (the end product of amino acid and protein metabolism), free amino acids, glucose, lactate, pyruvate, citrate, neuraminic acid, rhodanides (products of cyanide excretion from the body).

Important components of the protein fraction of saliva are hormones — glucocorticoids, sex hormones, thyroid hormones, etc. Saliva contains about 10–15% of the hormones in the blood.

*Mineral composition of saliva.* Saliva contains a number of mineral compounds. Compared to blood serum, saliva has a higher  $K^+$  content (4–5 times) and a lower  $Na^{2+}$  content (5–10 times). The  $Ca^{2+}$  content approximately corresponds to the level in blood. The chemical composition of saliva is closely related to the state of metabolic processes in the body.

Saliva tests are important laboratory tests in the diagnosis of oral diseases and general somatic pathology. In modern clinical practice, saliva is used to detect a number of general somatic diseases — in the enzyme-linked immunosorbent assay for hepatitis, herpesvirus infection, etc. (I. V. Grigoriev, A. A. Chirkin, 1998).

### **Cytological Methods of Research**

One of the methods of morphological examination is the cytological method based on the study of cells, their individual structures and conglomerates. The method is used to diagnose diseases of MM and periodontium, including to monitor the effectiveness of treatment, diagnose inflammatory and proliferative processes in the maxillofacial area.

The informative content of cytological examination is determined by the punctual implementation of the basic rules of sampling and preparation. According to the method of sampling, the materials can be divided into exfoliative, aspiration and washings (E. Kimele, 1984).

After sampling, the material is fixed and stained, for which purpose Nikiforov's fixative fluid is applied to the surface of air-dried cytological specimens (for 20–30 minutes) and stained according to the method of Romanovsky–Gimza, Leishman, Gram et al. and study with a microscope at low (7x6) and high (7x60 and 10x90 with immersion) magnifications.

For cytologic examination of the gingival sulcus contents, gingival fluid is collected using sterile gauze threads. After drying the examination area, the threads are placed at the bottom of the sulcus or tooth pocket for 5–8 minutes using a blunt probe. After removing the thread, smear-prints are prepared, fixed, stained according to the Romanovsky-Gimza method, and the number of cellular elements per 100 cells is counted.

**Oral cytodiagnosics** is based on the data of cyclic changes in the multilayer squamous epithelium of the oral cavity synchronously with the menstrual cycle (N. F. Danilevsky, A. V. Borisenko, 2000). The material for cytodiagnosics is obtained from the buccal mucosa above the line of teeth closure.

### **Microbiological Research Methods**

Microbiological studies allow determining the species composition of MM microflora, establishing their quantitative characteristics and determining the sensitivity of opportunistic and pathogenic microorganisms to antibiotic therapy.

Material for microbiological examination is collected in various ways: sterile cotton swabs, paper disks, periodontal pocket turundas, filtered paper, capillary tubes. After appropriate preparation, the material is inoculated on differential diagnostic media, such as meat-peptone agar with glucose for the determination of streptococci, 5% blood agar for streptococci and determination of the total number of hemolytic microorganisms, Endo medium for the isolation of enterobacteria. Microbial colonization is taken into account based on the number of colonies in 1 ml of saliva (CFU/ml), the number of colonies per square millimeter of mucosal area (CFU/mm<sup>2</sup>), etc. (J. S. Butel, 1998).

The severity of microbiological disorders (dysbiosis) of the oral cavity is evaluated by determining the severity (V. V. Khazanova et al., 1996).

### **Virological Research Methods**

The viral etiology of the disease is confirmed by the detection of specific antibodies of IgG and IgM classes in serological reactions of precipitation, complement binding, agglutination, indirect hemagglutination and inhibition of hemagglutination and some other reactions. Determination of the diagnostic titer of antibodies (in acute infection) or their fourfold increase (during relapse) can be a diagnostic criterion for determining the etiologic significance of the virus in the formation of the pathological process.

### **Blood Tests in the Clinic of Pediatric Therapeutic Dentistry**

Hemoglobin is the main respiratory protein of the blood, which belongs to chromoproteins. The diagnostic value is the determination of hemoglobin of the adult type (Hb A) and the fetal type, which prevails in the blood of newborns (Hb F).

A decrease in the number of red blood cells is the main criterion for anemia (deficiency, posthemorrhagic, hypo- and aplastic). Increase in the number of red blood cells is divided into primary and secondary.

The color index (CI) reflects the relative content of hemoglobin in the red blood cell. Normal values are generally 0.86–1.05. According to the CI, it is customary to systematize anemia: normochromic (with an unknown CI), hypochromic ( $CI < 0.86$ ) and hyperchromic ( $CI 1.2–1.3$ ).

One of the most important indicators in evaluating the blood condition is the hematocrit number, which is the ratio of blood plasma volume to blood cells. Hematocrit values fluctuate no more than 0.36–0.48. A decrease in the hematocrit number (to 0.20–0.25) is observed in anemia, an increase (to 0.55–0.65) — in erythremia.

### **Immunological Methods of Research**

The function of the immune system is to recognize genetically foreign substances (antigens) and to regulate them specifically. Immune homeostasis disorders play a role in the pathogenesis of most dental diseases. Modern laboratory diagnostics has a wide range of methods that allow to evaluate the state of various parts of the immune system, including the state of systemic and local nonspecific factors, as well as the nature of the specific immune response that occurs in response to a specific antigenic stimulus.

The main basis for immunological examination is the presence of clinical manifestations of immune disorders.

Immunodiagnostic methods are conditionally divided into two groups (K. F. Chernushenko, 1997). The first group includes methods that determine the state of systemic immunity (the number of peripheral blood lymphocytes; quantitative and functional parameters of T-lymphocytes, B-lymphocytes, K- and NK-cells; the state of phagocytic cells (monocytes, neutrophils); nonspecific factors (complement, lysozyme, C-protein, etc.); indicators of specific immune response; indicators determining the level of T-lymphocyte sensitization; level of specific antibodies to etiologically relevant antigens; indicators of autoimmunity; cell tests determining the degree of sensitization to tissue antigens, etc.) The second group includes indicators of local immunity (determining the state of the cellular level — cellular composition of secretions or mucosal flush; phagocytic activity of macrophages and neutrophils, level of humoral factor enzymes — lysozyme, interferon, S-IgA, etc.).

## Molecular Genetic Research Methods

In the clinic of pediatric dentistry, a large number of gene polymorphisms are markers: *COL2A1* (6846 C>A) (gene encoding type II collagen), *OMP9* (A-8202G) rs11697325 (gene that initiates physiological processes of tissue remodeling), *CYP1A1* (gene of the first phase of detoxification), *GSTM1*, *GSTT1* (genes of the second phase of detoxification), G (-308) A of *TNF* (tumor necrosis factor) gene, allelic variants of *AMELX* gene (rs17878486; rs946252) (a gene involved in biomineralization in the development of tooth enamel) and others. DNA is extracted from buccal epithelial cells using a modified Chelex method. In the “Eppendorf”, 200 µL of a 5% solution of Chelex 100 in sterile distilled water (Chelex in sodium form, 100–200 mesh, Bio-Rad) is added to the applicator with a scraping of epithelial cells. Before addition, the resin is mixed until homogeneous with a wide-bore pipette and an aliquot is taken directly during mixing. Incubate at 56°C for 30 min with constant stirring on a thermal shaker. Then incubation is carried out at 96°C for 8 min with periodic shaking. After incubation, centrifuged at 12,000 g for 3 min. The concentration and purity of the DNA preparation is determined on a spectrophotometer by taking a 5 µl aliquot directly from the tube with the DNA solution. For PCR, 5 µL of supernatant is taken.

## TOPICS OF REPORTS/ABSTRACTS

1. Features of methods of collecting various materials for laboratory research in adults and children.
2. Basic methods of laboratory examination of oral fluid in adults and children with multiple dental caries.
3. Basic methods of laboratory examination of oral epithelium in adults and children with various dental pathologies.
4. The most common methods of blood testing and their interpretation in adults and children with various dental pathologies.

## LIST OF RECOMMENDED REFERENCES

### *Main*

1. Periodontal and oral mucosa diseases: textbook. Vol. 2 / A. V. Borysenko, L. V. Lynovytska, O. F. Nesyn et al. ; edited by A. V. Borysenko. — Kyiv : AUS Medicine Publishing, 2018. — p. 349–373. (In Ukrainian)
2. Pediatric therapeutic dentistry / L. A. Khomenko, A. V. Savychuk, Ye. I. Ostapko et al. Kyiv : Book-plus, 2012. — p. 5–11. (In Ukrainian)

3. Stomatology : textbook : in 2 books. / M. M. Rozhko, Z. B. Popovych, V. D. Kuroiedova et al. ; edited by M. M. Rozhko. — Kyiv : AUS Medicine Publishing, 2020. — Book 1. — P. 684–712. (In Ukrainian)

*Additional*

1. Oral mucosa diseases : a textbook / M. Yu. Antonenko, O. F. Nesyn, S. A. Shnayder [et. al.]; ed. by A. V. Borysenko — Odesa: Print house, 2015. — P. 24–48. (In Ukrainian)

2. Tyldesley W. R. Oral diagnosis : a handbook of modern diagnostic techniques used to investigate clinical problems in dentistry / by W. R. Tyldesley Pergamon Press Oxford ; New York, 1978. — 153 p. (In English)

*Electronic information resources*

1. Gomez J. Detection and diagnosis of the early caries lesion // BMC Oral Health. — 2015. — Vol. 15 (Suppl 1). — P. S3. doi: 10.1186/1472-6831-15-S1-S3. (In English)

2. Wavelength-dependent fibre-optic transillumination of small approximal caries lesions: the use of a dye, and a comparison to bitewing radiography / J. Vaarkamp, J. ten Bosch, E. H. Verdonshot, M. C. Huysmans // Caries Res. — 1997. — Vol. 31 (3). — P. 232–237. doi: 10.1159/000262405. (In English)

3. Yang J, Dutra V. Utility of radiology, laser fluorescence, and transillumination // Dent Clin North Am. — 2005 Oct. — Vol. 49 (4). — P. 739–752. doi: 10.1016/j.cden.2005.05.010. PMID: 16150314. (In English)

## Practical Training No. 3

**Topic.** The use of physical factors in the diagnosis of main dental diseases.

**Purpose:** advanced mastery of the discipline by improving theoretical knowledge and professional competencies of applicants in clarifying the importance of physical factors in the diagnosis of main dental diseases of adults and children.

**Basic definitions:** leading clinical symptoms and syndromes in various clinical variants of main dental diseases in adults and children. Confirmation of the preliminary diagnosis using data from modern laboratory research methods, including physical methods. Establishing the final diagnosis, using physical methods of diagnosing dental diseases.

**Equipment:** multimedia projector, laptop, data from clinical examination methods.

### Plan

1. Organizational actions: greetings, checking the attendees, announcing the topic, the purpose of the lesson, motivating higher education applicants to study the topic.
2. Control of the basic level of knowledge.
3. Questions (test tasks) to check basic knowledge on the topic of the training.
4. Discussion of theoretical questions.
5. Topics of reports/abstracts.
6. Summing up: giving marks by the teacher, emphasizing the positive and negative aspects of the training, announcing the topic of the next training.
7. List of recommended references (main, additional, electronic information resources).

### CONTROL OF THE BASIC LEVEL OF KNOWLEDGE

Basic interview of applicants, communication with adults and children's parents to collect anamnesis, clinical examination of adults and children, preparation of a laboratory examination plan that includes physical factors, discussion on the confirmation and confirmation of the diagnosis using physical factors.

## **QUESTIONS (TEST TASKS) TO CHECK BASIC KNOWLEDGE ON THE TOPIC OF THE TRAINING**

1. List the main and additional methods of examination in the clinic of pediatric therapeutic dentistry.
2. List the paraclinical methods of diagnosing dental caries.
3. Name the physical methods of diagnosing periodontal tissue diseases in adults and children.
4. Name the basic principles of physiotherapy.
5. What is the rule of electrophoresis of drugs?
6. Name the indications for the use of local darsonvalization in adults and children.
7. What is the essence of ultrasound therapy?
8. What is the effect of UV rays in general and local application?
9. What are the warnings for local application?
10. What are the warnings for local and general use of UV irradiation?

## **DISCUSSION OF THEORETICAL QUESTIONS**

### **Electroodontodiagnosis**

**Electroodontodiagnosis** is the determination of the threshold of pulp excitability using an electric current. The method is based on the determination of the threshold excitation of pain and tactile receptors of the tooth pulp when irritated by electric current. The pulp of intact teeth responds to a current in the range of 2–6  $\mu\text{A}$ . In the case of a pathological process in the pulp (pulpitis, pulp necrosis), the threshold of excitability decreases. A decrease in the threshold in the range of 7–60  $\mu\text{A}$  indicates a predominant lesion of the crown pulp, 60–100  $\mu\text{A}$  — root pulp, and more than 100  $\mu\text{A}$  — the death of the pulp and the reaction to the electric current of the periodontal receptors.

To determine the viability of the tooth, special devices are used, such as EOM-3, IVN-1, OD-2M, OSM-50, etc.

In modern dentistry, compact devices (pulp testers) are used to determine the vitality (viability) of the pulp. They are relatively easy to use, but reveal only two conditions of the pulp: live and necrotic.

### **Determination of the Ohmic Electrical Resistance of Hard Tissues of Teeth**

Intact enamel is a fairly good dielectric, i. e. it does not conduct electric current. The affected hard tissues of the teeth change their elec-

trical characteristics (indicators) in the case of initial caries or non-carious lesions.

The ohmic electrical resistance decreases, i. e. the electrical conductivity of the affected hard tooth tissues increases.

The methodology for determining the ohmic electrical resistance of hard tooth tissues is no different from determining the threshold of pulp excitability.

Determination of the ohmic electrical resistance of dental hard tissues is used for differential diagnosis of caries in the stage of spot with other non-carious lesions of dental hard tissues, diagnosis of various degrees of fluorosis severity. In addition, it is used to determine the incomplete mineralization of crowns and fissures of teeth, to detect enamel microcracks and in other clinical cases.

### **Luminescent Diagnostics**

This method is based on the ability of tissues and their cellular elements to emit light of a certain color when exposed to ultraviolet rays (primary or intrinsic fluorescence of substances). It is used to determine the state of marginal adhesion of fillings, recognize early dental caries, differential diagnosis of OM, etc. To enhance the effect of fluorescence, the examined tissues can be pretreated with fluorescent substances, such as fluorescein, fluorochrome, tryptaflavin, etc. Such fluorescence is called secondary.

Special devices are used for the examination, for example OLD-41, and microscopes with special filters for fluorescence cytology. Diagnostics of dental lesions is carried out in a darkened room after the eyes have adapted to the darkness. The examined tooth surface is irradiated with the help of the device's lamp with ultraviolet rays from a distance of 20–30 cm.

### **Transillumination**

The method is similar to luminescent and is based on the glow of hard tooth tissues under the influence of green light. For diagnostics, the UVL-122 apparatus (LuxDent) is used. The hard tissues of the teeth (enamel, dentin) demineralized due to the development of the carious process look brown in the green ray. In case of pulpitis, the tooth crown becomes dark (“dim glow effect”), and in case of chronic gangrenous pulpitis, the surface of the crown is completely darkened (“black hole effect”).



## **Determination of Periodontal Capillary Resistance (V. I. Kulazhenko's Test)**

In 1958, V. I. Kulazhenko developed a method for diagnosing the severity and treatment of periodontitis. Kulazhenko's test is based on determining the rate of hematoma formation on the gingival mucosa under negative pressure, which is formed using a special apparatus for vacuum treatment of periodontal disease ALP-02. Normally, in the anterior gingival region, hematoma occurs in 50–60 seconds, in the lateral areas — in 70–80 seconds. In periodontitis, the time of hematoma formation is reduced by 3–5 times depending on the severity and course of the disease.

### **Capillaroscopy, Biomicroscopy**

Capillaroscopy, biomicroscopy is a lifetime study of the capillary network of the periodontium and OM using a capillaroscope, colposcope, special contact biomicroscope with fluorescent or polarized reflected light. The examination evaluates the number of vessels, their location, shape, size, and diameter. Periodontitis changes the length and diameter of capillaries, their number in the field of view, slows down blood circulation, etc.

### **Rheography (Rheodentography and Reoparodontography)**

Rheography is a bloodless in vivo method of studying the blood filling and blood circulation of living tissues of the body, based on the registration of pulse oscillations of the electrical resistance of tissues. A variant of rheography for studying the functional state of the vessels of the tooth pulp is called rheodentography. It can be used to determine the state of the pulp vessel walls, their tone, vasoconstriction, vasodilation, etc. The data obtained can be important for characterizing the pulp state, differential diagnosis of its diseases, evaluating the effectiveness of the treatment, etc.

The electrodes are applied to the tooth isolated from saliva and dried and the rheogram is recorded in parallel with the electrocardiogram. The signals are recorded in special rooms isolated by a metal mesh from the external electromagnetic field. The recorded rheogram is then studied and analyzed.

Reoparodontography is a method of recording changes in the electrical resistance of periodontal tissues caused by the pulse dynamics of their blood filling as a result of cardiac activity. With the help of reoparodontography, the condition of periodontal vessels, their tone and structure are evaluated by analyzing the graphic image of peripheral hemodynamics.

This research method is used for early diagnosis of periodontitis, differential diagnosis and evaluation of treatment effectiveness.

A rheograph (RPG 2-02) together with a multichannel electrocardiograph is used for rheodentography and reoparodontography. Signals are recorded in special rooms isolated by a metal wall from the effects of electromagnetic waves. Simultaneously with rheodentography and reoparodontography, an ECG is recorded in the second standard lead on a multichannel electrocardiograph. Then the rheogram is studied and analyzed.

### **Photoplethysmography**

This is a method of studying the state of blood circulation in periodontal tissues, which consists in recording the optical density of tissues and its light reflection. Unlike rheography, photoplethysmography records pulse fluctuations in the optical density of the light flux. To record photoplethysmograms in dentistry, photoplethysmographs FP-1, FP-7, etc. are used.

### **Polarography**

The polarography method is used to determine the oxygen balance in periodontal tissues. It is based on the reduction of oxygen on a platinum electrode, which is fixed on the gum surface. Polarograms are recorded using a special device — an electropolarograph RA-2. Analysis of the polarogram allows determining the rate of oxygen absorption by periodontal tissues, the state of macrocirculation and transcapillary metabolism. This method is used both for diagnostics and in the dynamics of periodontitis treatment.

### **Echoosteometry**

The echoosteometry method is based on the sound conductivity of bone tissue. In dentistry, it is used to study the condition of periodontal bone tissue. This method records the time of ultrasound pulse transmission through bone tissue, which is directly proportional to its density. With the development of osteoporosis, the echo osteometry index decreases.

### **Method of Electrometric Diagnostics of Caries**

A method of electrometric diagnosis of caries and a set of instruments for detecting initial caries not only in the visible areas of the tooth, but also in fissures have been developed (V. K. Leontiev, 1983). The method is

based on measuring the electrical conductivity of hard tooth tissues in the presence of an electrolyte and the ability of carious tissues to conduct electric current of varying magnitude depending on the degree of their damage. The electrometric method can also be used to diagnose initial fissure caries in teeth with incomplete enamel mineralization.

Currently, for the diagnosis of fissure caries, the method of objective analysis of the optical density of tooth tissues is used, which is implemented in the KaVoDiagnodent and KaVoDiagnodentPen devices (Germany).

### **The method of electronic apex localization**

The method of electronic apex localization (Sunada L., 1962), based on the constancy of resistance between the mucous membrane and the periodontium, has become widely used. The principle of determination is based on the measurement of the electrical resistance of the soft tissues of the oral cavity and tooth tissues. The resistance of the tooth tissues is much higher than the resistance of OM, so fixing the electrodes on the lip and in the tooth canal does not cause an electrical circuit to close until the electrode located in the canal reaches the physiological narrowing (periodontal tissue). In this case, the circuit is closed, which is usually accompanied by a sound signal.

### **Principles of Modern Physical Therapy**

The main principles of modern physical therapy in the field of internal diseases are:

— the principle of nervism, which includes the unity of nervous and humoral pathways, which realize the impact of energy of physical factors on the body from molecular processes to the activity of the whole organism;

— pathogenetic principle of using natural and preformed physical factors, which is realized on the basis of their prescription depending on the specific properties of the factor and its impact on certain processes in the body tissues;

— the principle of using mainly small doses of energy of physical factors based on the impact on the functional systems of the body through the nervous system and the stimulation of self-healing processes through it;

— the principle of including physical factors at the earliest stage of disruption of the functional state and activity of the body's physiological systems that ensure homeostasis by a pathological process;

— the principle of a broad combination of physical, pharmacological and other therapeutic methods in combination with exercise therapy to influence various aspects of the pathological process.

### **Medicinal Electrophoresis**

Medicinal electrophoresis is a method of combined action of direct current and a medicinal substance. During electrophoresis, both of these factors interact and cause a complex specific effect on skin receptors, the excitation of which is transmitted to the central nervous system and higher autonomic centers. The specificity of this irritating effect is ensured by the pharmacological properties of the injected substance. The resulting reflex reaction is either generalized or local, affecting mainly individual organs and systems, and corresponds to the specificity of the pharmacological action of the injected drug substance.

### **Darsonvalization**

Darsonvalization is a treatment with high-frequency (100–400 kHz) pulsed current of high voltage (10–100 kV) and low strength (10–15 mA). The intervals between individual current pulses are many times longer than the duration of the pulses. Such currents were first obtained by the French physiologist and physicist d'Arsonval in 1892 and used for general and local darsonvalization.

*Apparatus.* The domestic industry produces the device “Iskra-2” for local darsonvalization. It is a tube generator tuned to a frequency of  $(110 \pm 5)$  kHz, which corresponds to a wavelength of  $(1727 \pm 136)$  m. The current waveform is bell-shaped, with a maximum voltage of 15 kV.

*Biological and therapeutic effects of darsonvalization.* During local darsonvalization, a high-frequency current affects the receptors in the skin. This irritation causes reflex reactions of internal organs and systems. According to P. P. Lazarev (1918), high-frequency current of low strength does not cause excitation of the neuromuscular system.

*Indications for darsonvalization.* Local darsonvalization is indicated for periodontal disease, chronic gingivitis, neuritis and neuralgia.

*Contraindications to darsonvalization.* Intolerance to current, hysteria, malignant neoplasms, leukemia, myocardial infarction, condition after myocardial infarction within six months, bleeding, active pulmonary tuberculosis.

## Ultrasound Therapy

The essence of ultrasound therapy is the effect on certain parts of the patient's body of elastic vibrations and waves with a frequency exceeding 20 kHz. In the general medical practice, the frequency of oscillations in the range of 30 kHz is more commonly used. Transmission of an ultrasound wave cannot be carried out even through the thinnest air gap between the emitter and the surface of the body part, since the vibrations are almost completely reflected at the boundary with it. Therefore, during the treatment effect, a contact medium is introduced between the working surface of the ultrasonic head of the device and the patient's body part — a layer of neutral oil or water. When performing procedures in pediatric dental practice, petroleum jelly is used for this purpose, and glycerin in the oral cavity. The therapeutic effect of ultrasonic mechanical vibrations is based on the wave-like areas of compression and rarefaction (“cellular massage”), the formation of intracellular heat, intensification of physicochemical and biochemical processes, dilation of blood vessels, improved nutrition, and increased metabolic processes in tissues.

### Biological and Therapeutic Effects of Ultraviolet Radiation (UVR)

Ultraviolet radiation was discovered by W. Herschel, I. Ritter and U. Ulaston in 1801 by the recommendation of the Second International Congress on Physiotherapy and Photobiology, three regions were conditionally distinguished within the range of UV radiation from the Sun and artificial sources, which have a wavelength range: region A — from 400 to 320 nm (long-wave UV radiation); region B — from 300 to 275 nm (medium-wave UV radiation); region C — from 275 to 180 nm (short-wave UV radiation).

There are significant differences in the effect of long-wave, medium-wave and short-wave UV radiation on cells, tissues and the whole organism.

**Bactericidal effect of ultraviolet radiation.** Mechanism of action of the bactericidal property of light is due to the effect of UV rays on cell proteins. When irradiated, bacterial cells are first irritated, i. e., their vital activity is activated. Further irradiation leads to inhibition of cell vital activity due to protein denaturation. At sufficiently high doses, protein coagulation and bacterial death occur. According to V. L. Troitsky, ultraviolet coagulation causes the destruction of those molecular groups that cause the toxicity of bacterial cells; the substances that determine immune properties

remain unchanged. Further irradiation, possibly due to a violation of the enzyme balance of cells and activation of an autolytic enzyme, causes cell lysis and release of immunospecific substances located in them.

*Indications for the therapeutic use of ultraviolet rays.* Indications for ultraviolet radiation therapy in pediatric dentistry: 1) general irradiation is carried out for the prevention and comprehensive treatment of dental caries; 2) local: inflammatory processes in the maxillofacial area (furuncles, carbuncles), ulcerative lesions of MM (acute herpetic gingivitis stomatitis, chronic recurrent aphthae), erythema exudatum multiforme, cheilitis, and others.

*Contraindications to the therapeutic use of ultraviolet rays.* Malignant tumors, tendency to bleeding, active tuberculosis, blood diseases, severe cachexia, hyperthyroidism, lupus erythematosus, circulatory failure of the I and II degree, smallpox.

### **Physiotherapeutic Methods of Periodontitis Treatment**

*Depophoresis of copper-calcium hydroxide* (A. Knappvost, Germany) is also used for medical effects in root canals. For depophoresis, Cupral is used, which is a stable equilibrium system in which the active substances are hydroxycuprate ions, colloid and hydroxyl ions. The method ensures deep penetration of hydroxyl ions and hydroxycuprate ions into the system of macro- and microchannels regardless of the degree of instrumental passage, sterilization of the canal, tissue proteolysis, formation of a protective film of copper-calcium hydroxide on the surface of macro- and microchannels and stimulation of osteoblasts.

*Extremely high-frequency therapy (EHF therapy)* is the therapeutic use of electromagnetic waves of the millimeter range of non-thermal intensity (up to 10 mW/cm<sup>2</sup>), which is delivered to the patient using a waveguide or special antennas.

*The method of millimeter wave therapy (MMW-therapy)* — is a fundamentally new method of treatment based on the peculiarities of the human body's perception of microwave EMR, the wavelength of which is 4–8 mm. The use of microwave EMR imitates the natural control signals that take place in a living organism in the form of its own millimeter coherent EMR, which is involved in fundamental biological processes.

MMW-radiation activates the body's immune system. MMW-therapy helps to normalize disorders occurring at the cellular level (immunological system, blood rheology), normalizes hemodynamics with a hypotensive effect, stimulates reparative processes. MMW-therapy increases the nonspecific resistance and reactivity of the body under its influence, which dic-

tates the expediency of its use in patients with reduced body reactivity. The second phase — the trace effect of MMW-therapy is characterized by an increase in stress-limiting antisystems (increased content of antioxidants, prostaglandins of fraction E, insulin).

Physiotherapeutic methods for the treatment of chronic catarrhal gingivitis include hydrotherapy with carbon dioxide for 10 minutes daily or every other day, 10–15 sessions in total. Electrophoresis of 1% galascorbin solution or 5% ascorbic acid solution in combination with 1% nicotinic acid solution is also used. The course of treatment is 10 sessions.

In case of I–II degree hypertrophy, electrophoresis of 10% calcium chloride solution is effective. The introduction of chlorine ions from the active electrode leads to the appearance of foci of micronecrosis in the gingival mucosa. Subsequently, sclerosis of these areas occurs, which contributes to a decrease in the size of the gingival papillae. The number of sessions is on average 8–10.

In case of II and III degree hypertrophy, it is advisable to use electrophoresis of enzyme preparations, in particular lidase in a buffered solution (pH 5.2). The course of treatment is 15–20 sessions, every other day. Lidase contains the enzyme hyaluronidase, which breaks down hyaluronic acid. The latter, having a high viscosity, is a “cementing” substance of connective tissue. To regulate the metabolism of periodontal tissues and improve microcirculation, heparin is prescribed in the form of applications to the gingival mucosa or electrophoresis. The drug is injected from the cathode, the procedure is performed daily, in total 10–12 sessions.

In case of hypertrophic gingivitis of the III degree of severity, it is necessary to use destructive methods: cryodestruction, diathermocoagulation. However, they are rarely used due to the peculiarities of the pathogenesis of the proliferative process in the gums during puberty.

Physiotherapeutic methods play an important role in the complex treatment of generalized periodontitis. They are used at different stages of local treatment, taking into account the mechanism of action of each specific technique. Hydrotherapy, various types of massage, electrophoresis, phonophoresis, helium-neon laser are used. In case of gingival bleeding, electrophoresis of a 5% solution of ascorbic acid or 1% solution of galascorbin is prescribed for 10 days. Electrophoresis of 2.5% calcium glycerophosphate solution (5–6 sessions) in combination with 1% sodium fluoride solution (for 4–5 days) helps to reduce osteoporosis of the spongy substance of the interdental septa. In case of hypertrophic symptomatic gingivitis, vacuum massage is used. Atrophic changes in the gingival mu-

cosa are an indication for vibration massage. Aerosol inhalations can be used with a 0.01–0.05% solution of decarius 6–8 times a day, and UV light — 3–4 sessions once a day. To accelerate the epithelialization processes, it is recommended to use UV irradiation and helium-neon laser light.

In the treatment of patients with shingles with severe pain syndrome and a high rise in the temperature curve, it is advisable to use non-steroidal anti-inflammatory drugs in view of their anti-inflammatory and analgesic effects, ultraviolet light and darsonvalization.

### **Basic Principles of Physiotherapy in Children**

The effectiveness of the use of physical factors depends on the child's behavior, mood and awareness of the procedure, and the environment in which the treatment is carried out. The physiotherapy room should have appropriate furniture, paintings, toys that are easy to clean, etc. Each sick child should be explained (in terms he or she understands) how he or she should behave during the procedure and what sensations he or she may experience. For young children, in order to accustom them to the environment, the first procedure is best performed at a low dose and without turning on the equipment. Throughout the procedure, the nurse should stay with the child and observe his or her reactions.

The effectiveness of the use of physical factors in the treatment of dental diseases in children largely depends on the age characteristics of the child's body, the course of the disease, its stage, the mechanism of action of the desired physical agent, etc. Physical factors can be successfully used to treat various inflammatory diseases of the maxillofacial area, trigeminal neuralgia, facial neuritis to accelerate the resorption of fresh scars of post-traumatic or postoperative origin, temporomandibular joint arthritis with pain, etc.

However, in addition to the above said, contraindications to physiotherapy procedures should also be taken into account. These include: 1) diseases of the cardiovascular system in the stage of decompensation; 2) tuberculosis in the active phase; 3) diseases of the blood and hematopoietic organs; 4) suspected or present malignant tumors of the maxillofacial area; 5) diabetes mellitus; 6) individual intolerance to a physical agent or drug substance (in electrophoresis).

### **TOPICS OF REPORTS/ABSTRACTS**

1. Features of transillumination in the diagnosis of dental diseases.
2. Physical methods of diagnosing periodontal tissue diseases in children.
3. Physical methods of diagnosing dental caries.



## LIST OF RECOMMENDED REFERENCES

### *Main*

1. Periodontal and oral mucosa diseases: textbook. Vol. 2 / A. V. Borysenko, L. V. Lynovytska, O. F. Nesyn et al. ; edited by A. V. Borysenko. — Kyiv : AUS Medicine Publishing, 2018. — p. 349–373. (In Ukrainian)
2. Pediatric therapeutic dentistry / L. A. Khomenko, A. V. Savychuk, Ye. I. Ostapko et al. Kyiv : Book-plus, 2012. — p. 5–11. (In Ukrainian)
3. Stomatology : textbook : in 2 books. / M. M. Rozhko, Z. B. Popovych, V. D. Kuroiedova et al. ; edited by M. M. Rozhko. — Kyiv : AUS Medicine Publishing, 2020. Book 1. — P. 684–712. (In Ukrainian)

### *Additional*

1. Oral mucosa diseases : a textbook / M. Yu. Antonenko, O. F. Nesyn, S. A. Shnayder [et. al.]; ed. by A. V. Borysenko — Odesa: Print house, 2015. — P. 24–48. (In Ukrainian)
2. Tyldesley W. R. Oral diagnosis : a handbook of modern diagnostic techniques used to investigate clinical problems in dentistry / by W. R. Tyldesley Pergamon Press Oxford; New York, 1978. — 153 p. (In English)

### *Electronic information resources*

1. Gomez J. Detection and diagnosis of the early caries lesion // BMC Oral Health. 2015. Vol. 15 (Suppl 1). — P. S3. doi: 10.1186/1472-6831-15-S1-S3. (In English)
2. Wavelength-dependent fibre-optic transillumination of small approximal caries lesions: the use of a dye, and a comparison to bitewing radiography / J. Vaarkamp, J. ten Bosch, E. H. Verdonschot, M. C. Huysmans // Caries Res. — 1997. — Vol. 31(3). — P. 232–237. doi: 10.1159/000262405. (In English)
3. Yang J, Dutra V. Utility of radiology, laser fluorescence, and transillumination // Dent Clin North Am. — 2005 Oct. — Vol. 49 (4). — P. 739–752. doi: 10.1016/j.cden.2005.05.010. PMID: 16150314. (In English)

## Practical Training No. 4

**Topic:** Use of new rapid methods for diagnosing main dental diseases.

**Purpose:** advanced mastery of the discipline by improving theoretical knowledge and professional competencies of applicants in the study of new rapid research methods in the diagnosis of dental diseases in adults and children.

**Basic definitions:** leading clinical symptoms and syndromes in various clinical variants of main dental diseases in adults and children. Differential diagnosis of main dental diseases in adults and children. Establishing a preliminary and final diagnosis based on the data of new and various rapid research methods.

**Equipment:** multimedia projector, laptop, data from clinical examination methods.

### Plan

1. Organizational actions: greetings, checking the attendees, announcing the topic, the purpose of the training, motivating higher education applicants to study the topic.
2. Control of the basic level of knowledge.
3. Questions (test tasks) to check basic knowledge on the topic of the training.
4. Discussion of theoretical questions.
5. Topics of reports/abstracts.
6. Summing up: giving marks by the teacher, emphasizing the positive and negative aspects of the lesson, announcing the topic of the next lesson.
7. List of recommended references (main, additional, electronic information resources).

### CONTROL OF THE BASIC LEVEL OF KNOWLEDGE

General questioning of students, communication with adults and children's parents to collect anamnesis, clinical examination of adults and children, clinical examination plan making, discussion on diagnosis justification. Control of knowledge and skills of basic examination in the clinic of pediatric dentistry.

## **QUESTIONS (TEST TASKS) TO CHECK BASIC KNOWLEDGE ON THE TOPIC OF THE TRAINING**

1. The essence of determining the pH of the oral fluid.
2. Methods for evaluating caries resistance of hard dental tissues in adults and children.
3. The role of the tooth pulp in the formation of caries resistance of hard dental tissues.
4. Methods for evaluating the degree of periodontal tissue inflammation in adults and children.
5. The essence of the spectrophotometric method of diagnosing dental diseases.

### **DISCUSSION OF THEORETICAL QUESTIONS**

#### **Method for Evaluating the Level of Functional Reactions in the Oral Cavity by Fluctuations in the pH Value of Oral Fluid in Its Individual Samples**

The proposed method is based on the fact that fluctuations in the pH value ( $\Delta\text{pH}$ ) in individual samples are representative of the instability of homeostasis and the inability of the body to maintain acid-base balance in the oral cavity.

The method evaluates:

- $\text{pH}_{\text{av}}$  — average pH value, which is determined by several (at least 5) samples of mixed saliva, as more reliable than a single sample;
- value  $1/\Delta\text{pH}$ , which is the inverse of the confidence interval of the deviation of the pH value from  $\text{pH}_{\text{cp}}$ , characterizing the salivary homeostasis of the teeth (homeorhesis);
- value  $\Delta\text{pH}/\text{pH}_{\text{sr}}$ , proportional to the probability of tooth enamel demineralization.

The pH measurements are performed immediately after the collection of mixed saliva using a pH meter with a flat electrode “PHscan 20F” (Bante Instruments Limited, China), at least in five saliva collections taken from the patient. The five  $\text{pH}_i$  values obtained are used to calculate:

- arithmetic mean value:

$$\text{pH}_{\text{av}} = \frac{\sum_{i=1}^n \text{pH}_i}{5}; \quad (1.1)$$

— confidence interval of deviation of this value from its average value:

$$\Delta pH = t_{5; 0.95} \sqrt{\frac{\sum_{i=1}^5 (\Delta pH_i)^2}{5(5-1)}}, \quad (1.2)$$

where  $t_{5; 0.95}$  — Student's coefficient for 5 measurements and 0.95 confidence level;  $\Delta pH_i$  — deviation of  $pH_i$  values from the arithmetic mean, i. e.  $\Delta pH_i - pH_{av}$ ; relative confidence interval of deviation of this value  $\Delta pH / pH_{av}$ .

The intervals of caries susceptibility values are as follows:

— with high caries susceptibility (low resistance):

$\Delta pH \approx 0.2 \dots 1$ ;  $1/\Delta pH \approx 1 \dots 5$ ;  $\Delta pH / pH_{av} \approx 0.03 \dots 0.15$ ;

— with low caries susceptibility (high resistance):

$\Delta pH \approx 0.01 \dots 0.1$ ;  $1/\Delta pH \approx 10 \dots 100$ ;  $\Delta pH / pH_{av} \approx 0.001 \dots 0.03$ .

During the study, the data were averaged across the group.

### **Optical Rapid Method for in vivo Evaluation of Changes in the Structure of Tooth Enamel and Dentin Associated with the Processes of Mineralization, Remineralization and Demineralization**

The method allows you to evaluate changes in tooth enamel mineralization both by the specified digital and extended color parameters and by the combination of these parameters. At the same time, it is possible to record quantitatively insignificant changes in mineralization-related indicators caused by treatment and preventive measures and procedures, overloading of the periodontium with orthopedic structures and orthodontic appliances, chronic stresses of various nature.

With the help of an automatic spectro-colorimeter, the spectral distribution of the aperture light reflection coefficient of the tooth R in the wavelength range 380–720 nm is taken. At the same time, the color parameters of the tooth in color coordinates, color saturation, brightness, whiteness and yellowness are automatically calculated. For the comparative analysis, the optical and color parameters of a sample of synthetic hydroxyapatite applied to a glass plate in the form of a uniform layer of 0.5 mm thick are used.

*The mineralizing potential of saliva* was determined taking into account the nature of crystal formation in a dried sample of mixed saliva according to P. A. Leus in the modification of O. G. Kukina, 1995.

During the examination of the mineralizing properties of saliva, O. G. Kukina identified five types of crystal formation:

- I type — large tree-like crystals in the field of view;
- II type — the entire field of view is evenly filled with small and medium-sized tree-shaped crystals;
- III type — in the center there are crystals of various shapes, on the periphery there are small tree-shaped crystals that increase towards the edges;
- IV type — in the center there is a complete absence of tree-like forms, on the periphery there are medium and small tree-like crystals in islands.
- V type — complete absence of tree-like forms, a small number of irregularly shaped crystals are located in the field of view.

Oral fluid crystallization of types I and II is considered normal, the intensity of the caries process is low; types III, IV, V crystallization was considered pathological, the intensity of the caries process was high.

*The spectro-colorimetric method of evaluating the degree of gingival inflammation in patients* is based on changes in the permeability and staining of the gums with Schiller–Pisarev solution (SP), which are recorded quantitatively in optical and color indicators using a Pulsar spectro-colorimeter adapted for dental purposes.

To evaluate inflammatory processes in the periodontal tissues and gingival mucosa, the Schiller–Pisarev test is used, which is based on the reaction of iodine staining glycogen in a color that changes from light brown to dark brown depending on the degree of inflammation (with inflammation, the amount of glycogen increases dramatically). According to the degree of staining, a negative sample is distinguished (straw yellow color), slightly positive (light brown) and positive (dark brown). The disadvantage of this test is its low informational content due to subjectivity, the inability to detect small changes in the amount of glycogen in the gums by color, and therefore to determine the early stages of the inflammatory process and processes of an erased nature, which is characteristic of the child's body. At the same time, it is impossible to conduct a detailed analysis of the dynamics of changes in inflammatory processes due to the lack of a quantitative indicator, which is especially important for long-term follow-up, as well as for carrying out planned preventive measures in children's school and preschool institutions. The studies have shown that staining of the periodontal mucosa when using this solution is possible for two reasons. The first is associated with the staining of the gums with high permeability of the epithelium by the iodine solution itself. In this case, the color parameters of the gums will be determined by the iodine solution penetrating the mucosa. The second is associated with the reaction of io-

dine with glycogen, which gives a dark brown color and shifts the main maximum of the light reflection coefficient to the region of 660–700 nm. The method of quantitative evaluation of the degree of inflammation in periodontal tissues by means of spectrophotometry allows to quantify by color both the earliest stages of inflammation associated with a violation of the barrier properties of the periodontium and to quantitatively monitor the dynamics of the developed inflammatory process, accompanied by a change in the amount of glycogen in the periodontal tissues, which makes it possible to use therapeutic and prophylactic agents adequate to the degree of inflammation. This method allows to separate the initial stage of inflammation (violation of barrier protection) from the stage of advanced inflammation, when there is a reaction of iodine solution with glycogen, eliminates the occurrence of subjective errors in determining the degree of staining by visual inspection. The method provides the possibility of quantitative tracking of the dynamics of the inflammatory process (due to the storage of the study data) and thus allows the selection of the necessary therapeutic measures in orthopedic treatment.

*Spectro-colorimetric evaluation* of the functional state of the gingival microcapillary bed of patients is based on changes in capillary blood filling and, as a result, the spectrum of gingival reflection of visible light after a 10-minute nonphysiological chewing load using Orbit sugar-free chewing gum. The spectra of light reflection of the gums and their color parameters were also recorded using an automatic spectro-colorimeter “Pulsar”. Changes in the reflection spectra and related color parameters of the gums were averaged over the group.

*Evaluation of the color saturation of tooth staining in the TER test.* The existing TER test and its modifications for determining the acid resistance of tooth enamel, as well as tests for diagnosing the initial stages of enamel demineralization, are based on persistent staining of enamel with penetrating dyes.

The method is based on the measurement of the spectral distribution of the reflection coefficient of the tooth surface of light in the visible spectral region of 380–720 nm in one flash of a pulsed lamp with subsequent mathematical processing of signals by a programmable microprocessor.

For comparison, the color of the tooth was evaluated visually using color atlas tables consisting of 45 fields of each of the 12 color tones for the selection and determination of colors. In this case, it is proposed to use, first of all, the color saturation of the tooth stained during the TER test and calculated by the microprocessor, which represents the purity of color and is perceived by the eye as the intensity of color.

Before the measurements, the teeth are cleaned with a toothbrush with an angled tip and hygienic toothpaste. Then, a filter paper disk soaked in a 0.1N hydrochloric acid solution with a diameter of 4 mm is applied to the vestibular surface of the crown part of the tooth 1.5–2 mm above the cutting edge for 30 seconds. After removing the disk, the acid residues are washed off, the tooth is dried with a cotton swab and air, and a drop of 1% aqueous methylene blue solution is applied to the etching site for 3 minutes. Then the dye is removed with a dry cotton swab, the inlet of the phocon is pressed against the stained area of the tooth and the flash lamp button is pressed. The results are automatically processed by the microprocessor and displayed on the screen.

*Evaluation of the functional caries-protective activity (reaction) of pulp under acid load (FCPAP).* The method of evaluating the functional state of the dental pulp (FCPAP) is based on an increase in the electrical impedance  $Z_2$  of the hard tissues of the teeth for a certain period of time, when the enamel is exposed to acid ( $A = Z_2 / Z_1$ , where  $Z_1$  is the electrical impedance to acid exposure). This reduces the permeability of enamel not only to alternating electric current, but also to dyes used in the TER test. Normally, at the age of 6–7 years, the electrical impedance of teeth under the influence of an acidic stimulus can increase hundreds of times, with caries — several times, with fluorosis — the effect is practically absent. In the case of devitalised teeth, acid etching of the enamel always decreases the  $Z$  value. The electrical impedance of the tooth was measured at a frequency of 1000 Hz using an RLC 5030 measuring bridge.

*To determine the structural and functional state of bone tissue,* ultrasonic densitometry is used on the calcaneus using an ultrasonic densitometer Osteo Sys SONOST 2000 (Korea). The following indicators are determined:

- SOS (speed of sound) — the speed of ultrasound propagation through bone (m/s), an indicator determined by the elasticity and density of the bone;
- BUA (broadband ultrasound attenuation) is a broadband attenuation (decrement) of ultrasound through bone (dB/MHz), an indicator that characterizes the loss of ultrasound intensity in the medium of its propagation, and is a reflection not only of bone density, but also of the number, size and spatial orientation of bone trabeculae, i. e. bone architecture;
- BQI (bone quality index) — bone quality index (%), an indicator that is calculated by software based on SOS and BUA indicators.

## TOPICS OF REPORTS/ABSTRACTS

1. Method of modified pH test of oral fluid for express diagnosis.
2. Express method for evaluating the functional caries-protective activity of the pulp (FCPAP).
3. Method for evaluating the color saturation of tooth staining during the TER test.
4. Rapid method for evaluating in vivo changes in the structure of tooth enamel and dentin associated with the processes of their mineralization.

## LIST OF RECOMMENDED REFERENCES

### *Main*

1. Periodontal and oral mucosa diseases: textbook. Vol. 2 / A. V. Borysenko, L. V. Lynovytska, O. F. Nesyn et al. ; edited by A. V. Borysenko. — Kyiv : AUS Medicine Publishing, 2018. — p. 349–373. (In Ukrainian)
2. Pediatric therapeutic dentistry / L. A. Khomenko, A. V. Savychuk, Ye. I. Ostapko et al. Kyiv : Book-plus, 2012. — p. 5–11. (In Ukrainian)
3. Stomatology : textbook : in 2 books. / M. M. Rozhko, Z. B. Popovych, V. D. Kuroiedova et al. ; edited by M. M. Rozhko. — Kyiv : AUS Medicine Publishing, 2020. Book 1. — P. 684–712. (In Ukrainian)

### *Additional*

1. Oral mucosa diseases : a textbook / M. Yu. Antonenko, O. F. Nesyn, S. A. Shnayder [et. al.]; ed. by A. V. Borysenko — Odesa: Print house, 2015. — P. 24–48. (In Ukrainian)
2. Tyldesley W. R. Oral diagnosis : a handbook of modern diagnostic techniques used to investigate clinical problems in dentistry / by W. R. Tyldesley Pergamon Press Oxford; New York, 1978. — 153 p. (In English)

### *Electronic information resources*

1. Gomez J. Detection and diagnosis of the early caries lesion // BMC Oral Health. 2015. Vol. 15 (Suppl 1). — P. S3. doi: 10.1186/1472-6831-15-S1-S3. (In English)
2. Wavelength-dependent fibre-optic transillumination of small approximal caries lesions: the use of a dye, and a comparison to bitewing radiography / J. Vaarkamp, J. ten Bosch, E. H. Verdonschot, M. C. Huysmans // Caries Res. — 1997. — Vol. 31(3). — P. 232–237. doi: 10.1159/000262405. (In English)
3. Yang J, Dutra V. Utility of radiology, laser fluorescence, and transillumination // Dent Clin North Am. — 2005 Oct. — Vol. 49 (4). — P. 739–752. doi: 10.1016/j.cden.2005.05.010. PMID: 16150314. (In English)



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Навчальне видання

**ОСНОВИ КЛІНІКО-ЛАБОРАТОРНОЇ ДІАГНОСТИКИ  
СТОМАТОЛОГІЧНИХ ЗАХВОРЮВАНЬ**  
Методичні вказівки до практичних занять  
з навчальної дисципліни  
«Дитяча терапевтична стоматологія»

*Укладачі:*

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