Glycoproteinosis

Glycoproteins

🔎 *For more information see Glycoproteins.*

- are **proteins** that have oligosaccharides covalently attached to the **oligosaccharide**
- weight fraction of carbohydrates in the molecule is 1% to 85%
- Carbohydrate units, unlike glycosaminoglycans, do not change regularly
- are mostly neutral
- very common carbohydrates are fucose and sialic acid
- have different functions - for example as antigens, enzymes
- they are a standard part of membranes, they have catalytic functions, they are carriers of immunological specificity, they are part of mucus and also extracellular matrix
- protein carrier is synthesized on the rough ER, in the GA carbohydrates are bound to it in two ways:

1. **O-glycoside bond** to the OH group of Serine or Threonine protein using the N-acetylglucosamine carbohydrate chain
2. **N-glycoside bond** to the NH_2 group of Asparagine protein using N-acetylglucosamine to which the carbohydrate chain has been transferred from a dolicholpyrophosphate support

- degradation in lysosomes by **endoglycosidases** (fucosidase, aspartyl glucosaminidase) and **exoglycosidases** (galactosidase, neuraminidase, hexosaminidase, mannosidase)

Glycoproteinosis

- usually **AR inheritance**
- *symptoms are similar to mucopolysaccharidosis, but there is no mucopolysaccharide accumulation or mucopolysaccharidurie*
- fragments of glycoproteins are present in the urine
- lysosomal distension and secondarily induced increased activity of lysosomal enzymes occur

Mucolipidosis I (Sialidosis)

- **Defect:** ***'alpha-N-acetyl-neuraminidase'*** **activity deficit**
- **Clinical manifestations:** depending on the onset and severity of symptoms, there are several clinical types - ***severe infantile form*** and ' ***mild late infantile*** and ***adult forms***
  - The basic features of **severe forms** include dysurphias of the "hurleroid" type, multiplex dysostosis, mental retardation, a cherry spot on the back of the eye, and corneal opacity; it can also be hepatosplenomegaly, event. kidney disease (nephrosialidosis)
  - Accompanying manifestations of **adult form** include myoclonus induced by emotion and movement, a red spot on the back of the eye, and an intact intellect; there may be other neurological symptoms including mild sensorimotor peripheral neuropathy
- there is an increased amount of sialyloligosaccharides in the urine, which may not be detectable in milder forms of the disease with late onset
- **Treatment:** therapy not available
- **Diagnosis:** ML I is confirmed by determining the deficiency of α-N-acetyl-neuraminidase activity in cultured skin fibroblasts
- **Prenatal diagnosis:** in families with an enzymatically proven diagnosis is possible by analysis of native and cultured chorionic villi or cultured amniocytes; an additional examination is the analysis of the ultrastructure of chorionic villi

Mucolipidosis II (Inclusion disease, I-cell disease)

- **Defect:** mutation of lysosomal enzyme **N-acetylglucosaminyl-1-phosphotransferase** leading to secondary multiple deficiency of lysosomal enzymes due to their erroneous transport (defect in the gene encoding the enzyme protein)
  - Decreased activity of many lysosomal enzymes in tissues
  - increase in lysosomal protein activity in extracellular fluid (and plasma)

- **Clinical manifestations:** clinically distinguishes ***type II*** with *faster progression* and '***type III***, which is *milder form*
  - the basic characters of ***type III*** include:
    - late infantile form, bone changes predominate, other characteristics are dwarfism, dysmorphia, joint involvement and stiffness
    - brain functions tend to be mildly affected
    - Progression is slow and people with disabilities can live to adulthood
  - basic characters of ***type II*** include:
    - hurleroid appearance, rough facial features of bone deformity and mild stiffness of the joints
    - the disease develops early and progresses quickly, valve defects are common - the most common

cause of death is heart failure (before the age of 4)
- hydrolases are missing in lysosomes, material accumulates in them, which gives rise to inclusion bodies

- **Treatment:** therapy not available
- **Diagnosis:** mucolipidosis II and III is confirmed by determining the deficiency of phosphotransferase activity in leukocytes isolated from peripheral blood or cultured skin fibroblasts, or indirectly by determining a multiple increase in serum lysosomal hydrolase activities and simultaneously determining the deficiency of these hydrolases in cultured skin fibroblasts. fibroblasts
- **Prenatal diagnosis:** in families with enzymatically proven diagnosis is possible by analysis of amniotic fluid supernatant and cultured amniocytes or cultured chorionic villi

Mannosidosa

- **Defect:** acidic **α-mannosidase effect**
- **Clinical manifestations:** severe facial dysmorphia, psychomotor retardation, hepatosplenomegaly, corneal opacity, lens opacities, skeletal dysplasia, hearing impairment
  - there is a spectrum of clinical symptoms, but it is common to divide into a *pediatric form of α-mannosidosis*(**infantile, type I**) and a *form with later onset of clinical symptoms* (**juvenile - adult, type II**)
- oligosaccharides rich in mannose accumulate in the tissues, which are increasingly excreted in the urine in the characteristic spectrum
- **Treatment:** therapy not available
- **Diagnosis:** is confirmed by determining the deficiency of α-mannosidase activity in leukocytes isolated from peripheral blood or cultured skin fibroblasts
- **Prenatal diagnosis:** in families with an enzymatically proven diagnosis is possible by analysis of native and cultured chorionic villi or cultured amniocytes; an additional examination is the analysis of the ultrastructure of chorionic villi

Fucosidosis

- **Defect: α-L-fucosidase** deficit
- **Clinical manifestations:** basic features include neurological symptoms starting after the first year of life, hypotension, psychomotor retardation, later spasticity, seizures and decerebral rigidity
  - There may be mild dysmorphia, skeletal abnormalities and other signs of mesenchymal involvement
  - in milder forms with late onset of clinical symptoms are angiokeratomas
  - traditionally there are two clinical phenotypes, ***severe infantile type I*** and ***milder type II***
- low molecular weight fucoconjugates accumulate in the tissues, possibly. and fucoglycolipids, there is oligosaccharidurie in the urine with a characteristic spectrum

- **Treatment:** therapy not available
- **Diagnosis:** fucosidosis is confirmed by determining the deficiency of α-fucosidase activity in leukocytes isolated from peripheral blood or cultured skin fibroblasts

Links

related articles

Mucopolysaccharidosis

References

- MURRAY, Robert K., Daryl K. GRANNER, and Peter A. MAYES, et al. Harper's BIOCHEMISTRY. 4th edition. Jinočany: H + H, 2002. ISBN 80-7319-013-3 .
- HYÁNEK, Josef, et al. Hereditary metabolic disorders. 1st edition. Prague: Avicenum, 1990. pp. 342. ISBN 80-201-0064-4 .