



# ALYMENTARY SYSTEM RESEARCH METHODS

Research methods  
of the patient.

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# STOMACH RESEARCH METHODS QUESTIONING



# Complaints.

- Complaints. The leading symptoms of diseases of the stomach include pain, dyspeptic phenomena (from the Greek. dys — difficulty, impaired function, pepsis-digestion), which includes a large group of various symptoms (nausea, vomiting, heartburn, eructation, impaired appetite, etc.), gastroduodenal bleeding.

# Pain

- Crucial in the timely recognition of diseases of the stomach has the correct assessment of pain. However, it should be borne in mind that pain in the epigastric region, which is the designated «meeting place of all pain», frequently observed in other diseases of the digestive system (the lesion of the esophagus, liver, gallbladder, pancreas, etc.). Acute appendicitis in the first hours of its development due to viscerovisceral reflex can also result in pain in the epigastric region. Pain in this area occur in diseases of other abdominal organs (e.g., splenic infarction), pathology of the anterior abdominal wall, the mesenteric vessels atherosclerosis, diseases of cardiovascular system (myocardial infarction, pericarditis, dissecting aneurysm of the aorta), respiratory (lobar pneumonia, diaphragmatic pleurisy), endocrine diseases (e.g., diabetic ketoacidosis), diffuse connective tissue diseases (polyarteritis nodosa), intercostal neuralgia, etc.

- Gastric mucosa does not contain pain receptors and therefore is insensitive to touch, pressure, biopsy. In diseases of the stomach pain appears primarily in cases of violation of the motor function of the body (that causes spasm or stretching its smooth muscle fibers). Such pain received name visceral. Pains, the mechanism of occurrence of which is associated with irritation of the parietal leaf of the peritoneum (e.g., perforated gastric ulcer), are called the parietal (or somatic).
- These pains are usually sharp, constant, worse on movement and respiration, are accompanied by muscle tension anterior abdominal wall.
- The diversity of diseases in which there are pains in the epigastric region,
- requires a thorough analysis and need to identify and clarify in detail such
- features of pain as like localization and irradiation, the relationship of pains with food intake, the nature and intensity etc.
- The most frequent localization of pain in diseases of the stomach, is the epigastric
- region. Thus, as a rule, pain associated with violation of the body of the stomach, are projected to the left of the median line, and with the defeat of the pyloric division —to the right of it. The radiation of pain in diseases of the stomach may be different. In the pathology of the gastric cardia we observe distribution of pain in the left side of the chest, thoracic spine. With lesions of the antrum and the pyloric canal the radiation of pain in the right hypochondrium occurs

# Connection with food intake

- A clear connection with food intake is one of the most characteristic features of pain syndrome in diseases of the stomach. Accordingly to time past from the moment of ingestion to the occurrence of pain, customary they distinguish early, late and hunger pains. Early pain appear after 30-60 minutes after eating, lasting for 1-1,5 hours and decrease with the evacuation from the stomach contents. Usually the early pain occur with lesions of the middle and lower thirds of the stomach body. If the pathologic process (ulcer, tumor) in subcardial department or upper third of the body of the stomach pain may occur right after eating.

# Connection with food intake

- Late pain occur after 1 . - 3 hours after meal, increasing as income sour of gastric contents into the duodenum, and are considered a characteristic symptom of duodenitis and peptic ulcer disease with localization in the bulb of the duodenum. Such patients are often marked by hunger pains that appear in 6-7 hours after eating
- and disappearing after meals. Night pain is most often observed in peptic ulcer disease: it occurs in the period from 11 p.m. to 3 a.m. and is close in origin to the hunger pains. The regularity of the pain appearance after a certain
- period of time after ingestion is primarily attributed to the nature of the lesion
- (inflammation, ulcer), its localization, the level of secretion of hydrochloric acid, its binding with buffer food components, the rate of evacuation of gastric contents.

- A role in the recognition of diseases of the stomach plays has pain connection with a particular posture and physical activity. Thus, when ptosis of the stomach (gastroptosis) pain is often worse in an upright position. In the case of adhesions between the stomach and neighboring organs pain aggravated by body position change, weight lifting.
- Nature of pain and their intensity have significant diagnostic importance.
- Pain in diseases of the stomach are often aching in nature. In acute gastritis and
- other diseases in which there is spasm of the pylorus, pain can become
- colic like.



- In diseases of the stomach pain are usually of moderate
- intensity. Very sharp (<<dagger>>) pain appear when perforation of gastric ulcer. There are also severe pain with penetration ulcers, phlegmon of the stomach.
- An important feature of pain is the frequency of the pain. This periodicity, which includes the alternating periods of pain lasting a few weeks or months and periods of good health, is a characteristic symptom of peptic ulcer disease and is often combined with the seasonality of exacerbations, which is manifested by increased pain in the spring and autumn period and the improvement of health in the summer.



# effectiveness of medications

- Assessment of effectiveness of medications which reduce the pain is useful in recognition of diseases of the stomach. So, reduction of pain in patients with peptic ulcer promotes the intake of alkalizing drugs (antacids), antisecretory medications. In advanced cases of gastric cancer temporary relief occurs only sometimes when using narcotic analgesics.
- Assigning a greater role to scrutiny of pain, however, it should be remembered
- about concerning the frequent absence of pain in some diseases of the stomach. So, painless is often found in chronic gastritis. Possible painless form of ulcer, painless during the early stages of stomach cancer. This indicates the need for detailed assessment of other symptoms of diseases of the stomach.



# Vomiting (vomitus, emesis)

- Vomiting (vomitus, emesis) is the complex-reflex act of an involuntary ejection of stomach contents through the esophagus, throat, mouth, nasal passages. The mechanism of vomiting is regulated by a corresponding vomiting center located in the medulla oblongata. Irritation of the vomiting centre occurs due to the impulses coming from the receptors of the mucous membrane of the stomach, peritoneum, kidney, afferent fibers of the labyrinth.

- Vomiting may occur in various diseases. So, vomiting of Central
- origin (brain vomiting) appears in the case of increased intracranial pressure
- (for example, brain tumors, hypertensive crisis), lesions of the labyrinth apparatus and overstimulation at sea and air sickness. Hematogenous-toxic vomiting occurs when various exogenous intoxications (alcohol, nicotine, some drugs), endogenous intoxications, and metabolic derangements (chronic renal failure, diabetic ketoacidosis, toxemia of pregnancy first half of pregnancy).
- In clinical practice, there is often vomiting of visceral origin, which
- occurs when stimulation of the gastric mucosa by bacterial toxins, chemical substances, in various diseases of the stomach (peptic ulcer, gastric cancer),
- gallbladder (acute and chronic cholecystitis, cholelithiasis), pancreas (acute and chronic pancreatitis), intestines (acute appendicitis), abdominal (diffuse peritonitis). Any very severe pain, such as renal colic, can reflex to cause vomiting (so-called reflex vomiting). Great the number of different diseases in which vomiting occurs, requires a careful analysis of all the signs of this symptom

# Vomiting (vomitus, emesis)

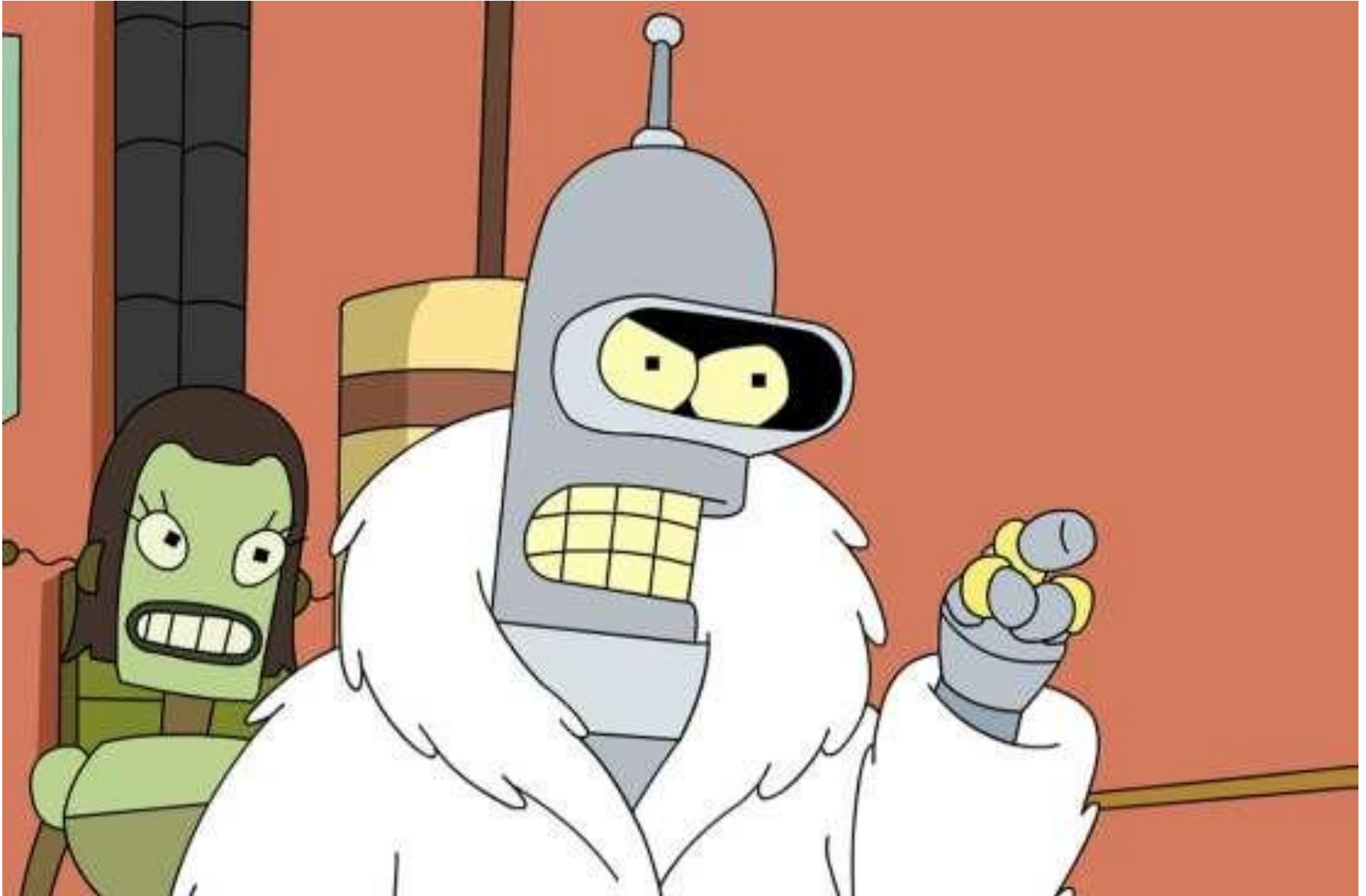
- You should, in particular, be sure to specify the time of occurrence of vomiting. Morning vomiting with mucus that appears fasting is observed in chronic alcoholism. Morning vomiting with acidic gastric contents shows high night secretion of hydrochloric acid. Vomiting that occur immediately after meals, it is noted in acute gastritis, as well as in lesions of the gastric cardia. The appearance of vomiting 1 to 2 hours after
- food may indicate an organic process (ulcer, tumor) in the body of the stomach.
- A characteristic feature of vomiting in diseases of the stomach is that it usually
- brings relief to the patients, so they can do it artificially for the purpose of
- reduction the pain.

- Great diagnostic value have such features as the volume of vomit, their
- smell, color, consistence, reaction, nature of residue, the presence of impurities. Thus, a large amount of vomit (several liters) may indicate the presence of
- stenosis of the pylorus. Undigested food residues with a neutral chemical reaction
- found in gastric achylia. Vomiting with food eaten the day before, sometimes alkaline
- reaction due to the ammonia formation is observed at decompensated stenosis of the pylorus.



- Vomiting with a lot of bile is in case of violation of duodenal patency distal from the major duodenal papilla ( Vaterova nipple), and when postgastrectomy disorders (afferent loop syndrome). Bloody vomiting is a symptom of gastroduodenal bleeding. Rotten, putrid smell of vomit mass appears during the disintegration of malignant tumors of the stomach. Fecal vomiting is a very serious symptom and indicates the presence of intestinal obstruction, peritonitis or gastric-colonic fistula.
- Frequent and profuse vomiting leads to the development of serious conditions in the body: dehydration, hypovolemia, electrolyte shifts that may be accompanied by disorders heart activity, kidney function and requires intensive therapeutic interventions.

# Nausea (nausea)



- Nausea (nausea) the characteristic heavy feeling of approaching vomiting accompanied by various vegetative disorders is called (weakness, dizziness, sweating, blanching of the skin). The basis of the appearance of nausea is subthreshold (not enough to cause vomiting) excitation of the vomiting center.
- Nausea often precedes vomiting and is due to the same reasons. So
- decided to allocate nausea of Central, reflex and toxic origin.
- Nausea occurs when increased intracranial pressure, meningitis, irritation
- the vestibular system, the exogenous and endogenous intoxications. Nausea is frequently observed in patients with chronic gastritis, peptic ulcer disease, often arising after errors in the diet.



# Burp (eructatio)

- Burp (eructatio) is an involuntary gas discharge from the stomach into the mouth cavity (burping air) or small quantities of food.
- Burping with air sometimes observed in healthy people with overeating, eating
- carbonated drinks, with exercise, if performed immediately after
- meal. Loud belching air, due to its habitual ingestion
- (aerophagia) occurs in the neuroses. With increased fermentation processes in the stomach (for example, on the background of secretory insufficiency), and formation as a result of organic acid appears belching with a smell of rancid butter. In patients with increased secretion of hydrochloric acid there is often acid burping. When injected into the stomach of duodenal contents mixed with bile belching bitter is observed. Putrid eructation (like «rotten egg») appears in the formation in the stomach from proteins by rotting substances, containing hydrogen sulfide and ammonia, and may indicate a long delay of the contents in the stomach in patients with decompensated stenosis of the pylorus.

# Heartburn or epigastric burning



# Heartburn or epigastric burning

- Heartburn or epigastric burning, as mentioned, is a frequent symptom of many diseases of the esophagus.
- At the same time heartburn frequently occurs when there is increased secretion of hydrochloric acid in
- patients with peptic ulcer and chronic gastroduodenitis, sometimes preceding the appearance of ulcer pain (initial heartburn). Heartburn much less frequently observed in patients with chronic gastritis and decreased acid-forming function of the stomach, arising as a result of stomach fermentation and formation the butyric, lactic and other organic acids in stomach.

# The appetite violation





The appetite violation is a frequent symptom of diseases of the stomach, although it may also occur in diseases of other organs and systems. So, loss of appetite occurs in infectious diseases, various intoxications, avitaminosis. Increased appetite is common in recovering patients, diabetes. The perversion of appetite with craving for inedible substances such as coal, chalk, etc., noted during pregnancy, anemia, mental illness.

Loss of appetite is often observed in patients with chronic gastritis with reduced secretory function. Complete lack of appetite (anorexia) with the advent of aversion to certain products (particularly meat) is common in patients with gastric cancer. It is necessary to distinguish sitophobia from reduce appetite (fear of eating for fear of subsequent occurrence or increased pain), occurring in patients with peptic ulcer.



Increased appetite (especially in the form of needs in often eating) is seen in case of

peptic ulcer with localization of ulcers in the duodenum. Painful feeling of hunger with the desire to lie down and to eat sometimes occurs in case of postgastrectomy disorders (hypoglycemic syndrome).

In diseases of the stomach there are other dyspeptic symptoms. In patients with

chronic gastritis there is often an unpleasant taste in the mouth. Hypersalivation and dysphagia are found in cancer of the gastric cardia. Persistent singultation associated with irritation of the phrenic nerve, observed in cancer of the upper part of the stomach, peritonitis, after operations on the stomach. Feeling of fullness in the stomach and feeling of rapid saturability is observed when decreased tonus and peristalsis of the stomach and neoplastic lesions. Common symptoms of stomach diseases are disorders of intestinal tract function: constipation (when gastroptosis, peptic ulcer disease), diarrhea (gastric achylia). Often, patients with diseases of the stomach (gastric cancer, peptic ulcer disease) complain of General (weakness, fatigue, decreased performance).

Expressed vegetative disorders (dizziness, palpitations, sweating) that occur in 10-15 minutes after eating, often detected in patients with postgastrectomy disorders (dumping syndrome)

# Stomach bleeding



# Stomach bleeding

- Stomach bleeding is considered to be one of the most serious complications of various diseases of the stomach. Often, however, it is the leading symptom of certain diseases of the stomach, which has important diagnostic value. Most often, stomach bleeding occurs in peptic ulcer disease, malignant tumors of the stomach, erosive gastritis, varicose veins of the stomach. More rare causes of bleeding are polyps, diverticula and benign tumors of the stomach, tuberculosis and syphilis of the stomach, vascular disease and blood coagulation.

# Stomach bleeding

- The main symptoms (direct signs) of gastric bleeding are vomiting with blood (haematemesis) and tarry black stool = melena (maelena). Vomiting with blood is observed, as a rule, in cases when the amount of blood loss exceeds 500 ml. Color vomit in this case is determined by the status of secretion of hydrochloric acid and the rate of bleeding. In patients with preserved gastric secretion vomit
- take the form of coffee grounds due to the formation of hydrochloric acid hematin. Patients with low secretion of hydrochloric acid in the vomit impurity
- unmodified blood possible. In the case of massive bleeding and rapid pace of its development vomiting unaltered scarlet blood is observed also in stored in acid production.

- Melena is often accompanied by bloody vomit, although may occur without it, and appears usually after 8-12 h after bleeding. The black color of feces is due to the presence of iron sulfide, as well as protoporphyrins and daitaporphyrins generated from hemoglobin under influence of enzymatic processes in the intestine. Sometimes when gastric bleeding (even profuse) signs of bloody vomit and melena are missing, and then on the foreground in the clinical picture are various General symptoms (weakness,
- dizziness, loss of consciousness, decreased blood pressure, tachycardia).In more
- late period of stomach bleeding symptoms from other organs and systems (the fever, the progression of hepatic or renal failure, the buildup of symptoms of circulatory failure, etc.) can join.





# The history of the disease.

- When evaluating the history of the development of the disease it is important first of all to assess
- its start. It can be either acute (acute gastritis, drug ulcers), or gradual. The subsequent course of the disease with alternating periods of exacerbation and remission observed in chronic gastritis, peptic ulcer disease. Steadily progressive course of the disease is peculiar to gastric cancer.
- Certain diagnostic value in the long course of the disease has the changing nature of complaints. Loss of usual communication of pains with food intake of patients with ulcer disease may indicate the development of the ulcer penetration. Joining the vomiting acidic gastric contents vomiting by food, eaten the day before, indicates the progression of scar-ulcerative stenosis of the pylorus. The appearance of reduced appetite, weakness unmotivated in the patient with chronic anacidic gastritis, can be one of the early symptoms of stomach cancer.

# The history of life.

- A specific diagnostic role plays clarification of family history. Diseases such as peptic ulcer disease, gastric cancer, are not genetically determined diseases, but their presence in relatives of the patient increases his risk of these diseases. You should pay attention to some co-morbidities (e.g. iron deficiency In 12-scarce anemia, adrenal insufficiency), which often discovered lesions of the stomach, medications (acetylsalicylic acid, indometacin, etc.) with ulcerogenic effect.
- Violations of the regime and diet, Smoking, alcohol abuse are also factors contributing to the onset and progression of chronic gastritis, peptic ulcer disease.

# PHYSICAL METHODS OF INVESTIGATION



# Inspection

- During the General inspection of patients with diseases of the stomach you must pay attention to the condition
- Patients. It can be as satisfactory (chronic gastritis, uncomplicated peptic ulcer disease), severe and very severe (advanced stages of cancer of the stomach).
- The position of patients often remains active, but in some cases can be forced. Thus, some patients with exacerbation of peptic ulcer disease prefer to lie on
- stomach (ulcers posterior wall of the stomach) or on the back with feet tightened to the stomach.
- When perforation of ulcers patients usually lie strictly on their back without moving because the slightest movement causes a sharp increase in pain.

- During the inspection of the skin sometimes you can note the pallor, which is due to the development of anemia in case of gastrointestinal bleeding. Waxy
- or sallow hue of the skin appear in patients with late-stage cancer of stomach. The degree of development of subcutaneous fat layer in many patients with diseases
- stomach remains satisfactory. Pronounced weight loss (up to the development of cachexia) is seen with the pyloric stenosis scar-ulcerative or neoplastic origin. On the study of the lymphatic system in patients with gastric cancer in left supraclavicular region between the legs of sternocleidomastoid muscle sometimes it is possible to determine the lymph node. It is dense with a rough surface (it is called Virchov`s metastasis).



# inspecting the oral cavity

- When inspecting the oral cavity in patients with diseases of the stomach various changes in the teeth are often detected (caries, periodontal disease, etc.). The tongue can remain pure (for example, patients with ulcer disease). Sometimes there is hypertrophy of the filiform and fungiform papillae. In chronic gastritis the tongue often reveals plaque with whitish-yellowish color. In atrophic gastritis, gastric cancer smoothing of the papillae of the tongue often occurs. In such cases the tongue becomes as if lacquered. Severe dryness of the tongue is noted when there is ulcer perforation. foul-smelling breath appears when there is disruption of a malignant tumor of the stomach.

# examination of the abdomen

- On examination of the abdomen (inspection should be performed in the patient supine and standing position) in patients with gastroptosis the change in its shape of the abdomen can be detected (<< pendulous abdomen>>). The bulging of the abdominal wall in the epigastric region is marked in patients with tumors of the stomach of the big sizes. When a significant weight loss the outline of the stomach sometimes is visually defines. When the development of stenosis of the output division of stomach you can see undulating motion, lifting the anterior abdominal wall due to increased peristalsis of the stomach. These movements become more noticeable after pre-light tapping of the abdominal wall in the epigastric region.



# Palpation

- The palpation of the stomach is carried out both in horizontal and in vertical position
- of the patients, since in the latter case, the small curvature of the stomach comes out of the left lobe of liver and is sometimes available to palpation.
- Using superficial palpation you can reveal abdominal rectus muscles of the abdomen in the area of the white line, to detect tenderness and muscle tension of anterior abdominal wall, identify symptoms of peritoneal irritation.

# Deep palpation of the stomach

- Deep palpation of the stomach is carried out by the method of Obratzsov and Strazhesko. Four bent fingers of the right hand several pull back the skin of the abdomen upwards, and slowly, gradually, with each exhalation, they immerse fingers deep into the abdomen.
- Finding a palpable part of the stomach or a tumor, slightly squeeze it to the back wall
- Of the abdomen. Further bent fingers produce a sliding motion from top to
- down. With this movement, palpable part of the stomach <<slip>> from under the fingers. In the time of<<slipping>> it is possible to obtain an idea about the size, shape, surface,
- consistency, mobility, tenderness palpable formation.



- A large curvature of the stomach in normal (experienced doctors) palpated in 45-60% of cases and is determined throughout 10-12 sm. length. It is on both sides of the midline of the body on 2-3 cm above the belly button and is felt on palpation in the form of a roller (ledge or staircase). The correct location of the greater curvature is confirmed by other methods define the lower border of the stomach. In addition, for the purpose of monitoring appropriate palpation to clarify the status of adjacent organs, primarily the transverse colon, which is sometimes mistaken for the great curvature of the stomach.
- The pylorus can be palpated in 20-25% of cases, often with omission of the stomach.
- The gatekeeper is in the triangle which is formed by the lower edge of the liver on the right from the middle line, the middle line of the body and a horizontal line drawn 3-4 cm above the navel (i.e. below the right direct muscle of a stomach). Since anatomically
- the gatekeeper has an oblique direction (from below and to the left — up and right), the fingers during palpation slide towards the top and left — down and right

- Gatekeeper is palpated in the form of a small short cylinder with a diameter of 1-1,5 cm appears and disappears (as a result of alternating contraction and relaxation), rumbling on palpation. With prolonged spastic state, as well as when scarring properties of the pylorus can change and it becomes more dense.
- Tumors of the stomach are clearly palpable in those cases, if they are located mainly in the distal stomach (antral and pyloric), and reach several centimeters in diameter (size <<plum>>). Tumors of the lesser curvature felt with their significant sizes or omission of the stomach.



# Percussion

- Percussion of the stomach is held in the horizontal position of the patient. With a quiet percussion on the basis of differences in the nature of gastric and intestinal tympanitis (first usually the lower) is often possible to determine the lower border of the stomach. In case of large tumors subcardial parts of the stomach there is marked reduction of the semilunar space of Traube during percussion. On the contrary, increased areas of gastric tympanitis (until the offset of its right edge from right outside the midclavicular line) is
- typical to a sharp expansion of the stomach. The detection of a positive symptom
- Mendel (the appearance of pain when percussion in the epigastric region
- with bent tip of the middle finger), that had played a role in recognition of exacerbation of peptic ulcer disease, currently has little diagnostic value, since this symptom is not strictly specific.

- To clarify the position of the lower border of the stomach the method of determining
- splash noise is used. They fixe
- the anterior abdominal wall muscles at the base of the xiphoid process of the sternum by edge of the left palm. Bent and
- a little divorced four fingers of the right hand (without lifting them from the surface of the abdomen)they produce short pushing movements, gradually moving hand down from the xiphoid process. These shocks are transmitted well through the liquid and the air contained in the stomach, and cause a distinct splashing noise, well audible in the distance. The lowest point, still splashing, will correspond to the lower border of the stomach. Normal splashing is revealed only after meals, so when defining the lower boundary of the stomach sometimes you have to ask the patient to pre-drink 1-2 glasses of water. The late (after 7-8 h after the meal) splashing appearance testifies to delay of evacuation of gastric contents (pyloric stenosis), or significant hypersecretion of the stomach. Detection of late splashing to the right of the midline of the body is a sign of expansion of prepyloric part of the stomach (Vasilenko's symptom).



# Auscultation

- Auscultation carried out together with palpation (the so-called stethoacoustic palpation), is used as a complementary way of determining the lower border of the stomach. They place stethoscope (phonedoscope) i under the left costal arch, below the Traube space. Simultaneously with the listening in the epigastric region the finger of their free hand they produce <<brushing>> motion in the horizontal direction downward from the xiphoid process. Characteristic <<rustling>> sounds will be auscultated through the stethoscope as long as the finger is in the projection of the stomach. The time of their disappearance indicates the limits of the projection of the stomach on the anterior wall of the abdomen.



**LABORATORY AND  
INSTRUMENTAL  
METHODS OF  
RESEARCH**

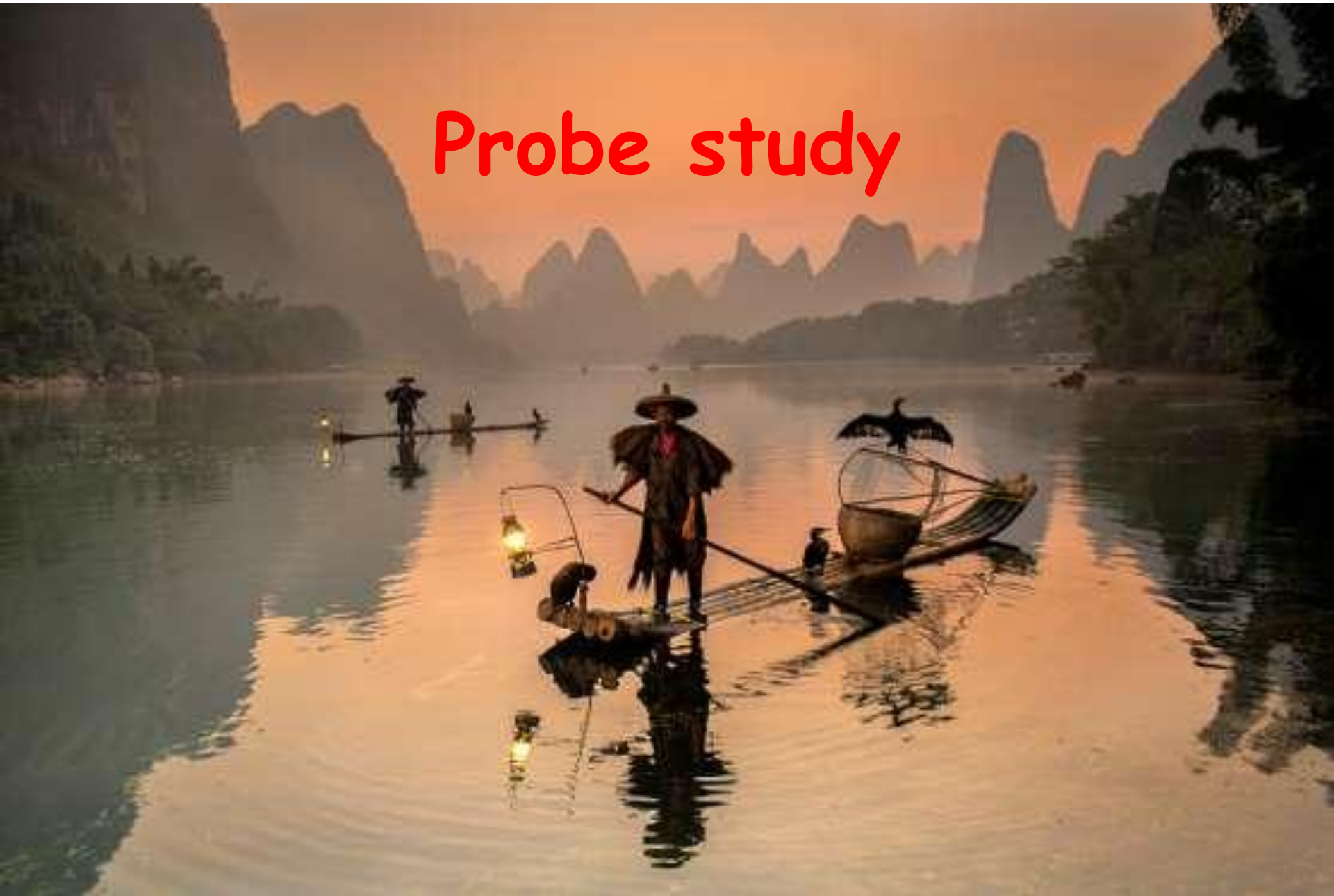
# The study of secretory function

- The study of gastric secretion is an integral part of a comprehensive diagnosis of the gastric mucosa functional state. The most reliable data on gastric secretion can be obtained by studying gastric fluid (gastric acid).

# Methods of obtaining gastric fluid for study.

- For many years research the study of gastric secretion was performed by probing with a thick probe. The main disadvantages of this method which is not used currently in clinical practice are asynchronicity of extraction of gastric contents in the mixture with test meal in unknown proportions. Because of this, it is impossible to obtain reliable information about the qualitative and quantitative sides of gastric secretion.

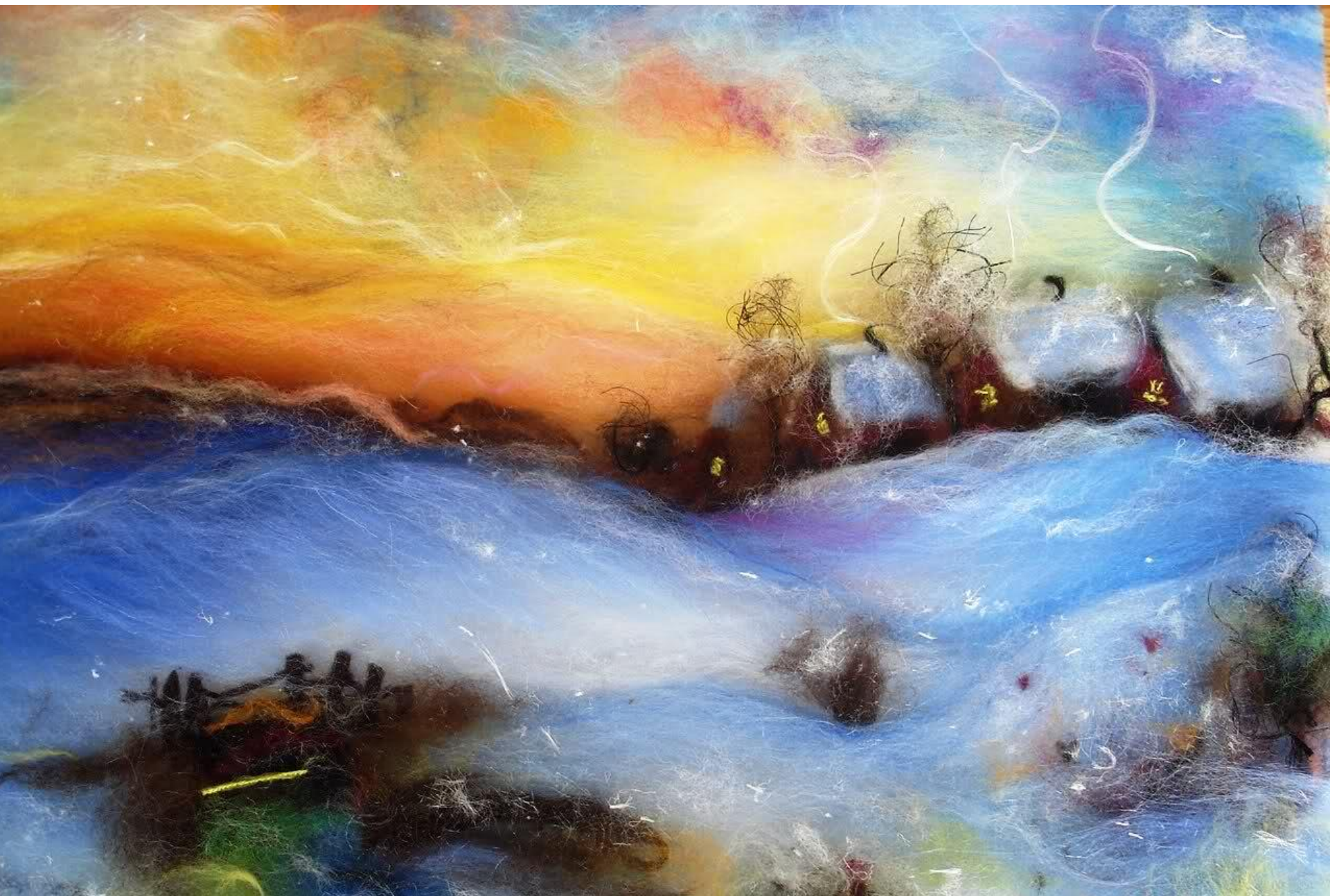
# Probe study



# Probe study

- Such a study allows to obtain pure gastric fluid , to study the secretion of a long time in various periods of the secretory cycle, rate
- qualitative and quantitative composition of gastric fluid , i.e. to provide
- getting maximum information about the state of the gastric mucosa. Stimulator of secretion must correspond to the goals and objectives of the study.
- For multimoment research of gastric secretion, that can result in a considerable
- information about her character, currently they use thin probe.

- A thin probe is an elastic rubber tube with an outer diameter of 4--5 mm and internal
- of 2-3 mm. The Blind end introduced into the stomach, has two side vents. As
- the probe is soft its actively enter into the esophagus is not possible, the patient should gradually swallowing. With the appearance of vomiting movements the probe can be inserted through the nose. When introduced into the stomach, small probe does not cause gag reflex, and can be left there for 1 1/2 — 2 hours or more. This enables long-aspirate stomach contents and assess its secretory function not only at some certain moment, but to trace it in time. The sticking out from the mouth free end of the probe is attached to the medical syringe , which evacuate the stomach fluid.





- Usually they begin with the extraction of fluid from an empty stomach. After that, according to some methods,
- immediately give a stimulant of secretion; according to others, continue to study «of skinny stomach», removing four (or two) 15-minute portions. This is so-called basal secretion. The name is not accurately reflects the merits of the case, because it is difficult to determine the extent to which the resulting secret stands out spontaneously and what portion is in response to stimulation by the probe or the swallowing act, etc. Experience shows that half-hour extraction gives the same information for basal secretion, as in an hour.

- After receiving the fourth portion of the basal secretion (i.e. after 60 min) patient is getting stimulator through the probe of secretion, it is so-called sample Breakfast — in the form of warm fluid in a volume of 300 ml. To induce the secretion of stomach you can and stimulant with parenteral stimulators— gastrin, histamine, insulin. The most effective in this respect
- tion is pentagastrin (a synthetic agent) and histamine, which are physiological activators of gastric secretion.

# Histamine

- Histamine introduction is contraindicated in organical changes of the cardiovascular system, allergic diseases, high blood pressure, pheochromocytoma, recent (2-3 weeks) gastrointestinal bleeding. The dose of histamine is calculated from the body weight of the patient (0.01 mg/kg of histamine hydrochloride or 0,008 mg/kg of histamine phosphate). Similar stimulation of gastric secretion is submaximal; and there is an optimum (maximum) dose of histamine, an increase of which does not cause further amplification of the secretory response of the stomach (0.04 mg of histamine hydrochloride per 1 kg). When they use the
- maximum dose of the histamine test (Kay) to stimulate gastric secretion, it is necessary previously to give the Antigua-staminia funds to the patient.



# enteral stimulants

- After the introduction of histamine or pentagastrine they collect gastric fluid for 1 hour, also typically with 15-minute intervals.
- Arsenal of enteral stimulants of gastric secretion presents a wide variety of stimuli: meat broth, and 5% alcohol solution, and the solution of caffeine (0.2 g in 300 ml water), 7% decoction of dry cabbage, and many others that can be used when there are contraindications to the administration of histamine.

- Oral use of stimulants of gastric secretion are widely used method of obtaining of gastric fluid offered **by N. I. Leporsky**. After removing the four portions of the basal secret they input throuth a probe 300 ml of cabbage broth, its acidity is 20 ie (titration units), after 10 min, they aspirate 10 ml, and after 15 minutes - all stomach contents. This aspiration is repeated every 15 min for another 4 times. The last four portions contain pure gastric fluid secreted in response to detect a stimulant (sequential secretion). Each of these portions are collected in a separate vessel and note its number. Stomach of healthy people typically contains up to 50 ml of liquid, sometimes more.

- Basal hour secretion equal 30-150 ml (average 50 ml). According to the volume of gastric contents after 25 minutes after a test Breakfast you can judge about the speed of evacuation from the stomach (i.e. motor function); normally this amount is an average of 75 ml. Summing the volume of the last four portions, they learn of hour strain of secretion. This value at 15-minute extraction is not quite accurate, so as with intermittent aspiration of fluid some part of it goes into the duodenum. Therefore, for more complete extraction of fluid you should pump it continuously separating portions every 15 min. Normal clock volume of secretion with intermittent aspiration is on average about 60 ml, with continuous aspiration - 1.5—2 times more. If they use parenteral stimulants they aspirate gastric fluid for 60 min. directly after insertion.

- Upon examination of the received portions of the gastric contents, they note color, consistency, presence of impurities and odor. Normal gastric fluid is almost colorless. The bile (when thrown into the stomach from duodenal contents) gives it a yellow or green color, blood — red or, more often, brown-black; the emergence of a large number of red blood when probing requires immediate termination of examination. The normal consistency of the fluid is liquid; the more mucus, the more viscous, sticky, sometimes to the extent that it is difficult to separate from the whole any part for research. A large amount of mucus indicates the presence of gastritis. Mucus floating on the surface, comes from the respiratory tract. Among the impurities, other than those listed in the contents in the fasting stomach sometimes they find the remnants of yesterday's food, which indicates the violation of its discharge.



Chemical study.



# Chemical study.

- After a description of the fluid they start the chemical study. Per serving determine free hydrochloric acid,
- General acidity, combined hydrochloric acid (associated) hydrochloric acid, lactic acid, in the portion with the maximum acidity — the amount of pepsin.
- The acidity of gastric fluid is determined by its titration with 0.1 mmol/l a solution of sodium hydroxide (NaOH) in the presence of indicators. They express the acidity most often in the number of milliliters of NaOH required to neutralize 100 ml of fluid. Last time more often they express the amount of hydrochloric acid in milligrams or milliequivalents. They produce titration in 5 or 10 ml of fluid, adding 2 drops of the indicators: 0,5% alcohol solution of dimethylaminoazobenzene and 1% alcohol solution of phenolphthalein (recently, they most often use solution phenol red). In the presence of free hydrochloric acid dimethylaminoazobenzene becomes red staining. Noticing the level of NaOH in the burette, they drop by drop pour the NaOH in a glass of fluid before colouring liquid in pink-orange color (salmon color), corresponding to the point of neutralization free hydrochloric acid. Seeing the new position of the meniscus of NaOH, they continue titration. The liquid first becomes yellow, then red again: after neutralizing all the acid reddens phenolphthalein. Again note the readings of the burettes: a number equal to the number of milliliters of NaOH spent during the first stage of the titration, multiplied by 20, corresponds to free hydrochloric acid. Number equal to the amount of NaOH consumed for all titration (again from red to red) also multiplied by 20, corresponds to the total acidity.

- It represents the sum of all containing-
- acidic fluids in the stomach: free and combined hydrochloric acid, organic acids, acidic phosphates.  
Hydrochloric acid undissociated protein
- molecules of hydrochloric acid of gastric fluid is called combined. Some proteins are in gastric fluid in normal (pepsin, gastronomiepreis); in case of gastritis, bleeding ulcer, tumor lysis the amount of protein in the stomach is increased, and and the amount of hydrochloric acid increases with them. It is determined indirectly by titrating the individual portions of fluid
- (5 ml) in the presence of sodium alizarinsulfonate that has yellow color with any free acids; when neutralizing color changes to purple.

- Subtracting number of milliliters of NaOH are spent for titration with alizarin (20 times) from the total acidity, they find out the amount of hydrochloric acid. The acidity taken for decades as the norm, recently revised. So, it was believed that in healthy people, fasting free hydrochloric acid is either absent or its content does not exceed 10-20 i.e. the Norm of acidity after a test breakfast shall be taken to be 20-40 i.e. for free hydrochloric acid and 40-60 i.e. for total acidity. Numerous studies of healthy people showed that only 50% of the acidity corresponds to the specified digits, and the other 50% it is below or above that is their constitutional feature. Yet total acidity below 20 i.e. should be treated as hypoacid, i.e. above 100 — hyperacid. Diagnostically important to reveal complete absence of hydrochloric acid. In the absence of gastric fluid free hydrochloric acid after administration of the maximum dose of histamine was given the name histamine-refractory achlorhydria and it may indicate atrophic process in the gastric mucosa.

# acidity

- The acidity (concentration of acid) do not give complete characterization of the acid-forming function of the stomach. For a more complete view of the acid formation it is necessary to calculate the debit-hour of hydrochloric acid — rate of production of hydrochloric acid (the amount of acid produced by the stomach per hour). To calculate the debit –hour it is necessary to measure the concentration of acid in gastric fluid, multiplied by the volume of secretion and divide by the number to which concentration of the acid specified: if the concentration of acid expressed in mg%, then to 100, and if in mEq/l by 1000.

- Acidity in titration units can be written as the acid concentration in mg%, if multiply the index by 3.65 acidity because the weight value of the titration unit mass is 3,65 mg hydrochloric acid or 0.1 mEq in 100 ml juice. Thus, for example, the acidity of 60 i.e. can be expressed as  $(3,65 \cdot 60)$  mg%, or 60 mEq/l, or 60 mmol/l of hydrochloric acid. Indicators of gastric secretion in the different phases and the application of various stimulants are given in Annex 1

- Since you can not introduce the probe to all patients (contraindications are: swelling of stomach, esophageal stenosis, aortic aneurysm, etc.) and not everyone is able to swallow, has long been looking determine acidity without the probe. In 1905 Sali proposed a simple method which is as follows: they give to the patient a small bag of thin rubber, containing 0.1 g methylene blue and knotted catgut thread to swallow. After that the patient eats a regular dinner. In the case of the contents hydrochloric acid in the stomach catgut digested, methylene blue dissolves in the stomach and after some time the urine stains.
- Over the past decade, a number of samples based on the use of ion-exchange resins. In pill of these resins a substance which is displaced from them with hydrochloric acid of the stomach is added, and then excreted with the urine. Pills with quinine, the dye Azur-1 are used. These methods are fairly reliable, but give the opportunity only to find out a presence or almost complete absence of hydrochloric acid in the stomach and are not a substitute for quantitative definition. You can use these methods only in patients with normal renal function.





- In recent years for studying the acidity (more pH) of gastric fluid a new and very promising radiotelemetric method (endoradiosonde) is used.
- The second important point in the study of gastric fluid is a definition of
- digestive ability, mainly according to the degree of digestion of protein.
- The simplest methods for determining peptic activity of the fluid proposed by Mett in 1899. In vitro with gastric fluid (acidic if it contains no free hydrochloric acid) they put down a narrow glass tube filled with denatured egg white, and put in a thermostat. After a day the height of the tube (in mm) released from the protein is measured by ruler.



# Method of V. N. Tugolukov

- In case of normal pepsin the total length of both ends of the tube should be 6-12mm. It is now widely used unified method of V. N. Tugolukov, giving more accurate results. In two centrifuge tubes (with exact and fine graduations in the lower part) pour a 2% solution of dry plasma and pour the diluted in the ratio 1:100 the gastric fluid (in one of the tubes pour the pre-boiled the fluid). Both tubes were placed in thermostat for 20 h. Then to both test tubes pour a solution of trichloroacetic acid and, mix well and centrifuge. According to decrease the volume of precipitated protein they judge about the digestive ability of gastric fluid. Comparing the obtained values and the results of similar experiments with different dilutions of clean dry pepsin, it is possible to Express the content of pepsin in the gastric fluid in milligrams.

- If you need to determine pepsinogens function of the stomach, without applying the probe, they resort to the definition of pepsinogen in the urine (uropepsinogen). Found that pepsinogen is not completely released in the stomach, a small portion (about 1%) penetrates into the blood and excreted in the urine, which indicates its presence in the stomach.
- The definition of uropathogen is similar to the definition of pepsin in the gastric juice or curdling milk, or by the method of V. N. Tugolukov.

# Lactic acid definition

- Lactic acid definition in the gastric fluid has some diagnostic value. It appears in the stomach as a result of bacillus of lactic acid fermentation life, vegetating in the stomach only in the absence of hydrochloric acid or in the presence of a malignant tumor of the stomach, in cells of a malignant tumor glycolysis occurs in anaerobic type with the generation of lactic acid. Therefore, it is not
- pathognomonic for a tumor, but requires a thorough examination of the patient with a view to its exceptions.

# Lactic acid definition

- One way to determine the lactate acid— Uffelmann`s reaction. They
- pour 1-2% phenol solution and add 2-3 drops 10%
- solution of ferric chloride in the tube on  $\frac{2}{3}$  of its volume. The reagent is getting a dark purple colour. Tilting the tube, along the wall slowly lower it 2-3 drops of gastric juice. In the presence of modairy acid sank to the bottom of the test tube a drop of the juice of lactic acid are iron painted in bright yellow color.



# Microscopic examination.

- They prepare native preparations of sludge, obtained by sedimentation or centrifugation. In a healthy person, they are mostly cells of the oral cavity — squamous epithelium and leucocytes. The presence of food residue —
- muscle fibers, fat, fatty acids, fiber — indicates the violation of evacuation of food from the stomach. If in stagnant fluid is acid sarciny are found there, if the acidity is absent — there are sticks of lactic acid fermentation. The presence of a small amount of red blood cells has no diagnostic value, as it can be the consequence of minor trauma when inserting the probe or the result of straining during vomit movements. When there is large number of red blood cells one can suspect an ulcer, a tumor or erosive gastritis.



# Exfoliative Cytology.

- Exfoliative Cytology. Diagnosis of early stages of gastric cancer, when the tumor
- still not palpable and cannot be detected clearly by x-ray study, presents great difficulties. One of the available methods with a greater degree the probability to detect the presence of tumors of the stomach, is exfoliative Cytology. It is
- based on the peculiarity of the cancerous tissue, consisting of weak ties tumor
- cells among themselves, so that they are relatively easily exfoliated and found in the gastric contents. We can find them in the sediment of gastric fluid or gastric washings. To enhance the desquamation of these cells they use special gastric probe with an inflatable cylinders with a rough surface, which contributes to the rejection of cancer cells.

- The resulting gastric fluid requires quick treatment to avoid destruction of tumor cells. It is centrifuged, the sediment is examined either in natural medicines with normal or phase-contrast microscope after colouring fluorochrome or in dry smears stained by Romanovsky—Giemsa, or by Papanicolaou or with hematoxylin and eosin. Differentiation of tumor cells requires a lot of experience. The main features of them are the same as in the corresponding cells in other localizations of the tumor (see subject "sputum"). For cytological studies they also use the biopsy specimens obtained during gastroscopy.

# Intragastric pH-metry.



- Intra-gastric pH-metry. In recent decades, in clinical practice the wide spread occurrence has a method of intra-gastric pH-metry. They study the concentration of hydrogen ( $H^+$ ) ions in the lumen of the gastrointestinal tract at different levels, depending on the purpose of the procedure. Unlike methods of research of gastric contents aspiration, when the removal of gastric fluid leads to a reflex increase of its products and overstates the numbers of acidity, gastric pH-metry provides more accurate information. The lack of pH-metry
- is that this method only estimates the concentration of hydrogen ions and
- doesn't provide data about the volume of secretion.

- Electrodes of pH-metric probe (usually 3, rarely 2 or 5) are located in the duodenum, the antrum and body of stomach. This arrangement of electrodes allows to assess the level of acidic production in the body of the stomach, the degree of alkalization in the antral part and duodenum, the presence of duodenal reflux.

# method of radiopill



- Less frequently method of radiopill is used, it is converts information about the environment in the lumen of the gastrointestinal tract in the radio signals. Radiopill significantly reduces mechanical irritation of the stomach wall in comparison with a probe that creates more physiological conditions, however, a significant disadvantage is the inability to accurately control the position of radiopill. The most widely used 2-hour pH-metry, in which the pH is measured in basal conditions in the first hour and then after administration of stimulants (histamine, pentagastrine, etc.).

# alkaline test

- Additional information gives the holding of the alkaline test, when they put solution
- sodium bicarbonate into the stomach through the special channel of the probe
- in basal conditions and after stimulation. Then evaluate alkaline time and the difference between the initial value and maximum pH. In the last
- years using of 24-hour pH-metry increases (thin plastic probe is inserted to the patient transnasal). It allows to assess the dependence of pH on the position of the patient's body (which is very important in gastroesophageal reflux), eating, drugs. Modern equipment allows to measure the pressure in the lumen of the gastrointestinal tract simultaneously with the registration pH, this is crucial for the detection of motility.



# Study the concentration of gastrin in the blood serum

- Gastrin is a gastrointestinal hormone of polypeptide nature, which is synthesized mainly in the G-cells of the mucous membrane of the antrum, proximal part of the duodenum and jejunum, pancreas. It has a powerful stimulating effect on the secretion of hydrochloric acid by the parietal cells of the gastric mucosa. Study the content of blood serum gastrin plays an important role in the diagnosis of Zollinger—Ellison syndrome (gastrin-producing tumor with preferential localization in the pancreas and is usually combined with hard treatment-resistant ulcers in the stomach and the duodenum). In this syndrome, the serum gastrin concentration exceeded normal values in several times. Moderate hypergastrinemia is also observed in pyloric stenosis, vitamin B12 deficiency anemia, chronic renal failure and other certain diseases. Determining the level of serum gastrin is carried out by radioimmunoassay technique .
- The method is based on the fact that the studied gastrin, performing the role of antigen, selectively competes with gastrin of standard reagent labeled with radioactive  $^{125}\text{I}$ , and displaces it from the immune complex. This result in change of radioactivity and allows to judge about the studied concentration of gastrin in the blood serum.

# Research of mucigenous function

- The composition of gastric mucus and the nature of its allocation is usually studied by determining the gastric fluid concentration and total production of mucus glycoproteins: fucose, leading to mucus viscosity, and N-acetylneuraminic acid, providing resistance of mucus to proteolytic action of hydrochloric acid and pepsin. A reduction in the production of mucus can serve as one of the pathogenetic factors in peptic ulcer disease.
- Expressed disorders of gastric mucigenous function is observed also in chronic gastritis. To assess the status of mucigenous function of the stomach they currently use and a direct analysis of the mucous layer contiguous to the epithelial
- cells of the gastric mucosa, in particular the determination of its thickness.
- To study the condition of the protective mucosal barrier of the stomach they use the measurement of transmural potential difference (electric potential difference between the mucous membrane of the stomach and its serous cover). The measurement is performed using
- special Potential measuring device , which is injected into the stomach through biopsy channel of the endoscope. Under normal conditions, the intact mucous membrane of the stomach has a negative charge relative to its serosa. At damage of protective mucosal barrier of the stomach (such as ulcerative lesions) indicators transmural potential difference substantially changes and may become positive.

# X-ray examination



# Radiooscopy and radiography

- Radiooscopy and radiography are among the most widespread methods of research of the stomach and widely used in hospital and in the outpatient setting. These methods allow us to estimate the position and shape of the stomach, the nature of the relief of the mucous membrane, the contours and elasticity of the stomach wall, the condition of its evacuation function.

# X-ray examination of the stomach

- X-ray examination of the stomach is carried out on an empty stomach with liquid
- aqueous suspension of barium sulfate prepared at the rate of 100— 150 g of contrast medium per 200 ml of water. If there are violations of the stomach evacuation function the presence of food remains, as well as in severe nocturnal hypersecretion of gastric fluid, it is advisable to conduct a preliminary gastric lavage or suction of its contents using a thin probe. They initially perform general radioscopy of the chest and abdomen for a rough estimation of their condition. Then the patient is instructed to take a mouthful of barium suspension, then pay attention to its passage through the esophageal-gastric junction.

- Using palpation or a special tube-compressor they achieve uniform distribution of contrast material on the inner surface stomach and do a few pictures to clarify the status of the folds of the mucous membrane (the direction, thickness, etc.). After receiving remaining portions of barium
- suspensions continue to study the so-called tight filling of the stomach. X-rays, supplemented by a series of sighting shots, performed in multiple projections and with
- different position of the patient. They study the position, size and shape of the stomach, its removability , the nature of peristalsis, the function of a pylorus, the evacuation of the contrast mass.

- Changing the relief of the mucous membrane of the stomach is always indicative for any pathological process. Thus, the occurrence of breakage of the folds of the mucous membrane of the stomach is characteristic of its infiltration by the tumor. In a tight filling of the stomach is shaped like a fishhook and is located in the upper abdomen, mostly on the left of the median line. Only the output part of the stomach is to the right of it. When diaphragmatic hernia part of the stomach is displaced through the esophageal opening into the chest cavity. The sharp expansion of the stomach is noted in tumor or cicatrical-ulcerative stenosis of the pylorus.
- In a tight filling of the stomach is shaped like a fishhook and is located in the upper abdomen, mostly on the left of the median line. Only the output part of the stomach is to the right of it. When diaphragmatic hernia part of the stomach is displaced through the esophageal opening into the chest cavity. The sharp expansion of the stomach is noted in tumor or cicatrical-ulcerative stenosis of the pylorus.

- The contours reflect the shade of the stomach inner surface of the body. In the presence of ulcers of the stomach the suspension of barium sulfate gets in it. In this case, a characteristic protrusion on the contour of stomach is formed, it is called a niche. In contrast, a growing tumor leads to the appearance of contours of the stomach without peristalsis, which on the x-ray image provides a picture of «the filling defect site». Malignant tumors also lead to the reduction of stomach displacement and the appearance of aperistaltic sections of its walls.



- Evacuation of 200 ml of suspension of barium sulfate from the stomach is within 1 1/2 to 3 hours, in addition to this after 30 minutes only about half of the adopted contrast agents remains in the stomach. In case of pyloric stenosis a significant part of the suspension of barium sulfate may remain in the stomach after 24 h after initial study.
- Currently they use more perfect methods of x-ray examination, for example the technique of double contrast study (barium suspension + air). Using pharmacological tests (atropine sulfate, metacin, butylscopolamine) helps in the differential diagnosis of different deformities of the stomach and duodenal ulcer and spastic contractions.

- The accuracy of radiological diagnosis of various lesions of the stomach significantly increases with the use of devices provided with electron-optical amplifiers, TV system, video recorder devices. Special indications using computer tomography that allows, for example, to detect changes in the wall of the stomach in neoplastic lesions and to detect metastases of cancer in regional lymph nodes, as well as angiography, which helps in recognizing the syndrome Zollinger—Ellison (gastroenterology adenoma of the pancreas, manifested by the emergence of hard scarring gastric ulcers and duodenal ulcers).

- In some cases, they use and radionuclide methods of investigation. So, gastroscintigraphy with  $^{99}\text{Tc}$ -pertechnetate (radionuclide imaging of stomach) makes it possible to evaluate the secretory function of
- stomach. The use of special «Breakfast» with the addition of the isotopes and the subsequent study of a patient with a gamma camera allows us to Refine evacuation function of the stomach.
- In the clinical examination of the population and selection of patients for subsequent, more in-depth examination of the use of the so-called test x-ray examination of the stomach, performed at a special gastrofluorographic installations.



# • Gastroscopy

- Gastroscopy is a visual examination of the gastric mucosa by using special flexible devices (gastroduodenoscope), in which the image of the inner surface of the stomach is transmitted to a light conductor consisting of a plurality of elastic glass fibers (Fig. 100). A special photographic set-top boxes, connected to the gastroscope (gastrocamera), gives the possibility to photograph different parts of the mucosa

- Gastroscopy, which is currently one of the main methods of diagnosis
- diseases of the stomach, allows to evaluate changes in its mucosa (specify the nature and prevalence of chronic gastritis, erosive and ulcerative lesions, tumors, etc.) to detect various motor disorders (gastroesophageal and duodenogastric reflux, disorders of evacuation). Using biopsy forceps, introduced into the stomach through the side channel of the gastroscope, and if you want to take pieces of tissue (ulcers, tumors, etc.) for subsequent morphological study. In the differential diagnosis of ulcerative lesions they use various modifications of endoscopic examination: endoscopic luminescent analysis with the use of hematoporphyrin and tetracycline, chromatography with methylene blue, etc.

- Endoscopic method of research plays a big role in identifying the source of bleeding (ulcers, erosions, malignant tumor, etc.). In these cases it is possible also to carry out the electrocoagulation or laser coagulation of the bleeding vessel.
- In recent years, a gastroscopy has been widely used in the treatment of patients with peptic ulcer disease for local administration in the area of the ulcer drugs, irradiation ulcers heineanum or an argon laser, and also to remove polyps of the stomach using a special loop.

- **Preparation for gastroscopy** (except for emergency cases) is conducted in the morning on an empty stomach. It involves subcutaneous injection of 1.0 ml of 0.1% solution of atropine sulfate for 30 min before the examination and anaesthesia of the pharynx 1 % solution dikaina.
- **Contraindications** for gastroscopy are sharp narrowing of the esophagus,
  - aortic aneurysm, acute myocardial infarction and severe heart failure, acute
  - cerebrovascular disease, severe kyphoscoliosis, mental illness.
- **Complications** when carrying out a gastroscopy include the most often allergic reaction related to hypersensitivity to the anesthetic used, and (very rarely) perforation of the wall of the pharynx, esophagus or stomach.



- A method of endoscopic investigation of the stomach does not compete with x-ray, but rather complements it. Each of these methods has its advantages and disadvantages, its limits diagnostic possibilities. Thus, the highest accuracy of diagnosis of diseases of the stomach is achieved with the skillful combination of both methods.



# Morphological study

- In vivo morphological study of the gastric mucosa nowadays has great importance in the diagnosis of various diseases of the stomach. There are two main ways of obtaining the necessary material with the help of suction (suction biopsy; aspiration biopsy = biopsy without visual control) biopsies and by using gastroscopic (target In case of aspiration biopsy pieces of the mucous membrane was prepared by introducing special biopsy probe in the stomach, aspiration (suction) of the area of the mucous shell and subsequent clipping aspirated plot with biopsy knife. Aspiration biopsy allows more or less accurately diagnose diffuse changes of mucous membranes (e.g., chronic gastritis) and almost nothing for the recognition of focal lesions. Therefore, at present it is rarely used, giving place to gastroscopic biopsy.

- The role of gastroscopic biopsy (performed during endoscopic examination)
- is extremely important in recognizing the malignant nature of the lesion,
- for example, upon detection of ulceration in the stomach. With regard to possible false-negative results of morphological research you should never take only one piece of tissue. Gastrobiopsy must be
- repeated, with taking at least 4-6 pieces each time. To assess structural changes of the gastric mucosa, in addition to conventional histological study morphometric method applies to establish quantitative relationships of the cellular elements of the gastric glands.

# histoautoradiography

- To clarify the nature of regeneration of epithelial cells of gastric mucosa
- a method of histoautoradiography can be used. It is based on the fact that when administered  $^3\text{H}$ -thymidine spiked are only those cells that currently synthesize DNA (desoxynucleic acid). Spiked with radioactive tritium epithelial cells of the gastric mucosa are the source of  $\gamma$ -rays, lightening emulsion and causing the appearance specific black granules in these cells. Estimation of the distribution of spiked epithelial cells at different times after  $^3\text{H}$ -thymidine injection allows to judge
- of the nature of the processes of regeneration of the gastric mucosa.



# Ultrasound

- In recent years in the diagnosis of diseases of the stomach they began to apply ultrasonic study. Echography of the stomach is carried out on an empty stomach, at various positions of the patient (lying, sitting, standing and turning). When changes of the gastric wall (tumor, polyps, ulcerative lesions) ultrasound examination is used to detect local thickenings of the stomach wall, to assess its diameter and the length of the pathological process on the lengthwise of stomach. Ultrasound of the stomach is continued after administration to patients 200-400 ml of water gives the opportunity to evaluate the tone of the stomach, peristalsis, and evacuation function. Sonography of the stomach is an auxiliary research method. All identified with it, the changes must be confirmed by other research methods. Currently developed devices allowing to carry out simultaneously ultrasonic and endoscopic examinations. The ultrasonic sensor is mounted directly to an endoscope and introduced together with it into the stomach.

# Methods of diagnosis of *Helicobacter pylori*

- The treatment of some diseases (primarily peptic ulcer disease) includes
- as a mandatory component of conducting eradication therapy in case of detection *Helicobacter pylori* (HP) in the gastric mucosa of patients. This involves conducting preliminary surveys of patients to detect these microorganisms. Currently there are various sensitive and specific methods for diagnosis of HP infection with your statement



- 1. Serological method of screening diagnostics HP sensitivity 90%, specificity 90%
- 2. microbiological method, the definition of sensitivity HP to antibiotics, sensitivity 80-90%, specificity 95%
- 3. morphological, primary diagnosis of HP infection in patients with peptic ulcer sensitivity 90%, specificity 90%
- 4. Rapid urease test, the primary diagnosis of HP infection in patients with peptic ulcer, sensitivity 90%, specificity 90%
- 5. Breath test, control of completeness of eradication, sensitivity 95%, specificity 100%

# Serological method

- Serological method for detecting antibodies to HP (now most often used method is enzyme-linked immunosorbent assay), mainly used for screening studies
- to identify infection of different population groups. This method is not suitable
- to monitor the effectiveness of eradication therapy, as a change in titre of antibodies to H. pylori eradication occurs after several months after eradication.
- The method of obtaining microbiological culture HP has the advantage that it can be used to determine the sensitivity of microorganisms to specific antimicrobial drug. However this method is quite expensive. In addition, it is associated with
- certain difficulties, due to the need for special environments,
- optimal temperature, humidity, air quality, etc. This leads to the fact that it is not always possible to obtain the growth of colonies of microorganisms. The disadvantage of this method is due to the fact that you have to wait its results, as a rule, at least 10-14
- days. In clinical practice it is mainly used in cases of HP infection, resistant to conventional schemes of H. pylori eradication therapy

- **Morphological method** with rapid urease test currently is the most common methods of primary diagnosis of HP infection. Examination of biopsy specimens of gastric mucosa using various stains (acridine orange, a dye Gisy, silvering on Vartin—Starry), allows not only detect the presence of HP with high degree of reliability, but also to quantify the degree
- of contamination.

- **Biochemical methods**, of which the most commonly used rapid urease test are currently the most popular choice for the primary diagnosis of HP infection. Rapid urease test (in clinical practice widely used CLOtest, Campy-test) is based on determining of the pH changes using color indicator`s changes, which occur as a result of excretion of ammonii by cleavage of urea by urease of bacteria. The results of this test are known within an hour after receiving the biopsy specimens of the gastric mucosa. In addition, the urease test is the cheapest of all methods of diagnostics of HP infection (there is only one test cheaper - a method of diagnosis of HP in smears, which is currently not applied due to low sensitivity). The disadvantages of the method include the fact that its results can be false negative when the number of HP organisms in biopsy samples of  $<10^4$ , therefore it may give erroneous conclusions when testing the completeness of the eradication.

- **Radionuclide methods**, the most famous of which is respiratory test using urea marked with  $^{13}\text{C}$  or  $^{14}\text{C}$  (carbon) isotopes, involve the use of a mass spectrograph to trap these isotopes in the exhaled air. Abroad
- breath test is called the «gold standard» verification of the eradication therapy completeness because it is noninvasive and has high sensitivity.
- Now more widespread is the definition of DNA HP (in mucosa
- of the stomach, in feces, saliva) using polymerase chain reaction, which is now the most accurate method of diagnosis of HP infection, especially in cases where the bacteria have become coccoid shape (for example, after a course of antibacterial therapy) and when other methods of diagnosis (in particular, rapid urease test)
- give fals negative results.

- When using endoscopic methods of diagnostics HP they take at least 2 biopsy samples from the body of the stomach and 1 biopsy from the antrum of the stomach. The reliability of the results increases if one patient used not one but two diagnostic methods (e.g. morphological method and rapid urease test).



THANK YOU !