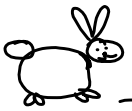
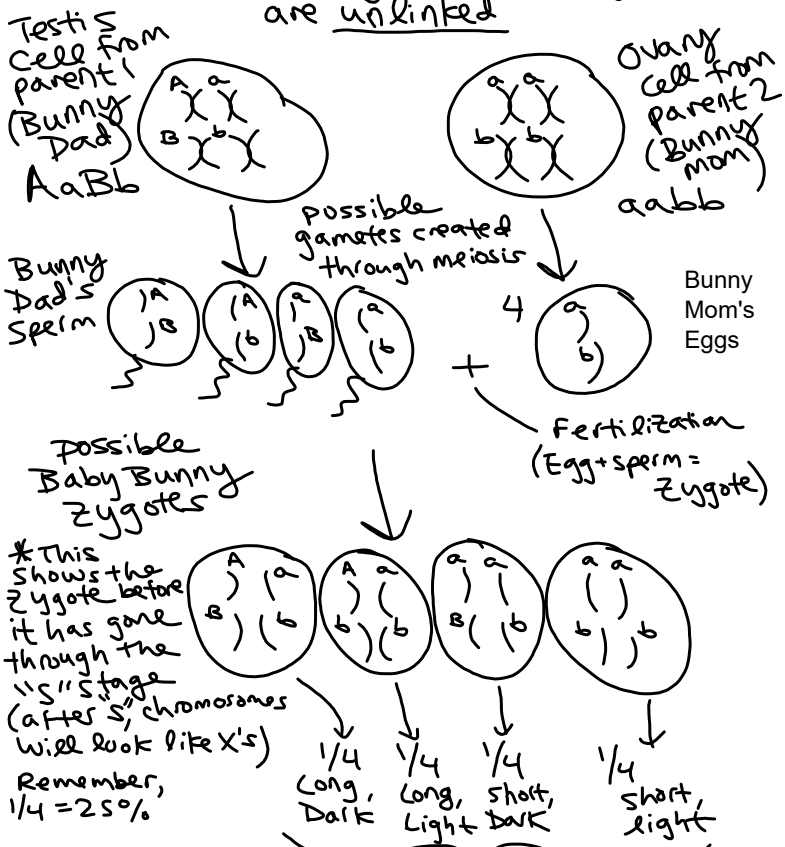


# Examples of Unlinked vs. Linked Genes in Rabbits

Ear length Gene
A = long ears
a = short ears

Fur Color Gene
B = dark fur
b = light fur

## If ear length + fur color genes are unlinked




These offspring phenotype frequencies match the frequencies seen in a dihybrid cross between parents AaBb x aabb (see below)

| | AB | Ab | aB | ab |
|---|---|---|---|---|
| ab | *AaBb* | **Aabb** | aaBb | **aabb** |
| ab | *AaBb* | **Aabb** | aaBb | **aabb** |
| ab | *AaBb* | **Aabb** | aaBb | **aabb** |
| ab | *AaBb* | **Aabb** | aaBb | **aabb** |

I have color coded the offspring genotypes that will result in the four offspring phenotypes. A summary of the offspring phenotype ratios is given below.

Long Ears, Dark Fur (*italicized*) = 4/16 = 25%

Long Ears, Light Fur (**bolded**) = 4/16 = 25%

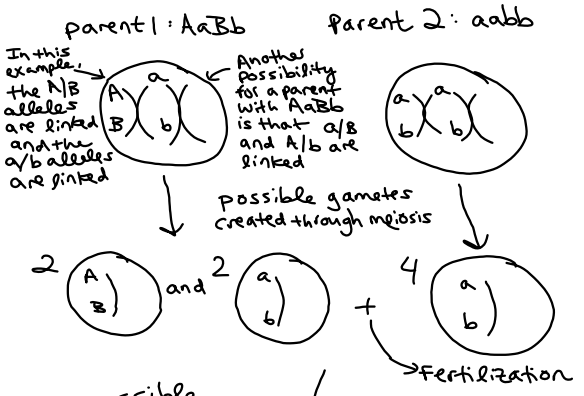
Short Ears, Dark Fur (underlined) = 4/16 = 25%

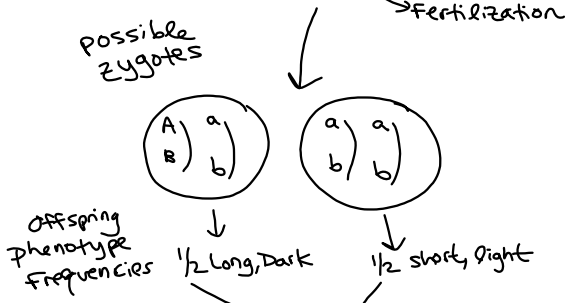
Short Ears, Light Fur (**bolded and underlined**) = 4/16 = 25%

In a real mating of parents with these genotypes, the offspring frequencies might differ slightly from 25% (example given below), but we would still conclude that the genes for ear length and fur color are unlinked

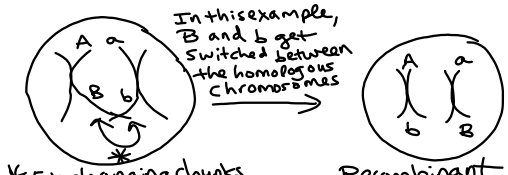
| **Phenotypes** | **Number of Offspring** (out of 100) |
|---|---|
| Long Ears, Dark Fur | 23 (23%) |
| Long Ears, Light Fur | 28 (28%) |
| Short Ears, Dark Fur | 22 (22%) |
| Short Ears, Light Fur | 27 (27%) |

If ear length and fur color genes are linked




Note: These frequencies won't actually be this high because there may be some long/light and short/dark baby bunnies created due to crossing over of the homologous chromosome pair in the bunny Dad's (Parent 1's) Testes cells, which could occasionally separate the A/B and a/b alleles, creating gametes with a/B and a/B (see picture below)




In a real mating of these parents, offspring phenotype frequencies may be similar to those shown below

| Phenotypes | Number of Offspring (out of 100) |
|---|---|
| Long Ears, Dark Fur | 45 (45%) |
| Long Ears, Light Fur | 6 (6%) |
| Short Ears, Dark Fur | 5 (5%) |
| Short Ears, Light Fur | 44 (44%) |

1st and 4th phenotypes have higher frequencies because the A/B alleles are linked in parent 1, as are the a/b alleles

2nd and 3rd phenotypes are present in low frequencies due to crossing over

These offspring phenotypes aren't even close to the frequencies predicted by a dihybrid punnett square for parents of these genotypes (25% of each phenotype). Therefore, if we saw these frequencies, we could conclude that the genes for ear length and fur color are linked (found on the same chromosome)