PHTHISIOLOGY DEPARTMENT

FIGHT AGAINST TUBERCULOSIS
TB infection control depend, in general and first of all, on early diagnosis and treatment of contagious patients - that are, patient with respiratory TB. With effective therapy, contagiousness declines very rapidly, and may become MBT-negative after 2 to 3 weeks of treatment.
Fight against tuberculosis in Ukraine should be considered among the purposes of the entire state. Hospitals, prevention facilities, medical workers of different specialties, health service workers, local, public and state representatives - all should play their role to control tuberculosis successfully. Scientific and methodological assistance is provided by F.G. Yanovsky Institute of Phthisiology and Pulmonology of the Academy of Medical Sciences of Ukraine and phthisiology and pulmonology chairs of Ukrainian institutions of higher medical education of the 3rd-4th degree of accreditation.
The main organizational and methodical center of tuberculosis control is a TB dispensary, a specialized treatment- and-prophylactic facility working towards decreasing the infection and morbidity of tuberculosis, disability and mortality from tuberculosis in the population of a given area.
ORGANIZATION OF TUBERCULOSIS CASE FIND

METHODS OF CASE FIND:

• FLUOROGRAPHY;
• MICROSCOPY OF SPUTUM SMEAR IN ADULTS;
• TUBERCULIN DIAGNOSTICS PERFORMED IN RISK GROUPS AND MASS TUBERCULIN DIAGNOSTICS AT THE AGE OF 7 AND 14 YEARS BEFORE REVACCINATION.
WAYS OF CASE FIND:

- FOLLOW UP AFTER INDIVIDUALS WITH INCREASED RISK FOR TUBERCULOSIS (FLUOROGRAPHY EVALUATION).

- FINDING OF TUBERCULOSIS UPON VISIT TO DOCTOR;

- ACTIVE PROPHYLACTIC EVALUATION FOR TUBERCULOSIS (BY MEANS OF FLUOROGRAPHY) PERFORMED IN SPECIALISTS OF CERTAIN PROFESSION.
CATEGORIES OF POPULATION WITH INCREASED RISK OF CONTRACTING TUBERCULOSIS:

CONTACTS:

- OCCUPATIONAL CONTACTS;
- HOUSEHOLD CONTACTS;
- PENITENTIAL CONTACTS (JAIL, PRISON CONTACTS).
DUE TO MEDICAL FACTORS:
• PATIENTS WITH GASTRIC AND DUODENAL ULCER, DIABETES MELLITUS, CHRONIC NON-SPECIFIC AND OCCUPATIONAL RESPIRATORY DISEASES;
• HIV INFECTED AND PATIENTS WITH AIDS AND OTHER IMMUNODEFICIENCY STATES;
• PERSONS WITH RESIDUAL ALTERATIONS AFTER RECOVERY FROM TUBERCULOSIS;
• INDIVIDUALS ON LONG-TERM CORTICOSTEROID AND IMMUNODEPRESSANT THERAPY;

DUE TO SOCIAL FACTORS:
• INDIVIDUALS WITHOUT PERMANENT RESIDENCE;
• REFUGEES, MIGRANTS, JOBLESS;
• ALCOHOLICS, DRUG ADDICTS;
• INDIVIDUALS RETURNED FROM PENITENTIAL FACILITIES (FOR PERIOD OF 3 YEARS);
FINDING OF TUBERCULOSIS UPON VISIT TO DOCTOR

PATIENTS WITH TUBERCULOSIS-LIKE SYMPTOMS (DRY OR PRODUCTIVE COUGH FOR 2 WEEKS AND MORE, BREATH RELATED CHEST PAIN, HEMOPTYSIS, PULMONARY BLEEDING, FEVER, GENERAL WEAKNESS, LOSS OF APPETITE, WEIGHT LOSS, AND INCREASED SWEATING) SHOULD BE EVALUATED IN OUTPATIENT DEPARTMENT AS FOLLOWS:

- CASE HISTORY (COMPLAINTS, HISTORY OF DISEASE AND LIFE);
- PHYSICAL EXAMINATION (INSPECTION, PALPATION, PERCUSSION, AND AUSCULTATION);
- COMMON BLOOD COUNT;
- CHEST X-RAY;
- BACTERIOSCOPY OF SPUTUM FOR AFB NO LESS THEN IN 2 SMEARS.
VARIANTS OF RESULTS OF PRIMARY SPUTUM TESTING AND X-RAY DIAGNOSTICS RECEIVED IN GENERAL MEDICAL FACILITY

PATIENTS WITH TUBERCULOSIS-LIKE SYMPTOMS

BACTERIOSCOPY OF SPUTUM FOR AFB NO LESS THEN IN 2 SMEARS

CHEST X-RAY

ACID-FAST BACTERIA ARE FOUND IN AT LEAST ONE OF 2 SPECIMENS OF SPUTUM

PATIENT IS REFERRED TO ANTITUBERCULAR DISPENSARY FOR VERIFICATION OF DIAGNOSIS.
PATIENTS WITH TUBERCULOSIS-LIKE SYMPTOMS

BACTERIOSCOPY OF SPUTUM FOR AFB NO LESS THAN IN 2 SMEARS
CHEST X-RAY

ACID-FAST BACTERIA ARE NOT FOUND IN ANY ONE OF 2 SPECIMENS OF SPUTUM BUT THERE ARE DISSEMINATION, ROUND SHADOW, CAVITY, PLEURITIS, ENLARGEMENT OF INTRATHORACIC LYMPH NODES.

PATIENT IS REFERRED TO ANTITUBERCULAR DISPENSARY FOR VERIFICATION OF DIAGNOSIS.
VARIANTS OF RESULTS OF PRIMARY SPUTUM TESTING AND X-RAY DIAGNOSTICS RECEIVED IN GENERAL MEDICAL FACILITY

PATIENTS WITH TUBERCULOSIS-LIKE SYMPTOMS

BACTERIOSCOPY OF SPUTUM FOR AFB NO LESS THEN IN 2 SMEARS

CHEST X-RAY

ACID-FAST BACTERIA ARE NOT FOUND IN ANY ONE OF 2 SPECIMENS OF SPUTUM BUT THERE ARE INFILTRATION OR FOCAL ALTERATIONS IN LUNGS ON CHEST X-RAY

PATIENT RECEIVES WIDE SPECTRUM ANTIBIOTICS FOR TWO WEEKS. ANTITUBERCULAR DRUGS ARE NOT TO BE USED (SUCH AS STREPTOMYCIN, KANAMYCIN, CAPREOMYCIN, MYCOBUTIN, FLUOROQUINOLONES).

WHEN POSITIVE EFFECT IS RECEIVED AFTER SUCH TREATMENT THEN DIAGNOSIS OF TUBERCULOSIS IS NOT CONSIDERED
VARIANTS OF RESULTS OF PRIMARY SPUTUM TESTING AND X-RAY DIAGNOSTICS RECEIVED IN GENERAL MEDICAL FACILITY

PATIENTS WITH TUBERCULOSIS-LIKE SYMPTOMS

BACTERIOSCOPY OF SPUTUM FOR AFB NO LESS THEN IN 2 SMEARS
CHEST X-RAY

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ABSENCE OF POSITIVE EFFECT FROM WIDE SPECTRUM ANTIBIOTICS

PATIENT IS REFERRED TO ANTITUBERCULAR DISPENSARY FOR VERIFICATION OF DIAGNOSIS.
TB CASE

NEW CASE:
- PATIENTS WHO WERE NEVER DIAGNOSED WITH TUBERCULOSIS BEFORE;
- PATIENTS WHO RECEIVED ANTITUBERCULAR MEDICATION FOR LESS THAN 1 MONTH AND WERE NOT REGISTERED AS PATIENTS WITH TUBERCULOSIS.

RELAPSE:
RENEWAL OF ACTIVE TUBERCULOSIS AFTER SUCCESSFUL TREATMENT OF PREVIOUS ONE BEFORE THE END OF BASIC COURSE OF TREATMENT.

CHRONIC TUBERCULOSIS:
TUBERCULOSIS THAT REMAINS ACTIVE FOR TWO YEARS AFTER FINISHED BASIC COURSE OF TREATMENT OR AFTER SEVERAL COURSES OF TREATMENT INCLUDING SURGICAL ONE.
GROUPS OF PATIENTS FOR DISPENSARY FOLLOW-UP

ALL PATIENTS OF ANTI-TUBERCULOSIS DISPENSARIES ARE DIVIDED UNDER 5 CATEGORIES.

FIRST 4 CATEGORIES INCLUDE PATIENTS WITH ACTIVE TUBERCULOSIS OF DIFFERENT LOCALIZATION.

FIFTH CATEGORY INCLUDES PERSONS, WHO HAVE RECOVERED FROM TUBERCULOSIS, AND ALSO PERSONS FROM THE RISK GROUP OF PRIMARY OR RECURRENT TUBERCULOSIS.
TO THE 1-st CATEGORY BELONG:

- NEW CASES OF TUBERCULOSIS OF DIFFERENT LOCALIZATION WITH BACTERIAL SEEDING (NCTB MBT+);

- PATIENTS WITH OTHER (ADVANCED AND SPREAD) TYPES OF TUBERCULOSIS OF DIFFERENT LOCALIZATION WITHOUT BACTERIAL SEEDING (NCTB MBT-), SUCH AS PATIENTS WITH MILIARY, DISSEMINATED TUBERCULOSIS, MENINGITIS, PLEURITIS (WITH GRAVE COURSE), TUBERCULAR PERICARDITIS, PERITONITIS, TUBERCULOSIS OF BOWEL, TUBERCULOSIS OF SPINE WITH NEUROLOGICAL COMPLICATIONS, UROGENITAL TUBERCULOSIS.
TO THE 2-nd CATEGORY BELONG:

- PATIENTS WITH RELAPSE OF TUBERCULOSIS OF DIFFERENT LOCALIZATION WITH BACTERIAL SEEDING (RTB MBT+);

- NEW CASES OF TUBERCULOSIS OF DIFFERENT LOCALIZATION WHO WERE UNSUCCESSFULLY TREATED, WITH BACTERIAL SEEDING;

- PATIENTS WHO DISCONTINUED ANTIMYCOBACTERIAL TREATMENT FOR OVER 2 MONTHS, WITH BACTERIAL SEEDING;
TO 3 CATEGORY BELONG:

- NEW CASES OF TUBERCULOSIS OF DIFFERENT LOCALIZATION WITHOUT BACTERIAL SEEDING;

- PATIENTS WITH LOCAL INFECTION OF LUNGS (NO MORE THEN 2 SEGMENTS AFFECTED) AND CASES OF EXTRAPULMONARY TUBERCULOSIS, NOT INCLUDED IN 1 CATEGORY.
TO 4 CATEGORY BELONG:

- PATIENTS WITH MULTIPLE DRUG RESISTANCE TUBERCULOSIS (MDR-TB);

- PATIENTS WITH EXTENSIVELY DRUG RESISTANCE TUBERCULOSIS (XDR-TB);

- PATIENTS WITH CONFIRMED CASES DRUG RESISTANCE TUBERCULOSIS, WHO REQUIRES TREATMENT MORE THEN 12 MOUNTH.
TO 5.1 CATEGORY BELONG (adults):

PATIENTS WITH CASES OF RESIDUAL ALTERATIONS AFTER RECOVERY FROM TUBERCULOSIS OF DIFFERENT LOCALIZATION.

5.2 CATEGORY (adults):

INCLUDES CONTACTS WITH BACTERIAL SEEDING PATIENTS WITH TUBERCULOSIS, AND THOSE WHO CONTACTED WITH DISEASED ANIMALS.

FOR CHILDREN: category 5.1 (group 5.1A, 5.1B), category 5.2 (group 5.2A, 5.2B)-like in adults; category 5.3-children with tubercular alterations of indefinite activity of infection; category 5.4 (group 5.4A, 5.4B, 5.4 C, 5.4 D, 5.4 E)- risk groups for TB, post-BCG vaccination complications, HIV.
EFFECTIVE TREATMENT

- Recovery is completion of full course of treatment (including surgical when indicated), resulting into ceasing of bacterial seeding, healing of cavems, dissolution of infiltration and tubercular foci (or latter consolidated).

- Completed treatment is completed basic course of antibacterial therapy (including surgical when indicated) but there is no verification of recovery or data on MBT cultures are absent, or there is no confirmation of cavem healing on tomography, or there is no special evaluation of persons with extrapulmonary tuberculosis, that is a patient does not correspond to criteria of ‘recovery’ and ‘ineffective treatment’.

- Ceasing of bacterial seeding is described when full course of treatment is completed and bacterial seeding has stopped, which is confirmed by no less then 2 microscopy and culture, but areas of destruction (cavems) did not heal.
INEFFECTIVE (FAILED) TREATMENT

- in new case with positive bacterioscopy result after 5 and more months of treatment;

- in patients who ceased taking medication for 2 and more months before completion of 5 months chemotherapy and who had positive last bacterioscopy for MBT.

- patients who had negative bacterioscopy at the beginning of treatment and became positive on the 2nd month of treatment.
DISCONTINUED TREATMENT is considered in patient who began to receive therapy after 2 and more months of not taking medication, independent on last bacterioscopy results. After course is discontinued a patients receives repeated course of antimycobacterial therapy such as patients of 2\textsuperscript{nd} category do.

CONTINUED TREATMENT is registered in patient who did not complete therapy or have already completed basic standard course of treatment, but therapy was prolonged due to its ineffectiveness.

LOST FOR FOLLOW UP / TRANSFERRED are those patients who moved to another residence, transferred to another area and results of their treatment are unknown.

LETHAL OUTCOME
**CLINICAL RECOVERY** is stable healing from tuberculosis verified by long term follow up. It is determined according to two basic signs: a. size of residual alterations, and b. presence of grave concomitant diseases.

**STABILIZATION OF PROCESS** healing of specific process with the same signs as in recovery, but positive dynamic of residual changes is absent when X-ray and tomography scans done in 3-6 months period, are compared.

**RESIDUAL ALTERATIONS** are changes remaining after recovery from tuberculosis. There are small and large changes depending on size, character, and spread of residual changes.
TUBERCULOSIS PREVENTION

SOCIAL PREVENTION

Includes measures on the state level directed at increase of quality of life of population.

Three levels of control measures:

- **Administrative controls:** managerial measures to reduce risk of exposure to *M. tuberculosis*

- **Environmental controls:** engineering systems to prevent the spread of and reduce the concentration of infectious *M. tuberculosis* droplet nuclei in air

- **Respiratory-protection controls:** personal protection to further minimize risk for exposure to *M. tuberculosis*
TUBERCULOSIS PREVENTION

Administrative Controls (reasonable location of departments in antitubercular institution; isolation of bacteria seeding patients until termination of spread, which is verified on microscopy, and regulation of patient admition)

Environmental Controls (system of ventilation, sterilization with ultraviolet lamps)

Respiratory Protection (hygiene of patient’s cough, wearing surgical masks by bacterial seeder, and wearing respirators with heafilters by medical staff contacting with MBT seeding patients)
TUBERCULOSIS PREVENTION

Environmental control

Consist of technologies that are designed to remove or inactivate airborne *M. tuberculosis*

- Ventilation technologies
- High efficiency particulate air filtration (HEPA)
- Ultraviolet germicidal irradiation (UVGI)
TUBERCULOSIS PREVENTION

Ventilation Technologies

• Ventilation is the movement of air in a building and the replacement of air inside with air from outside

• Ventilation technologies include:
  – Natural ventilation
  – Mechanical ventilation
TUBERCULOSIS PREVENTION

Natural ventilation

- Doors and windows should be open
- Fans can be used to distribute air
- HCW should sit near fresh air source
- Can be useful for nontraditional settings that do not have a central ventilation system
Mechanical Ventilation

- Refers to the use of technological equipment to circulate and move air
- Consists of two types of technologies
  - Local exhaust ventilation
  - General ventilation
- Should be used by hospitals, TB clinics, and other settings where TB patients are expected
HEPA Filters

- HEPA filters are special filters used to remove droplet nuclei from air
- Must be used when releasing air from:
  - Local exhaust ventilation booths to surrounding area
  - All room to general ventilation system
TUBERCULOSIS PREVENTION

UVGI

• UVGI is air cleaning technology that consists of lamps that give off UV light, which can kill tubercle bacilli

• Should be used with other infection control measures

• UV light can be harmful to skin and eyes
TUBERCULOSIS PREVENTION

Respiratory-Protection Controls

• Third level of infection-control that includes:
  – Implementing a respiratory-protection program
  – Training health care workers on respiratory-protection
  – Educating patients on respiratory hygiene
TUBERCULOSIS PREVENTION

Respiratory-Protection Controls

- Should be used in:
  - TB All rooms
  - Cough-inducing procedure rooms
  - Ambulances transporting infectious TB patients
  - Homes of infectious TB patients
Respirators that can be used to protect against *M. tuberculosis*:

- Nonpowered respirators with N95, N99, N100, R95, R99, R100, P95, P99, and P100 filters
- Powered air-purifying respirators (PAPRs) with high-efficiency filters
TUBERCULOSIS PREVENTION

Health care worker wearing a personal respirator
TUBERCULOSIS PREVENTION

Patient wearing a surgical mask
Sanitary prevention is sanitizing of foci of tubercular infection, sanitary and veterinarian follow up, sanitary and educational work, and early case find and treatment of new cases of tuberculosis.
TUBERCULOSIS PREVENTION

Criteria for hazard of focus are:

1. massiveness of bacterial seeding;
2. presence of children and teenagers in focus of tubercular infection;
3. conditions of life and following sanitary and hygienic conditions in focus of tubercular infection.
TUBERCULOSIS PREVENTION

Bacterial seeding might be:

1. massive, when MBT are found in light microscope bacterioscopy or with culture (over 20 colonies);
2. scarce, when MBT are found only with bacteriology (no more than 20 colonies);
3. formal (conditional), when bacterial seeding has stopped, but patient is still registered in epidemiological registry.
Foci of tubercular infection are divided **into three groups** depending on their hazard.

**Classification of foci of tubercular infection:**

1. **1 group** (epidemiologically most dangerous) finding in patient residing in the focus:
   a. massive (permanent or periodical) bacterial seeding;
   b. scarce bacterial seeding if children and teenagers live in the focus or when complicating factors are present, such as inadequate living conditions, not following sanitary and hygienic rules, alcohol abuse.
TUBERCULOSIS PREVENTION

2 group (epidemiologically less dangerous) is finding in a patient:

a. scarce bacterial seeding when only adults live in the focus without complicating factors;

b. formal bacterial seeding, if children and teenagers or at least one complicating factor are present in focus of tubercular infection;

3 group (with potential for epidemiologic hazard) when patient has formal bacterial seeding, only adults reside in the focus and no complicating factors are present.
TUBERCULOSIS PREVENTION

First measures in focus of tubercular infection are as follows:

1. hospitalization of patient and intensive treatment in hospital followed with controlled ambulation chemotherapy;
2. current and complete disinfection (by sanitary and epidemiological station);
3. isolation of children from bacterial seeder (hospitalization of patients or placement of children in pediatric facilities);
4. vaccination of newborns or re-vaccination of non-infected with BCG;
5. regular evaluation of contacts and their chemoprophylaxis;
6. improvement of living conditions.
Specific primary prophylaxis of tuberculosis is vaccination (BCG, BCG-M), revaccination and chemoprophylaxis.

BCG is the only vaccine available for prevention of TB in humans. BCG is an attenuated live vaccine that was obtained after 230 successive passages in the laboratory between 1908 and 1921 (1919) from a pathogenic strain of M. bovis.
TUBERCULOSIS PREVENTION

BCG stimulates immunity increasing the body’s defenses without itself causing damage.

Following BCG vaccination TB may enter the body but in most cases the body’s increased defenses will control or kill them.

BCG protects children against severe forms of tuberculosis – miliary and tuberculous meningitis.
The present recommendation by WHO and International Union against Tuberculosis is that in countries with high tuberculosis prevalence BCG should be given as a routine to all infants.
Dry BCG vaccine for intradermal injection is used for active specific prophylaxis of tuberculosis. It consists of alive Mycobacteria of vaccine strain of BCG-1 lyophilized in 1.5% solution of sodium glutaminate. BCG-M is used for sparing vaccination (half dose of BCG). Vaccine is available in ampoules sealed under vacuum and containing 1.0 mg of dry BCG vaccine or 0.5 mg of BCG-M. 1 mg of vaccine contains 8 million of bacilli (0.05 mg has 400 thousand bacilli).
TUBERCULOSIS PREVENTION

• The effect of BCG lasts about 7-15 years.

• In Ukraine first vaccination is carried out on the 2 day of life.

• Repeated vaccination (revaccination) is performed at the age of 7 and 14 years

With correct technique injection should be followed by whitish papule 6-8 mm in diameter (5-6 mm in newborns), which disappears in 15-20 minutes.
TUBERCULOSIS PREVENTION

Contraindications for BCG vaccination:

- Body weight of premature infants being less than 2,000 g;
- Intrauterine infection;
- Neonatal trauma with neurological disturbances;
- Any acute disease;
- Purulent skin infections;
- Hemolytic disease;
- Generalized BCG infection in other children of the family;
- Inborn enzimopathy;
- Inborn immunodeficiency.
TUBERCULOSIS PREVENTION

- Children infected with TB in the past
- Doubtful Mantoux test reaction
- Complication of BCG vaccination at birth
- Allergy
- Any acute disease
- Exacerbation of chronic disease
- Blood cancers, tumors
- Immunodeficiency and long-term immunosuppressive therapy
TUBERCULOSIS PREVENTION

Most frequent complications

- Cold subcutaneous abscess
- Superficial ulceration
- Post-vaccination lymphadenitis of regional (armpit) lymphatic node
- Keloid scar

Complications could be caused by:
- Wrong technique
- Neglecting of contraindications
TUBERCULOSIS PREVENTION

Basics of DOTS-strategy

Dutch scientist Carel Stiblo, after working in many countries of Africa where antitubercular facilities are absent, suggested treating patients with tuberculosis under strict control, finding cases upon visit to doctor and verify tuberculosis with microscopy of smear. His suggestions laid ground for DOTS-strategy.
Abbreviation DOTS stands for “D” – direct, “O” – observed, “T” – treatment, “S” - short course of chemotherapy. This abbreviation does not include many other elements of DOTS, for instance passive method of case find, etc.
TUBERCULOSIS PREVENTION

*DOTS includes 5 basic principles:*

1. Political obligations. This means political and financial support of DOTS-strategy from country’s government.

2. Diagnostics. This means case find and verification of tuberculosis with microscopy of smear. Rest of methods of case find (fluorography, tuberculin diagnostics, laboratory, biochemical, immunological) are not prohibited but are not recommended by DOTS strategy.

3. Treatment. This means short term and chiefly ambulatory 6-8 months courses of standard chemotherapy under control. Pathogenetic principles are not recommended, as these do not affect pathogen while costing much. These are prescribed in side effect of chemotherapy drugs. Treatment is standardized and controlled. Ambulatory nurse provides control over treatment. Surgeons treat chronic tuberculosis and complications of tuberculosis.
4. Material and technical provision consists of regular and reliable delivery of needed antitubercular drugs, microscopes, cover glasses, Ziehl-Neelsen dye, report forms, computers, etc. Government should provide for centralized purchase of chemotherapy drugs of I line for 6-8 months of treatment and allot them to all administrated territory of Ukraine. Chemotherapy drugs purchase should be done twice a year.

5. Control is reliable and adequate reporting.
TUBERCULOSIS PREVENTION

Purpose of DOTS-strategy:

1. To find 70% of MBT-positive patients (with bacterial seeding).
2. To provide recovery of 85% of patients with bacterial seeding and more.
World Tuberculosis Day (March 24)
Thank you