



# **Inheritance Patterns**

## **Chapter 14**

# Karyotype



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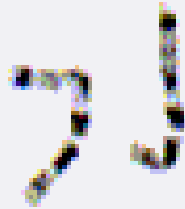
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X

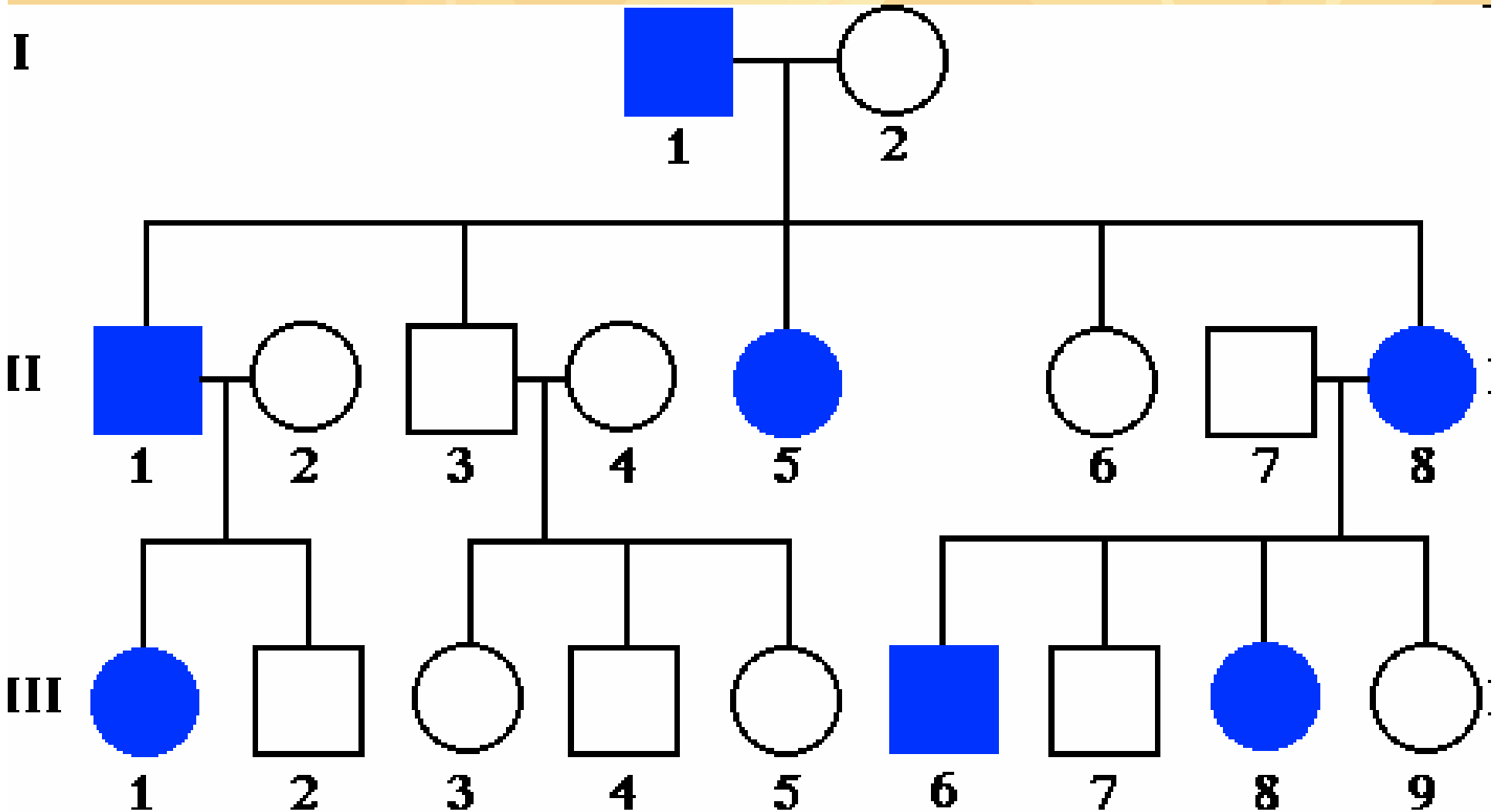


Y

- **Pedigree**: A family tree diagram that shows how a trait is inherited over several generations



# Pedigree



# Pedigree Diagrams

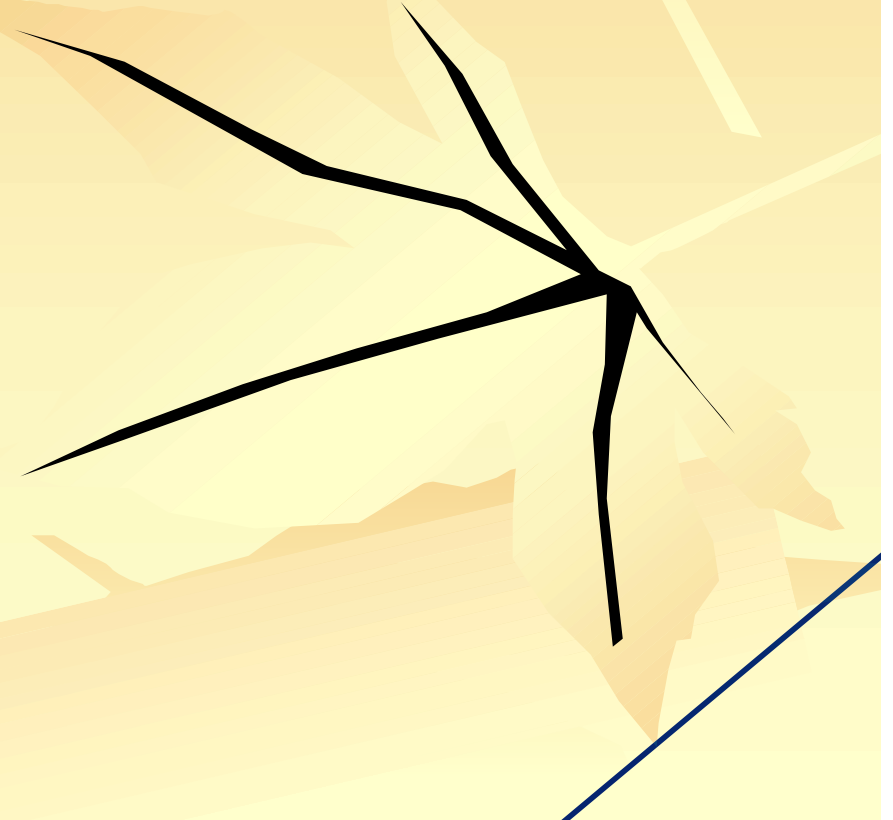
**Not Shaded** = Normal (does not have the trait)

**Half-shaded** = Carrier (can pass the trait to offspring, but does not express the trait themselves)

**Shaded** = Displays trait

**Square** = male

**Circle** = female



# Types of Inheritance

- Humans have 100,000 genes on their 23 pairs of chromosomes
- 2 types of chromosomes:
  - 1. Autosomes:** all chromosomes except sex chromosomes
  - 2. Sex Chromosomes:** Determine sex (X and Y)

# Autosomal Inheritance

- **Autosomal Inheritance:** trait inherited from a gene located on one of the autosomes.
- Genetic disorders resulting from autosomal inheritance comes in two types

**1. Autosomal Dominant:** inherited from one parent who is affected (has the dominant allele) – Examples:

- Huntington's Disease
  - Dwarfism
  - Polydactyly (extra fingers or toes)
- 
- Persons with an autosomal dominant disorders may be homozygous dominant or heterozygous (HH or Hh)

## 2. Autosomal Recessive: must be inherited from both parents

### Examples:

- Albinism
- Cystic Fibrosis
- Sickle cell anemia
- Persons with an autosomal recessive disorders must be homozygous recessive (hh)

# Sex-linked Inheritance

- **Sex Linkage**: inheritance of a gene located on one of the sex chromosomes
  1. **Y-Linked**: inheritance from a gene on the Y chromosome – only affects males
    - Y-linked traits are not as common as x-linked traits.

## 2. X-Linked: inheritance from a gene on the X chromosome

- Most X-linked disorders that we know of are X-linked recessive – Examples:
  - Colorblindness
  - Hemophilia
  - Muscular Dystrophy
  - Pattern Baldness

**TPS:** Who would be more likely to inherit an X-linked recessive disorder? Males or females?

- Males are more likely to be affected by an X-linked recessive disorder because males only have one X chromosome

# Calico and Tortoiseshell Cats



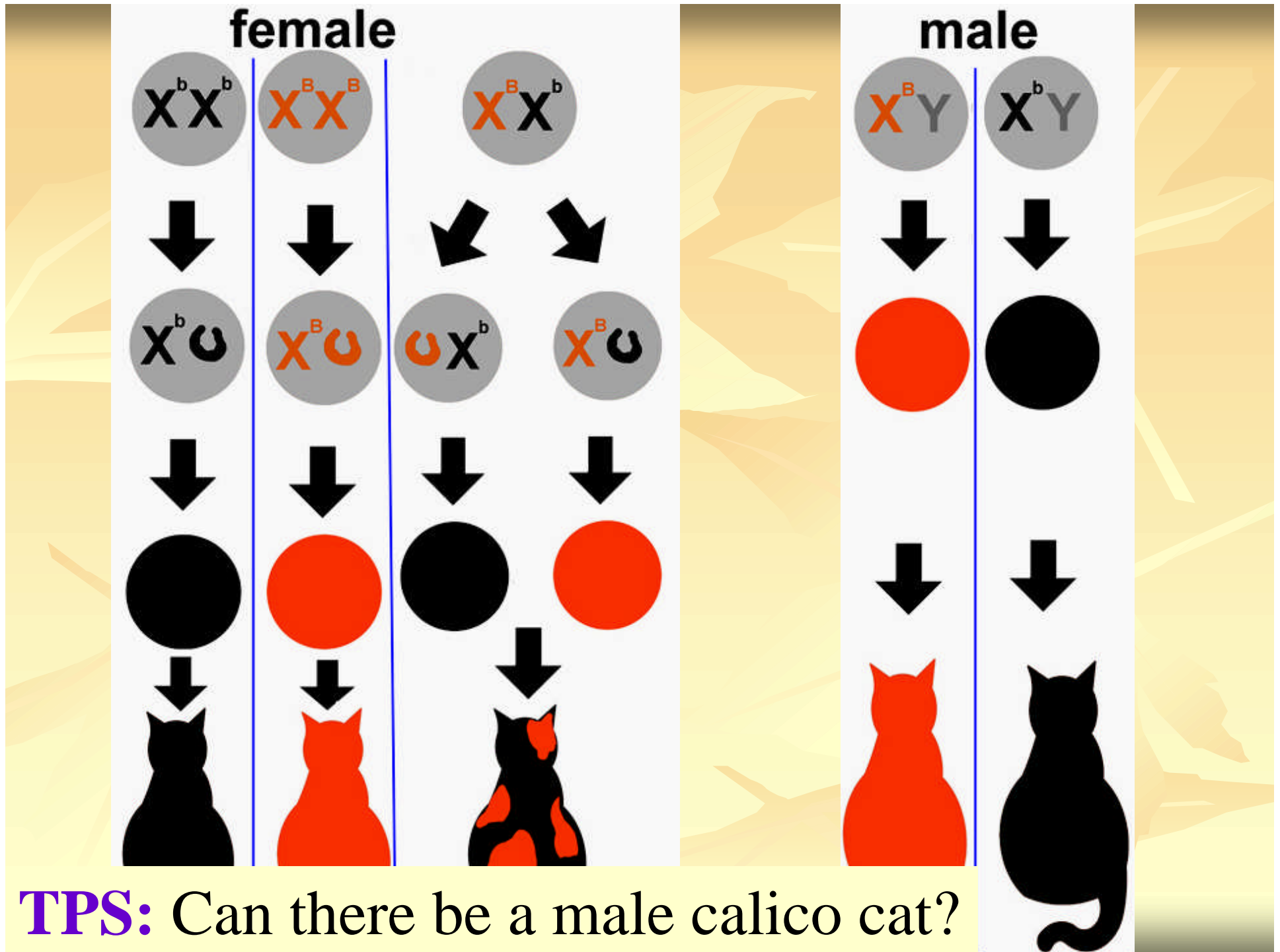
- Hair color is located on the X Chromosome.

- Alleles

$X^B$  = orange

$X^b$  = black

- Within a patch of skin only one X chromosome is expressed. The other chromosome is deformed.



# Self Check

- What is a pedigree?
- What would be the genotype of a “carrier”?
- What is the difference between autosomal inheritance and sex-linked inheritance?
- Give examples of autosomal disorders.
- Give examples of X-linked disorders.
- If y-chromosomes contain fewer genes than the X, why are males more likely to inherit X-linked recessive genes.