MONOHYBRIDISM AND DIHYBRIDISM

2nd year, dentistry
week 1

MONOHYBRIDISM

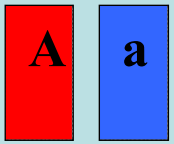
PARENTAL GENERATION

GENOTYPE

GAMETES

F_1 GENERATION

GENOTYPE



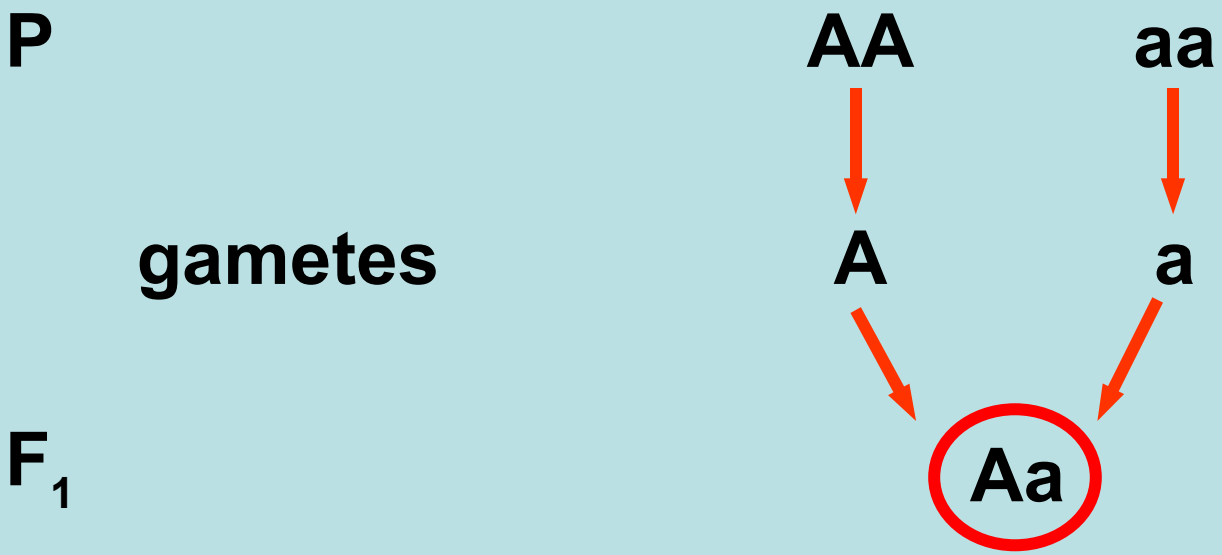
GAMETES

F_2 GENERATION

GENOTYPE 1 : 2 : 1

PHENOTYPE 3 : 1

Monohybridism



gametes

	A	a
A	AA	Aa
a	Aa	aa

F2

M o n o h y b r i d i s m

Complete dominance (*KrOt* p. 7/task 1)

	R a t i o s	
t y p e o f b r e e d i n g	**genotypic**	**phenotypic**
heterozygote x rec. homozygote *backcross* **Bc**	**1 : 1**	**1 : 1**
heterozygote x dom. homozygote *(backcross* **Bc***)*	**1 : 1**	**only dominant**
heterozygote x heterozygote *intercross* **F_2**	**1 : 2 : 1**	**3 : 1**

M o n o h y b r i d i s m

(*KrOt* p. 7-8/task 3)

t y p e o f b r e e d i n g			o f f s p r i n g	
			albino	pigmented
F_1 (alb x pigm)	x	F_1 (alb x pigm)	18	61
Cc		*Cc*	1	3
F_1 (alb x pigm)	x	albino P	32	28
Cc		*cc*	1	1
F_1 (alb x pigm)	x	pigmented P	0	61
Cc		*CC*	0	1

The albinisms is recessive, the (normal) pigmentation of the coat is **completely dominant**.

M o n o h y b r i d i s m

(*KrOt*, p. 8, task 5)

Polydactyly

			Offspring		
Type of hybridization			**Normodactylous**	**Polydactylous**	**Total**
Lx*/*Lx	**x**	**+/+**	**87** ***+/Lx***	**0**	**87**
+/Lx	**x**	***Lx*/*Lx***	**160** ***+/Lx***	**160** ***Lx*/*Lx***	**320**
+/Lx	**x**	***+/Lx***	**1199** ***+/+, +/Lx***	**394** ***Lx*/*Lx***	**1593**

dominant allele +

mutant allele for polydactyly *Lx*

The normodactyly is dominant, and the polydactyly is recessive (*Lx*/*Lx*).

Family	Blood group in children		
	M	MN	N
1	2		
2		1	1
3	1	3	
4		2	1
5	1	1	1
6			2
7		1	1
8	1	1	
9		2	
10	1	1	
11		3	
12		1	2
13	1		
14		1	
15	2		1
16			1
17		1	
18		1	
19		1	1
20		1	

Monohybridism

- phenotypical ratios in humans

(*KrOt*, p. 9, task 6)

Monohybridism
- phenotypical ratios in humans
(*KrOt*, p. 9, task 6)

Family	Blood group in children		
	M	MN	N
1	2		
2		1	1
3	1	3	
4		2	1
5	1	1	1
6			2
7		1	1
8	1	1	
9		2	
10	1	1	
11		3	
12		1	2
13	1		
14		1	
15	2		1
16			1
17		1	
18		1	
19		1	1
20		1	

Family	Blood group in children		
	M	MN	N
Total	**9**	**21**	**11**

i.e. approx 1 : 2 : 1

CODOMINANCE

Monohybridism

- phenotypical ratios in humans

(*KrOt*, p. 9, task 6)

Family	Blood group in children		
	M	MN	N
1	2		
2		1	1
3	1	3	
4		2	1
5	1	1	1
6			2
7		1	1
8	1	1	
9		2	
10	1	1	
11		3	
12		1	2
13	1		
14		1	
15	2		1
16			1
17		1	
18		1	
19		1	1
20		1	
Total	9	21	11

i.e. approx 1 : 2 : 1

CODOMINANCE

Dihybridism

P AABB aabb

gametes AB ab

F_1 AaBb

gametes → / F_2 ↓	AB	Ab	aB	ab
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	aabb

Dihybridism – independent segregation of polydactyly and congenital icterus (*KrOt*, p. 12, task 11)

	Offspring			
Types of hybridization genotypes of parents	**Normodactylous nonicteric rats**	**Polydactylous nonicteric rats**	**Normodactylous icteric rats**	**Polydactylous icteric rats**
	98	**26**	**28**	**9**
	36	**34**	**29**	**33**

allele for normodactyly +
mutant allele for polydactyly *Lx*

allele for normal metabolism of bilirubin +
mutant allele for jaundice *j*

Dihybridism – independent segregation of polydactyly and congenital icterus (*KrOt*, p. 12, task 11)

	Offspring			
Types of hybridization **genotypes of parents**	**Normodactylous nonicteric rats**	**Polydactylous nonicteric rats**	**Normodactylous icteric rats**	**Polydactylous icteric rats**
+/Lx +/j **x** ***+/Lx +/j***	**98**	**26**	**28**	**9**
+/Lx +/j **x** ***Lx/Lx j/j*** ***+/Lx j/j*** **x** ***Lx/Lx +/j***	**36**	**34**	**29**	**33**

allele for normodactyly +
mutant allele for polydactyly *Lx*

allele for normal metabolism of bilirubin +
mutant allele for jaundice *j*

Monohybridism – ABO blood group system

phenotypes and genotypes (*KrOt*, p. 9, task 7)

a)

phenotype	**0**	**A**	**B**	**AB**
genotype	*00*	*AA, A0*	*BB, B0*	*AB*

4

6

b)

rec. homozygote	*00*
dom. homozygote	*AA, BB*
heterozygote	*A0, B0, AB*
codominancy	*AB*

c) Blood group: mother - 0 child - A

(genotype) *00* *A0*

man possible as father **A, AB**

(man that can not be excluded as father)

man excluded as father **B, 0**

Mother	Child	Man as father	
		impossible	possible
A	A	--	A,B,AB,O
	B	A,O	B,AB
	AB	O,A	B,AB
			A,B,O
B			A,AB
			A,B,AB,O
			A,AB
			A,B,O
AB			A,B,AB,O
			A,B,AB,O
			A,B,AB
	0		mother excluded
0	A	O,B	A,AB
	B	O,A	B,AB
	AB		mother excluded
	0	AB	O,A,B

Monohybridism
– ABO blood group system phenotypes in paternity determination
(*KrOt*, p. 10, task 8)

Dihybridism – paternity examination by combination of two blood group systems (*KrOt*, pp. 13-14, task 14)

Blood groups			
Mother	Child	Man possible as father	Man impossible as father
0, M	0, MN	A, B, 0, N, MN	AB M
0, Rh+	0, Rh-	A, B, 0 Rh+, Rh-	AB
0, Rh-	A, Rh+	A, AB, Rh+	B, 0, Rh-
0, MN	B, MN	B, AB, M, N, MN	A, 0
A, N	0, MN	A, B, 0, M, MN	AB, N
A, MN	A, N	A, B, 0, AB, N, MN	M
A, Rh+	B, Rh-	B, AB, Rh+, Rh-	A, 0
A, Rh-	A, Rh+	A, B, 0, AB, Rh+	Rh-
A, N	AB, MN	B, AB. M, MN	A, 0, N
B, MN	0, N	A, B, 0, N, MN	AB, M
B, Rh+	B, Rh-	A, B, AB, 0, Rh+, Rh-	
B, Rh-	AB, Rh-	A, AB, Rh+, Rh-	B, 0
B, MN	0, M	A, B, 0, M, MN	AB, N
AB, N	A, N	A, B, 0, AB, N, MN	M
AB, Rh+	B, Rh-	A, B, 0, AB, Rh+, Rh-	
AB, Rh-	AB, Rh+	A, B, AB, Rh+	0, Rh-
AB, MN	AB, M	A, B, AB, M, MN	0, N

p. 11, task 9 homework