POLYGENIC INHERITANCE
NONALLELIC GENE INTERACTIONS
Stomatology

Brief repetition:

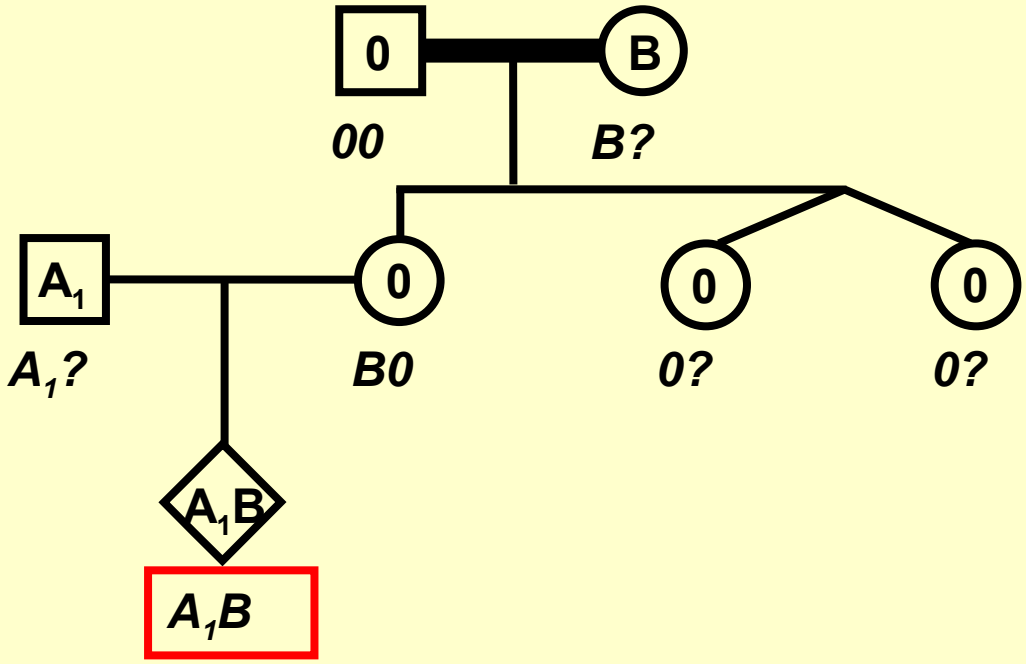
- Monogenic inheritance
  - participation of alleles of the same gene (locus) in hybrid phenotype formation
  - differences in allele dominance level
- Allelic and non-allelic genes
- Dihybridism
  - 16-poles table of genotype combinations
  - genotypic and phenotypic ratios

Introduction I:

- **genetic determination** of particular traits - **participation** of alleles of two,three or more genes
  - **modifying genes**
  - **gene interaction**
  - **complementary, epistatic or suplementary genes** -

Bombay phenotype in the AB0 system

Task 3/p. 96 KrOt

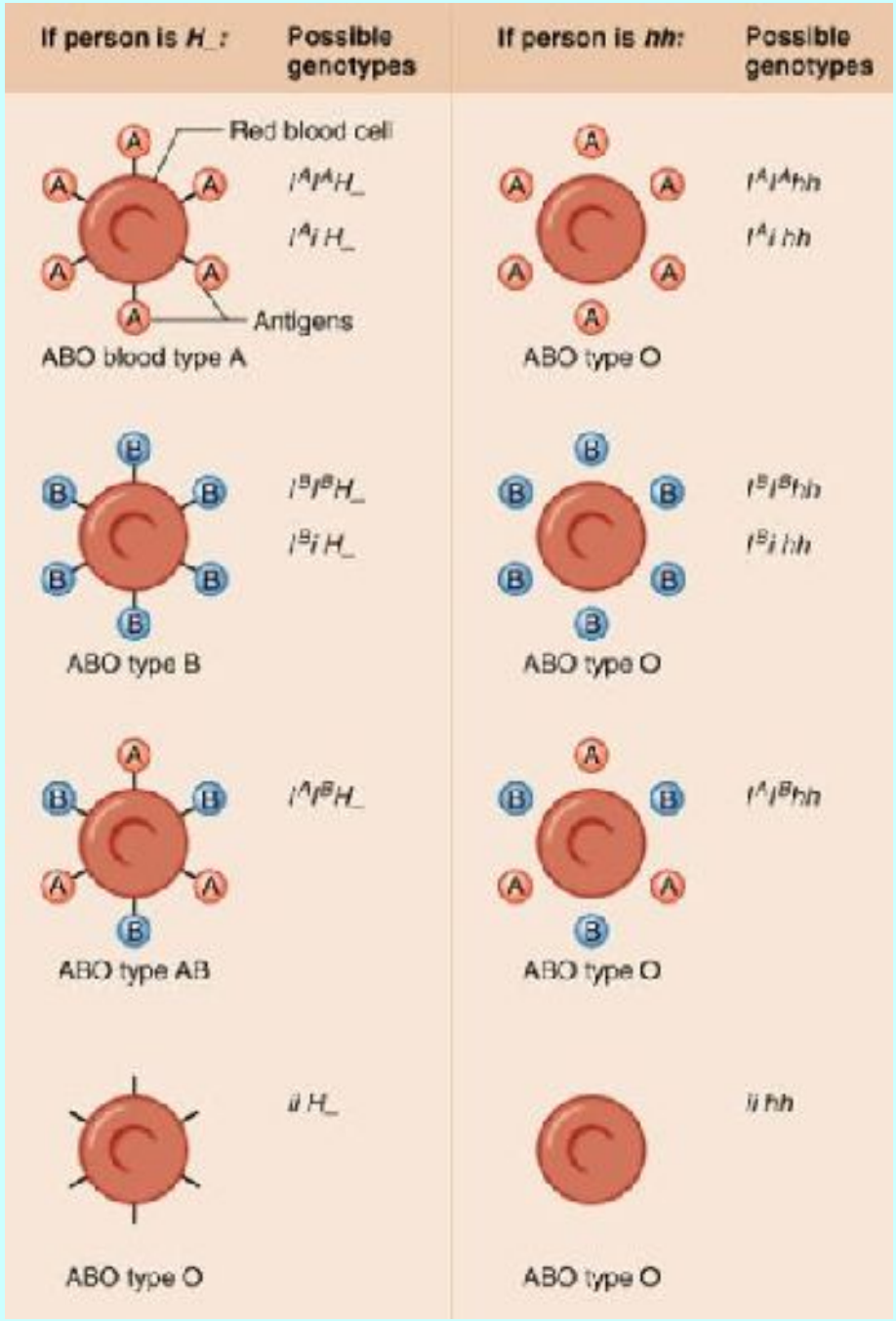


Suplementarity, recessive epistasis, exemple of metabolic pathway.

H and AB0 loci as recessive epistasis

Homozygocy for alleles of one gene affects the expression of a second gene.

- H gene is epistatic to the ABO gene.
- H substance is attached to the cell surface.
- *hh* genotype = no H protein.
- All ABO genotypes appear as type O.



Introduction II: Recapitulation of key-words

- multifactorial traits
- polygenic inheritance
- major and minor genes
- modifying genes
- active and non-active alleles
- additive effect of alleles
- variability caused by genotype and environment expression

Segregation ratios
Pascal's triangl

n	$(1 + 1)^n$	Total
1	1 1	2
2	1 2 1	4
3	1 3 3 1	8
4	1 4 6 4 1	16
5	1 5 10 10 5 1	32
6	1 6 15 20 15 6 1	64
7	1 7 21 35 35 21 7 1	128
8	1 8 28 56 70 56 28 8 1	256

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Number and frequences of the genotypes for 3, 4 a 5 genes

1 : 10 : 45 : 120 : 210 : 252 : 210 : 120 : 45 : 10 : 1

Recurrence risk estimates for diseases with multifactorial etiology

1. Although the disorder is obviously familial, there is no distinctive pattern of inheritance within family
2. The recurrence risk to first-degree relatives is approximately the square root of the population risk (incidence) – Edwards' formula
3. The risk is sharply lower for second-degree than for first-degree relatives, but it declines less rapidly for more remote relatives.
4. The risk is higher when more than one family member is affected – for first-degree relatives, the value calculated from Edwards' formula is multiplied by 2, 3 etc.
5. The more severe the malformation, the greater the risk
6. If a multifactorial trait is more frequent in one sex than in the other, the risk is higher for relatives of patients of the less susceptible sex.
7. An increased risk when the parents are consanguineous (multiple factors with additive effects may be involved)
8. Strongly affected by the environmental factors

Neural tube defect reccurence risk

Task 9/p. 94 KrOt

Congenital malformation with multifactorial ethiology and polygenic inheritance, population frequency ca 0,0009