**LECTURE SYLLABUS**

**(Dental medicine)**

**Pathophysiology of growth and development**

**Factors influencing growth and development**

Intrinsic factors

* genetics
* epigenetics

Extrinsic factors

* nutrition
* infections
* toxins
* physical factors (radiation, temperature, pressure, mechanical injuries...)
* endocrine system functioning
* allergen exposure
* etc.

It depends on individual sensitivity (reactivity of the organism), intensity and length of exposure and developmental stage.

Activity and stimulation have also significant impact on the individual’s development.

**Critical periods of development**

- periods of faster development

- periods of principal developmental changes

- different for different organs

Factors acting during these periods have higher impact on development (either negative or positive).

→ Harmful factors acting in certain period induce developmental changes of particular organs.

Altricial (human) X precocial animals

**Problematic developmental periods**

Delivery

- transition from a safe and sterile environment to the external world

Weaning

- change of nutrition, risk of some nutrient deficit

Puberty

- hormonal changes, rapid growth and development, behavioral changes

**Disorders of prenatal development**

Teratology = science studying congenital malformations

1. Gametopathy = disorder of gametes

2. Blastopathy = from conception to the 15th day

 - The cells are equal → full substitution of lost cells

 - double monsters

3. Embryopathy = from day 15 till the end of the 3th month

 - severe congenital malformations

4. Fetopathy = from the beginning of the 4th month till the birth

 - less severe developmental disorders

**Mechanisms of congenital malformations**

Cell death

Disorders of cell

* proliferation
* migration
* differentiation
* extinction → atresia of organ lumen, autism?

**Teratogenic factors**

* Infections – TORCH (T = toxoplasma, O = others, R = rubeola, c = cytomegalovirus, H = herpes)
* Chemical substances - alcohol, medicaments, drugs...
* Radiation
* Mutations

**Chromosomal aberrations**

Down‘s syndrome = ch. 21 trisomy

Edward‘s syndrome = ch. 18 trisomy

Patau‘s syndrome = ch. 13 trisomy

Cry du chat syndrome = ch. 5 short arm deletion

Turner‘s syndrome = 45, X0

Klinefelter‘s syndrome = 47, XXY

Superfemale = 47, XXX

Supermale = 47, XYY

**Perinatal affections**

Fetus hypoxia

Mechanic injuries

Cerebral palsy in children

ADHD (Attention Deficit Hyperactivity Disorder)

**Disorders of sexual differentiation**

Real hermaphroditism = both ovarian and testicular tissue – mosaicism XX/XY, or translocation of a part of the Y chromosome to the paternal X chromosome

Pseudohermaphroditism = only one type of the gonads corresponding to the genotype, but the genital corresponds with the opposite gender

Female pseudohermaphroditism - 46, XX, male genital

- congenital virilising adrenal hyperplasia, administration of androgen during gravidity (week 8-13)

Male pseudohermaphroditism - 46, XY, female genital

Embryonic defect of the testes

→ female external and internal genital (absence of both testosterone and Müller inhibitory substance from Sertoli cells → no regression of Müller duct)

**Adolescence**

Pubertas praecox

Pseudopubertas praecox

Pubertas tarda

**Growth disorders**

nanism X gigantism

proportional X disproportional

Achondroplasia

Hypothyroidism

STH deficiency, Laron‘s nanism

STH excess - gigantism

Premature puberty

Eunuchoidism

Chronic diseases

Malnutrition

**Ageing**

Geriatrics = medical discipline, diagnostics and therapy in aged patients

Gerontology = a science studying senescence and ageing

Telomere shortening

Mutation accumulation

Oxidative injury

Glycosylation (AGE = advanced glycosylation endproducts)

Endocrine changes

Accumulation of consequences of diseases and injuries

**Terminal states, death**

**Clinical death:**

= reversible vital functions halting

= no breathing, no circulation, unconsciousness; the brain is not irreversibly damaged

- About 5 min

If the delivery of oxygenated blood is not restored

 → gradual development of irreversible brain damage; transition into biological death

**Biological death:**

= vital function halting with irreversible changes that disable recovery of vital functions.

Biological death of an individual = brain death = irreversible termination of all brain functions

**Causes of cell death**

* hypoxia
* nutrient shortage
* metabolism disorders or structural proteins of the cells (hereditary disorders)
* chemical substances (poisons, medicaments....)
* free radicals
* physical factors (temperature, radiation, mechanical damage...)
* infection
* immune response
* etc.

**Cell death**

Necrosis

- uncontrolled

- inflammation

Apoptosis

- programmed cell death

- no inflammation

Autophagy

= degradation of cell‘s own structures

- response (adaptation) to starvation, hypoxia, organelle damage