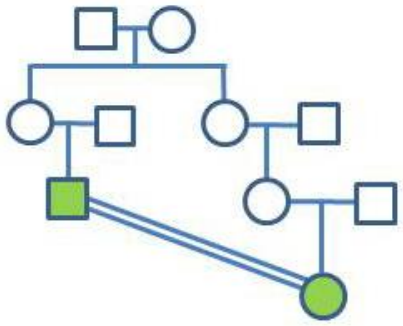
Chapter 12 Molecular Genetics V

(book edition 2009)

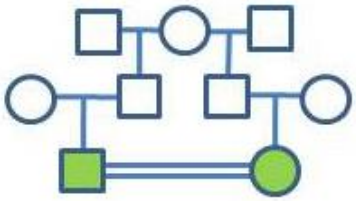
Task 1.

a)



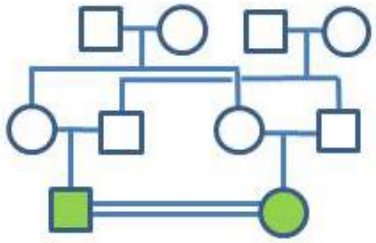
r = 1/16

b)



r = 1/16

c)



r = 1/4

Task 2

a) risk of cousin´s child to be affected is 1/16
b) no risk
c) no risk

Task 3

a) Parents are heterozygotes (Aa), Healthy daughter may be either a dominant homozygote (probability 1/3) or a heterozygote (probability 2/3)
b) Recurrence risk for the third child is 25 %. Prenatal diagnostics based on DNA analysis may be offered.

Task 4

a) Risk calculation for the healthy daughter: 2/3 x 1/50 x 1/4 = 1/300

b) Risk calculation for the affected son: 1/50 x 1/2 = 1/100
Risk calculation for the healthy son: 2/3 x 1/50 x 1/4 = 1/300

c) Risk to have a child with PKU with a healthy non-consanguineous partner is 0.3% for the healthy daughter and the healthy son and 1% for the affected son.

Task 5

a) Risk calculation: 1/2 x 1/2 x 2/3 x 1/4 = 1/24
(4% =higher risk than with non-consanguineous partner)

b) 25%

Task 6

a) Result is informative

b) Daughter´s genotype is Aa, son´s genotype is AA.

c) No. (The results of indirect DNA diagnostics are useful only for related persons in the examined family.)

Task 7

a) Homozygotes for the standard allele will have 2 fragments of the identical length (245 bp) – one band on an electrophoretic gel.
Heterozygotes will have 3 different fragments (245 bp, 108 bp + 137 bp).
Homozygotes for the mutant allele will have two different bands on electrophoresis (108 bp + 137 bp)
ERRATUM: The numbers in the Fig No.12/5 should be 245, 137 and 108
Genotypes of family members:
Father: +/+
Mother: R408W/+
Affected son: R408W/+
Healthy son and healthy daughter: +/+
Partner of the healthy daughter: R408W/+

b) Risk calculation: 1 x 1/2 X 2/3 x 1/2 = 1/6 (17%)

c) Prenatal diagnostics in this couple should combine the approaches of direct and indirect DNA diagnostics.

d) Prenatal diagnostics in this family would profit from the exact characterization of the second mutant allele (mutation, which is present in father´s and daughter´s genotypes)

e) To proceed with the DNA analysis in this family it would be necessary to obtain the inform consents from all examined family members.

Task 8

a) Genotypes of family members:
Father: 6mut/+
Mother: R408W/+
Affected son: R408W/6mut
Healthy son: +/+
Healthy daughter: 6mut/+
Partner of the healthy daughter: R408W/+

b) After chorionic villi sampling or amniocentesis, the DNA analysis in this family may combine the direct diagnostics (R408W mutation detection) with the indirect method (examination of the intragenic Bgl II polymorphism). The mutation in the exon 6 found by SSCP method should be sequenced and then it would be possible to offer direct diagnostics for the detection of both mutant alleles occurring in this family.