# Chronic lung diseases

## Bronchopulmonary dysplasia

[ ✎ upravit vložený článek ]

**Bronchopulmonary dysplasia (BPD)**, more recently **chronic lung disease (CLD)** is a neonatal form of chronic lung disease. BPD is defined as the persistent dependence of an initially immature newborn on oxygen or ventilatory support at the age of 28 days. Bronchopulmonary dysplasia shows signs of respiratory distress. The essence of the problem is the restriction of the respiratory surface of the lungs with an increase in interstitial ligament. The X-ray correlate is lung fibrotization with focal emphysema. The development of BPD involves anatomical and functional immaturity of lung tissue and the effects of infection, amniotic fluid aspiration, artificial lung ventilation, oxygen administration, etc. In addition to ventilation support and oxygen therapy, treatment includes adequate nutrition and balance of the internal environment. Protection against respiratory infections is important. Bronchopulmonary dysplasia tends to gradually regress.

**The "new" form of bronchopulmonary dysplasia** affects extremely low birth weight infants who initially had no or only mild ventilation support and minimal oxygen requirements.

Bronchopulmonary dysplasia is defined as persistent oxygen dependence or ventilatory support at 28 days of age. The severity of respiratory distress in early childhood due to BPD can be more accurately determined by oxygen dependence at 36 weeks postconception age in children born before 32 weeks of gestation and at 56 days in children born after 32 weeks of gestation. It is during this period that the weight of BPD is determined. It is divided according to the ventilation support needed to keep the saturation above 89%:

- **mild BPD** - no need for oxygen therapy (at 36 weeks postconception age or 56 days);
- **moderate BPD** - if oxygen therapy is necessary up to 30% oxygen;
- **severe BPD** - when > 30% oxygen is needed and / or CPAP (*continuous positive airway pressure*) or artificial lung ventilation is required.

**The incidence** of bronchopulmonary dysplasia increases with decreasing birth weight. It affects about 30 % of children with a birth weight of less than 1000 g.

The main **risk factors** for the development of bronchopulmonary dysplasia include:

- immaturity (increasing number of surviving extremely immature infants), white race, male gender,
- chorioamnitis, colonization of the tracheal ureaplasma.

Other risk factors are:

- RDS (*Respiratory Distress Syndrome*), excessive early administration of intravenous fluids, symptomatic PDA (*ductus arteriosus patens*), sepsis, oxygen therapy, vitamin A deficiency, occurrence of atopy in the family.

### Pathophysiology

The following are involved in the development of bronchopulmonary dysplasia:

- **inflammation** - increased inflammatory response in the first days of life (influx of proinflammatory cytokines, macrophages and leukocytes into the alveoli);
- **artificial lung ventilation** - volumotrauma and barotrauma;
- **oxygen therapy** - hyperoxia causes proliferation of alveolar cells II. type and fibroblasts, changes in the surfactant system, increases the concentration of inflammatory cells and cytokines, increases collagen deposition and reduces alveolarization and microvascular density.

The damaged lungs heal abnormally, structural changes occur, such as slowed alveolarization and pulmonary vascular dysgenesis. Lungs affected by BPD have fewer septas, fewer alveoli, larger alveoli, reduced pulmonary capillarization, which can lead to secondary pulmonary hypertension.

### The clinical picture

- Progressive idiopathic deterioration of lung function - the need for oxygen therapy and / or ventilation support after the first week of life. Increased breathing (tugging of the intercostal spaces and jugula), episodes of apnea and bradycardia, wheezing, prolonged expiration. Pulmonary edema, hyperreactive airways.
- Failure and growth retardation.
- Cor pulmonale, enlarged liver due to right heart failure or liver movement caudally due to lung hyperinflation.

### Diagnosis

- anamnesis;
- characteristic clinical picture;
- ABR: carbon dioxide retention, pH usually subnormal (≥ 7.25);

- electrolytes - changes due to chronic hypercapnia (compensatory increased bicarbonate), diuretic treatment (hyponatremia, hypokalemia, hypochloraemia) and fluid restriction (increased urea and creatinine);
- typical X-ray finding - diffusely small infiltrates appear, signs of lung hyperinflation X-ray stages of bronchopulmonary dysplasia:

  I. diffuse reticulogranular lung drawing with a positive aerobronchogram,
  II. continued shading of the lungs,
  III. formation of numerous cysts,
  IV. increasing size of individual bullous cysts and atelectases (= dystelectases) with the development of cardiomegaly,

- Functional examination of the lungs - shows obstruction (partially reversible after administration of bronchodilators).
- Chronic hypoxia, pulmonary edema and cor pulmonale develop.

## Prevention

- prevention of prematurity and respiratory distress syndrome (good prenatal care, induction of pulmonary maturity with corticosteroids);
- minimization of risk factors (optimization of oxygen therapy, gentle ventilation, accurate calculation of administered fluids, PDA closure, nutrition optimization);
- vitamin A is an important factor in epithelial cell differentiation and repair; extremely immature infants have low levels of vitamin A; it can be supplemented by them;
- caffeine reduces the frequency of apnea and thus allows for earlier extubation;
- inhaled nitric oxide (iNO) reduces pulmonary vascular resistance and the need for mechanical ventilation.

## Therapy

### Minimization of ventilatory support

Adequate oxygenation and ventilation with acceptance of permissive hypercapnia; saturation monitoring. It is very important to achieve disconnection from the fan as soon as possible.

### Improvement in lung function

- Fluid restriction (usually to 120 ml/kg/day) and increase in caloric density.
- Diuretics: furosemide (side effects: electrolyte imbalance, interference with bilirubin albumin binding capacity, calciuria and nephrocalcinosis, bone demineralization, kidney stone formation, ototoxicity); bumetanide; chlorothiazide and spironolactone (more suitable for chronic therapy than furosemide for less common side effects).
- Bronchodilators: inhaled β2-agonists for the treatment of acute exacerbations (side effects: tachycardia, hypertension, hyperglycaemia, arrhythmias), inhaled anticholinergics (ipratropium bromide), theophylline - airway smooth muscle dilatation, improvement of diaphragm contractility, respiratory center stimulation and prevention diuretic effect. Side effects: irritability, gastroesophageal reflux, gastrointestinal irritation.
- Corticosteroids: dexamethasone (side effects: impaired brain development and growth, higher incidence of cerebral palsy, risk of infection, hypertension, gastric ulcers, hyperglycaemia, adrenocortical suppression, impaired lung growth and hypertrophic cardiomyopathy), methylprednisolone, nebulized non-corticosteroids, smaller effect).
- Chest physiotherapy.

### Optimizing growth and nutrition

Coverage of increased energy requirements (120 - 150 kcal/ kg/day).

### Prevention of respiratory disease

Seasonal vaccination against RSV - *Human respiratory syncytial virus* (palivizumab - humanized monoclonal antibody).

Indication criteria for the Czech Republic (2014):

- Newborns with BPD born at gestational age 28 + 6 and earlier. An age limit of 12 months or 12 months from discharge from the perinatology center applies to these patients.
- Newborns born at gestational age ≤ 28 + 6 or with birth weight ≤ 1000g, without BPD, born a maximum of 6 months before the start or discharge during the RSV season.
- Newborns born at gestational age 29 + 0 - 31 + 6, without BPD, with birth weight ≤ 1500 g, born a maximum of 6 months before the start of the RSV season or release during the RSV season (1. 11. - 31. 3.).
- All neonates with BPD, regardless of gestational week, who required treatment for BPD / CLD (oxygen therapy, bronchodilator therapy, corticoids, diuretics) for 6 months before the start of the RSV season. These newborns are entitled to immunoprophylaxis up to 2 years of age.
- Hospitalized immature infants at risk of nosocomial RSV infection are entitled to 1 dose of Synagis.

Only perinatology centers are authorized to prescribe Synagis.

**Home oxygen therapy**

At present, long-term home oxygen therapy is possible, which makes it possible to shorten the hospital stay and thus the risk of nosocomial infection, also enables the creation of a family bond and supports the child's psychomotor development. A mobile unit with liquid oxygen is used, which allows the child to move freely. BPD / CLD tends to gradually regress, with most children ceasing to be dependent on oxygen therapy within the first year.

### Complications

- Obstructive bronchitis , PPHN (persistent neonatal pulmonary hypertension), cor pulmonale, systemic hypertension, GERD (gastroesophageal reflux).

### Prognosis

The prognosis of bronchopulmonary dysplasia depends on the severity of the disease and possible comorbidities. During the first year of life, rehospitalizations for wheezing and respiratory infections are common, and death can result from cardiorespiratory failure, sepsis, respiratory infections, and SIDS (sudden infant death syndrome). Most children get rid of their oxygen dependence by the first birthday, and after an improvement in lung function, a growth spurt often occurs. Most adolescents and young adults who have had moderate or severe BPD in childhood have some degree of pulmonary dysfunction - obstruction, airway hyperresponsiveness, and hyperinflation.

Bronchopulmonary dysplasia is often accompanied by impaired neuromotor and cognitive functions, and there is a higher risk of hearing loss and retinopathy of prematurity, learning difficulties, attention deficit and behavioral disorders.

# Bronchiectasis

Bronchiectasis is characterised by enlarging of the bronchi, usually followed by their chronic inflammation. It appears most commonly in pre-school and school ages.

### Pathogenesis

Two important factors play a role: airway obstruction with insufficient mucus drainage and damage to the bronchial wall by infection or aspiration.

- *Division by shape:*
  - cylindrical;
  - spindle-shaped;
  - varicose;
  - sac-shaped.
- *Division by etiology:*
  - idiopathic;
  - inborn – on the basis of insufficient cartilage development (Williams-Campbell syndrome), congenital tracheobronchomegaly etc.
  - inflammatory – with primary disease such as CF, ciliary dyskinesia syndrome, immune deficits, and others;
  - post-infection – with TBC, after measles, pertussis, viral infections;
  - post-obstruction – inhaled foreign bodies, external compression of the bronchus, bronchial tumour.

### Clinical presentation

A typical presentation is chronic cough with sputum production, particularly in the morning. During the day the amount of sputum decreases. Auscultation - crackles over the affected area (findings are changeable according to how much the ectases are filled by mucus). Later, chronic hypoxia and cor pulmonale, and clubby fingers develop. In medical history, respiratory infections and dyspnea during exertion are common. The doctor should be alerted to the possibility of bronchiectasis by: chronic cough, lasting atelectasis, unimproving X-ray findings on the lungs after a respiratory infection.

### Diagnosis

- X-ray of lungs - peribronchial cuffing or areas with atelectases.
- Cystic changes in the lungs are possible.
- Can be assessed well by HRCT; nowadays all non-CF bronchiectases should be diagnosed on the basis of CT examination.
- Functional examination - sign of obstruction.

### Complications

- repeat pneumonia, hemoptysis, cor pulmonale;
- rarely abscesses.

### Therapy

Therapy consists of infection and bronchial secretion control. The removal of a part of the lung or arterial embolization lower possible complications. Furthermore, positional drainage is used. Mucolytics are used to remove mucus.

# Primary ciliary dyskinesia

- Older name: immotile cilia syndrome; OMIM: 244400
- It is a generalized disorder of motility of cilia and flagella of all cells, inherited in an autosomal recessive manner.
  - The movement is either completely absent or is uncoordinated.
  - It was originally described as part of Kartagener's syndrome (bronchiectasis, sinusitis, situs viscerum inversus).

### Clinical picture

- Impaired self-cleaning ability of the epithelium, productive expectoration and bronchiectasis occur.
- Other symptoms: sinusitis, chronic rhinitis, rhinorrhea, nasal polyps, recurrent otitis, conduction disorder hearing loss, tympanic perforation, DC obstruction, recurrent pneumonia, infertility.
- Situs viscerum inversus only occurs in about 50% of cases.
- Diagnosis: complicated confirmation and it is necessary to know the result of electron microscopy and high-speed video microscopy (HSVM).

### Therapy

- Symptomatic, similar to other bronchiectasis.

# Idiopathic pulmonary fibrosis

It is a diffuse, primarily fibrotic lung process.

### Pathogenesis

This is probably a uniform pathological response of lung tissue to both infectious and non-infectious agents. These cause damage to the lining of the alveoli and thus result in progressive and uncontrollable scarring. The inflammatory reaction as such can occur only secondarily.

### Epidemiology

- Patients are most often between the ages of 40 and 70.
- The incidence in women is 7.4 / 100,000 and in men 10.7 / 100,000.
- It occurs sporadically, is equally widespread in all localities, familial cases are rare.
- The disease is practically incurable, and even with adequate treatment, survival usually does not exceed 3-5 years.

### Clinical picture

- Onset – rolonged unproductive cough in time with worsening exertiona dyspnea, fatigue, weight loss, tachypnoe;
  - on the bases of lungs late inspiratory crepitus similar to Velcro opening;
  - eventually chronic hypoxia with cyanosis develops.
- In 2/3 of the patients there are club-shaped fingers with nails in the shape of a watch glass.
- Image of COPD without obstructive defect, in the later phase restrictive lung damage - reduction of FVC.
- Despite the typically protracted progressively deteriorating course, acute exacerbations may occur in some patients:
  - sudden clinical deterioration;
  - decreased lung function;
  - radiological image of the so-called milk glass (indicating alveolitis).

### Diagnostics

Here, HRCTs are crucial, and a typical clinical finding does not require a biopsy if systemic connective tissue diseases and an exogenous cause are excluded.

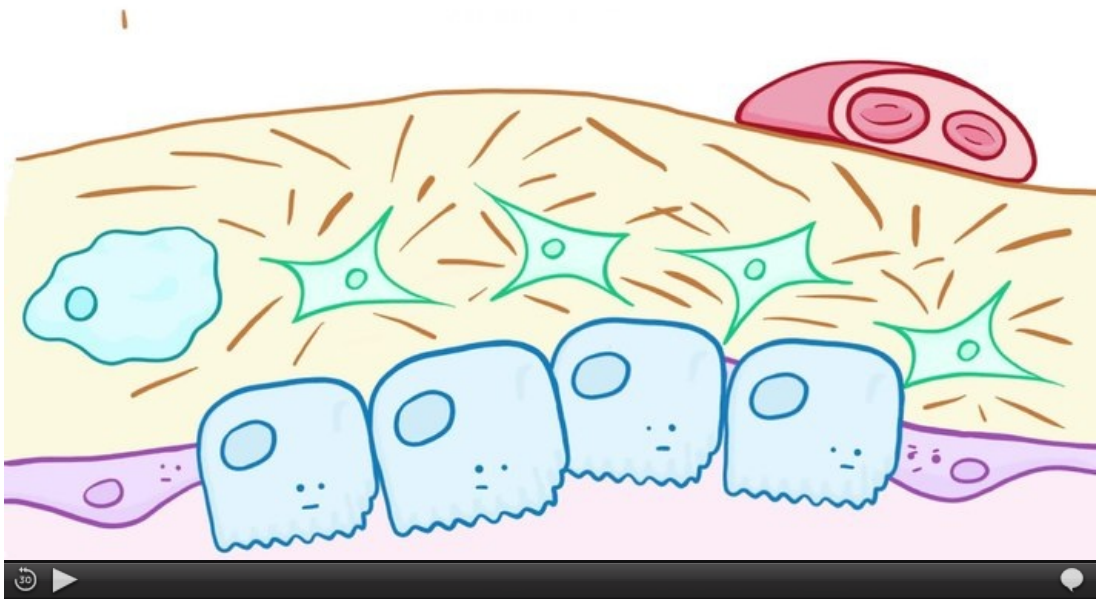
- HRCT image of the lungs: pulmonary fibrosis with an image of the honeycomb lung in the bases of the lungs

and minimal areas of active changes.
- Histology from a lung biopsy.
- In patients unable to undergo surgical biopsy, X-ray and bronchoscopy must be sufficient.
- X-ray: increased lung drawing to reticulation - honeycomb lung.
- Functional examination: restrictive ventilation disorder, pulmonary compliance disorder.

### Therapy

- Anti-inflammatory and immunosuppressive drugs are ineffective because the main pathological mechanism here is pathological fibroproduction, so they are not used in treatment today.
- Pirfenidon – inhibits fibrosis, indicated in patients with FVC 50-80%. Dosage 3x3cps - a total of 2403 mg.
- Nintedanib – a tyrosine kinase inhibitor on VEGFR, FGFR, and PDGFR
- Early alveolar lesions: N-acetylcystein 3 times 600 mg (antioxidant effect).
- Acute exacerbations: high doses of corticoids, anticoagulant therapy, and antibiotics. PPI (proton pump blockers) are given to prevent exacerbations.
- Advanced diseases with hypoxemia: long-term home oxygen therapy and consideration of lung transplantation.
- Corticosteroids in long-term therapy are ineffective, pbecause fibrotization is not induced by an inflammatory response.

### Summary video



Idiopathic pulmonary fibrosis (video in english)

# Exogenous allergic alveolitis

Exogenous allergic alveolitis (or hypersensitive pneumonitis, farmer's lung, pigeon's lung) includes a group of immunologically conditioned diseases (type III. hypersensitivity) with granulomatous inflammation in the bronchioles and alveoli. It is an interstitial pulmonary fibrosis caused by repeated contact with certain allergens. The most endangered group are workers of plant and animal production after repeated exposure to moldy hay, straw and grain. Exogenous allergic alveolitis also occurs while working with moldy malt, furs, moldy cheese, feather and bird excrement. It is rare in children and is most often caused by inhalation of organic dust from birds (pigeons, parrots, budgies).

### Diagnostics

- Patient's history, laboratory signs of inflammation, precipitating antibodies (specific IgG) in serum against including antigen
- Chest X-ray: reticulonodular drawing with mottled volatile infiltrates
- BAL: usually lymphocytic alveolitis, ↓ CD4/CD8
- Chronic phase: X-ray + HRCT image of interstitial pulmonary fibrosis/honeycomb lung; restriction, lung diffusion capacity disorder, hypoxemia; lung biopsy.

### Clinical picture

#### Acute

The acute form is reversible and develops within about 6 hours after intense antigen exposure. It expires within 48 hours. Physically, crepitus above the lung bases is demonstrable. The following characteristics are manifested:

- paroxysmal cough, fever, chill, malaise, myalgia, headache.

### Chronic

If antigen exposure persists, a chronic form of exogenous allergic alveolitis develops. In case of repeated exposure, lower concentrations of the respective antigen are also sufficient. Irreversible interstitial lung fibrosis (restriction disorder) occurs. The symptoms are:

- weight loss, fatigue, cough, dyspnoea and cyanosis, cor pulmonale, clubbed fingers, respiratory failure.

### Therapy

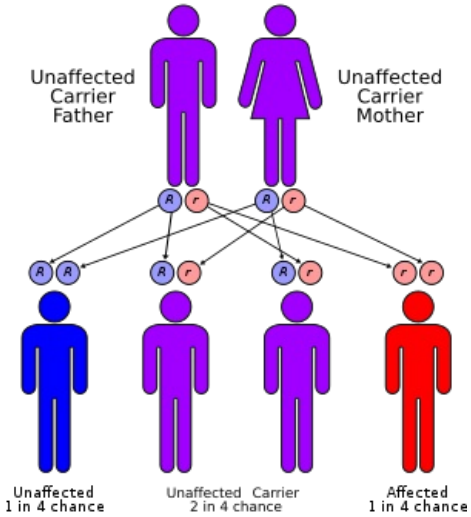
- Elimination of antigens – necessary permanent exclusion of the workers from exposure (for occupational diseases)
- corticoids
- oxygen therapy

# Cystic fibrosis

Cystic fibrosis or mucoviscidosis is a multisystem genetic condition, which in its classical form manifests itself in chronic progressive diseases of the respiratory tract and lungs , insufficiency of external secretion of the pancreas , high concentration of electrolytes in sweat and male reproductive disorders.

## Occurence and heredity

Cystic fibrosis is the most common life-threatening hereditary disease of the white race. The incidence in the Czech Republic is estimated at 1: 2,500, so 35–45 children with CF are born each year (but all cases are not diagnosed).




It is an autosomal recessive (AR) inherited disease. The defective cystic fibrosis transmembrane conductance regulator gene *CFTR* (cystic fibrosis transmembrane conductance regulator) is located on the long arm of chromosome 7. This gene encodes a chloride channel. About 2015 mutations of this gene are known (in 68 % the mutation is ΔF508).

## Pathogenesis

The defective cystic fibrosis transmembrane conductance regulator *CFTR* gene mutation results in a high concentration of chlorides and sodium in the sweat. In the respiratory tract, GIT and reproductive system, increased concentrations of chloride anions lead to excessive sodium reabsorption. Sodium is passively followed by water, which dehydrates the mucus and thus increases its viscosity. Most clinical manifestations of CF can be easily explained by mucus thickening. Periciliary fluid should normally be hypotonic, in CF it is isotonic, which impairs the ability of bactericide and the action of antimicrobial peptides (defensins). This explains the initial bacterial colonization. The infection stimulates the cells to produce more mucus, thus worsening the airway obstruction.

Fatty acids play another role – there is a disparity between arachidonic acid (there is more) and docosahexaenoic acid in the body. This plays a role mainly in the regulation of inflammation.

## Clinical picture

The clinical picture depends on the age at which the first symptoms appear:

- In neonates meconium ileus, prolonged jaundice and the fact that they do not reach their birth weight within 1 month are typical. Furthermore, hypoproteinemia with edema and metabolic breakdown – metabolic alkalosis.
- Infants are characterized by a lack of appetite, steatorrhea which gives the impression of cow´s milk orceliac intolerance and rectal prolapse.
- Older children tend to have growth failure, recurrent Sinusitis (often mistreated for asthma) and clubbing fingers.
- Azoospermia occurs in adulthood which may be the only symptom for some mutations. The most common respiratory problems include chronic cough, tachypnea, hemoptysis, bronchiectasis, nasal polyps and wheezing.

Respiratory manifestations

They can manifest at any stage of life. In infants it is usually critical, with severe Bronchiolitis. Atelectasis and pneumonia also occur. In later life the most common manifestation is a cough (dry, irritating or productive, associated with purulent expectoration). It is caused by exacerbations of lung infections. Young children swallow and vomit sputum. Some still cough, others have a cough-free period. Exacerbations are rarely accompanied by fever. A sensitive indicator of worsening airway damage is tachypnea.

The causes of respiratory infections are most often *S. aureus*, *Hemophilus*, *Pseudomonas* or *Burkholderia* (very resistant to ATB). *Pseudomonas* commonly occurs in the external environment and patients are mainly inhabited by its mucosal form. The prevalence of pseudomonas infections increases with age. They are often transferred from one CF patient to another, and therefore strict separation of CF patients is recommended. Pseudomonas is not dangerous for healthy individuals. Some strains of*Burkholderia cepacia* cause the so-called cepacia syndrome (septic with dispersed pneumonia), which quickly leads to death from abscessing pneumonia and sepsis. Fungal complications (*Aspergillus*). are not rare either. These infections cause serious chronic changes - permanent damage to the capillaries and the walls of the airways. Chronic bronchitis is complicated by bronchiectasis, Atelektasis and emphysema or chronic pansinusitis, often accompanied by nasal polyposis.Stick- shaped fingers develop early.

Serious respiratory complications of CF includepneumothorax, hemoptysis, global respiratory insufficiency. Partial respiratory failure is otherwise quite common, leading to pulmonary hypertension and development of cor pulmonale. The development of global insufficiency with Hypercapnia is a warning sign.

GIT disability

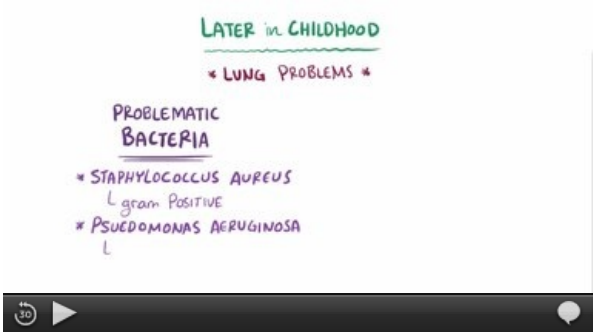
manifests itself mainly by failure and this subsequently adversely affects the course of respiratory infections. The main cause is insufficiency of the external secretion of the Pancreas, that the food is not sufficiently cleaved. Children have a balloon-raised belly that contrasts with the wand. The stools are bulky, greasy and foul-smelling. Children have a good appetite, but they do not increase (disproportionately to what they eat). This most often occurs during the transition to artificial nutrition, but pancreatic insufficiency may not be present and will manifest later, or if there is a great appetite, failure may be compensated.

There are also deficiencies of vitamins A, D, E, K, minerals a trace elements.

Rectal prolapse can sometimes be the first sign of disease. Later, it is present mainly in children with poor treatment or persistent cough. Frequent abdominal pain can have many causes, such as dilatation of the loops, flatulence, muscle pain from persistent cough, etc. Distal intestinal obstruction syndrome, congested intestinal obstruction, the so-called meconium ileus equivalent , can occur as an abdominal emergencies, in which dehydration is involved, etc. About 10–15% of CF patients are born with meconium ileus (intestinal obstruction in the first hours of life).

Hepatobiliary complications

manifest themselves in varying degrees of severity. They are caused by obstruction of the bile ducts. They can result in cirrhosis and portal hypertensis. It sometimes manifests as cholestatic jaundice, cholelitiasis and GER are common. Recurrent pancreatitis is mainly described in patients without a secretion defect.




**Other manifestations**

- **Diabetes mellitus** associated with CF is about 10%.
- Dilated cardiomyopathy.
- Chronic infections, which are thought to cause many autoimmune processes.
- Osteoporosis, which is present in almost a quarter of adult patients.
- 98% of men are infertile due to obstruction of the vas deferens (obstructive azoospermia).

## Diagnosis and differential diagnosis

Diagnosis is based on:

1. a clinical suspicion,
2. assessment of chloride concentration in sweat,
3. molecular-genetic testing.

A clinical suspicion arises from the main symptomps of cystic fibrosis, which must give rise to suspicion:

- a chronic sinopulmonary syndrome,
- clubbing of the fingers,
- proof of pseudomonas,
- x-ray image,
- digestive issues,
- family history of cystic fibrosis,
- proof of azoospermia.

The sweat test is based on stimulation of sweating by using the pilocarpine iontophoresis, collecting of the sweat and a analysis of chlorides. Normal values of chloride are 10–30 mmol/l, cystic fibrosis is characterised by values above 60 mmol/l. During pilocarpine iontophoresis, a direct current of 4 mA is used. Via this current, the pilocarpine

is driven into the skin and it reaches the sweat glands, thus stimulating sweating. Sweat is collected after the iontophoresis is finished in the place of the positive electrode (the anode). All patients with a positive test should undergo an analysis of the genotype.

Genetic testing is most commonly performed on leukocytes from venous blood of children and adults, or from the cells of the amniotic fluid or the chorionic cells in case of a prenatal diagnosis. It is necessary for the confirmation of the diagnosis. It makes it possible to detect carriers in a high risk family, based on which a targeted prenatal diagnosis can be offered.

Examination of pancreatic function is not necessary for the diagnosis of cystic fibrosis, it is however necessary to decide on a possibility of substitution treatment. Quantitative examination of faecal fat loss is used. Examination of stool for presence of elastase via ELISA.

Monitoring of nutrition – height, weight, weight to height and arm circumference ratio (in percentiles).

Airway secretion microbiology should be performed at every examination, in order to infection in a timely manner.

X-ray of the lungs is characteristic, it is performed when an infectious complication is suspected, and it is also performed regularly once every year. Bronchovascular markings are multiplied, hiluses are enlarged. Pus filled bronchiectasis and emphysematous bullae indicate severe damage. Signs of emphysema (especially in the side image) occurring mainly retrosternally and retrocardially are significant. HRCT can be used for better diagnosis.

Examination of lung function – early manifestation is an obstruction of the peripheral airways, later hyperinflation and obstruction of the central airways increase..

Blood gas tests are also regularly used for an early detection if respiratory insufficiency. Pulse oximetry also works as a guide (in case of saturation under 92 % we indicate Astrup).

Inflamatory markers are regularly monitored, aswell as liver tests twice per year, annual ECG tests, vitamin levels of A and E. In children older than 10 years, we also examine glucose intolerancy oGTT, bone age and USG of the liver.

Differential diagnosis is used while considering recurrent airway inflammation, sinobronchial syndrome, eventually asthma bronchiale. In gastrointestinal manifestations of celiac disease.

Since October 2009, a test for cystic fibrosis has been part of prenatal screening.

## Therapy

The treatment must be intensive and comprehensive, the child must be dispensed (ideally once a month, at least quarterly). The treatment of respiratory manifestations consists mainly in the fight against infection and care for airway patency. It is important to prevent, such as vaccinations, especially against the flu, and and to support coughing, for example with "Flutter", which is a „ball“, that vibrates when you exhale and thus improves the movement of mucus in the bronchus.

When exacerbating a respiratory infection we initiate targeted, intensive antibiotic therapy. To achieve a therapeutic serum concentration, a CF patient needs higher doses. For the first seizure of Pseudomonas we use per os *ciprofloxacin (30 mg/kg/day)* and *colistin* by inhalation. *Fluoroquinolones* are rarely used in pediatrics because they damage the growth cartilage. They are indicated only for CF and vital indications. In children chronically infected with pseudomonas, we give ATB 3-4 times a year for 14 days, etc. ATB, regardless of the clinical condition (combination -*aminoglycoside + beta-lactam*, or *cotrimoxazole*). We essentially avoid monotherapy because it often leads to resistance.

Anti-inflammatory treatment consists mainly in the administration of NSAIDs (corticoids are effective but have many side effects). *Ibuprofen* is given at a dose of 20-30 mg / kg twice a day. Airway patency, dilution of secretions, is ensured by inhalation of mucolytics (*N-acetylcystein*, *bromhexin*, *ambroxol*). Purulent secretion dissolves recombinant human deoxyribonuclease very well (dissolves DNA from decayed PMNs), administered by inhalation.

Bronchodilatators are less common than other chronic obstructive diseases because they can sometimes cause bronchial colapse. They are indicated exclusively for patients with a positive bronchodilatation test.

Home oxygen therapy is used in patients with persistent hyposaturation.

Lung transplantation is the last resort for patients who do not hope to live for more than 2 years. It is indicated when it is impossible to influence the course with conventional treatment, a decrease in FEV1 below 30 and at the patient's request. Bilateral sequential lung transplantation from cadaveric donors is usually performed. Lung lobes from living relatives begin to be transplanted (2 donors - half a lung each). 70-80% survive the first year after transplantation, 50-55% survive 5 years. Most patients have a significantly better quality of life after transplantation.

It is important to take care of good nutritional status, starting from the first days of diagnosis. The patient needs about 40% more energy (of which 35-45% is to pay for fats, mainly vegetable fats). Emphasis is placed on hearty breakfasts and snacks, second dinners, adequate fluid and salt supply. If the condition does not improve orally, we choose a nasogastric tube or percutaneous gastrostomy. We serve fat-soluble vitamins (vitamin K – we serve 2-5

mg per week until one year of age). Pancreatic substitution in the form of microtablets coated with an acid-resistant layer, which dissolve only in the distal duodenum – contain various concentrations of pancreatic enzymes (mainly lipase). Medicines are given before each meal (except fruit).

The forecast has improved significantly in recent decades. The length of survival is determined by the rate of progression of the lung disease. Today they are born to hope to survive 40 years.

# Interestingness

The relatively high incidence of G551D and CFTRdel21kb mutations in the CFTR gene in patients with cystic fibrosis in the Czech Republic may be related to the representation of descendants of the Slavic and Celtic ethnic groups in the current Czech population. Among linguists and historians who do not find support for such an interpretation of genetic research in their disciplines, there is more skepticism about the interpretations described above.

# Links

## Reference


1. DORT, Jiří, et al. *Neonatologie : vybrané kapitoly pro studenty LF.* 1. vydání. Praha : Karolinum, 2005. ISBN 80-246-0790-5.
2. ↑ Skočit nahoru k:a b c d e f g h i j k l m GOMELLA, TL, et al. *Neonatology : Management, Procedures, On-Call Problems, Diseases, and Drugs.* 6. vydání. Lange, 2009. s. 416-421. ISBN 978-0-07-154431-3.
3. ↑ Skočit nahoru k:a b c HAVRÁNEK, Jiří: *Respirace*
4. ↑ KANTOR, L. *DOPORUČENÁ INDIKAČNÍ KRITÉRIA PRO RSV PROFYLAXI (SYNAGIS) U NOVOROZENCŮ* [online]. Česká neonatologická společnost, ©2014. [cit. 2020-10-18]. <http://www.neonatology.cz/upload/www.neonatology.cz/soubory/synagis-kriteria-2014.pdf>.
5. ↑ DORT, J a E DORTOVÁ. Dlouhodobé zkušenosti s využitím domácí oxygenoterapie v léčbě nedonošených dětí s bronchopulmonální dysplázií. *Pediatrie pro praxi* [online]. 2009, roč. 10, vol. 2, s. 114-117, dostupné také z <http://www.solen.cz/pdfs/ped/2009/02/13.pdf>. ISSN 1803-5264.
6. ↑ MCSHANE, Pamela J, Edward T NAURECKAS a Gregory TINO, et al. Non-cystic fibrosis bronchiectasis. *Am J Respir Crit Care Med* [online]. 2013, vol. 188, no. 6, s. 647-56, dostupné také z <https://www.ncbi.nlm.nih.gov/pubmed/23898922>. ISSN 1073-449X (print), 1535-4970.
7. ↑ HILL, Adam T, Mark PASTEUR a Charles CORNFORD, et al. Primary care summary of the British Thoracic Society Guideline on the management of non-cystic fibrosis bronchiectasis. *Prim Care Respir J* [online]. 2011, vol. 20, no. 2, s. 135-40, dostupné také z <https://www.ncbi.nlm.nih.gov/pubmed/21336465>. ISSN 1471-4418 (print), 1475-1534.
8. ↑ KOLEKTIV, Marek. *Farmakoterapie vnitřních nemocí - 4. zcela přepracované a doplněné vydání.* - vydání. Grada Publishing a.s., 2010. 777 s. s. 170. ISBN 9788024726397.
9. ↑ BENEŠ, Jiří. *Studijní materiály* [online]. [cit. 2010]. <http://jirben.wz.cz>.
10. ↑ ČEŠKA, Richard, et al. *Interna.* 1. vydání. Praha : Triton, 2010. 855 s. ISBN 978-80-7387-423-0.
11. ↑ VAŠÁKOVÁ, Martina. Léčba idiopatické plicní fibrózy. *Remedia* [online]. 2012, roč. 2012, vol. 2, s. 398-402, dostupné také z <http://www.remedia.cz/Clanky/Farmakoterapie/Lecba-idiopaticke-plicni-fibrozy/6-L-1oN.magarticle.aspx>. ISSN 0862-8947.
12. ↑ BENEŠ, Jiří. *Studijní materiály* [online]. [cit. 11.3.2010]. <http://jirben.wz.cz>.
13. ↑ DÍTĚ, P., et al. *Vnitřní lékařství.* 2. vydání. Praha : Galén, 2007. ISBN 978-80-7262-496-6.
14. ↑ TUČEK, Milan, Miroslav CIKRT a Daniela PELCLOVÁ. *Pracovní lékařství pro praxi : Příručka s doporučenými standardy.* 1. vydání. Praha : Grada Publishing, 2005. s. 69-70. ISBN 80-247-0927-9.
15. ↑ http://genet.sickkids.on.ca/cftr/StatisticsPage.html
16. ↑ [1]
17. ↑ MACEK, Milan, Milan jr MACEK a Alice KREBSOVÁ, et al. *Relativně vysoký výskyt mutací G551D a CFTRdel21kb CFTR genu v České republice u pacientů s cystickou fibrózou objektivně prokazuje, že naše populace je slovanského a keltského původu* [online]. [cit. 2011-02-05]. <http://www.lf2.cuni.cz/Ustavy/ublg/pdf/kelticz99.pdf>.
18. ↑ MACEK, Milan jr, et al. Population study of the CFTR gene mutations in Bohemia and Moravia: hypothesis on the historical spread of the G551D and F508 mutations in Europe. *American Journal of Human Genetics.* 1991, roč. 49, vol. Suppl. A 2703, s. -, ISSN 0002-9297.
19. ↑ VENCLOVÁ, Natalie a Petr DRDA, et al. *Archeologie pravěkých Čech : 7, Doba laténská.* 1. vydání. Praha : Archeologický ústav AV ČR, 2008. 164 s. ISBN 978-80-86124-80-3.