**Notes 3/5/2015 How to decode pattern of inheritance for a phenotype**

Step 1:

Most human traits fall into one of four categories. These are listed below. The first step necessary in a pedigree is to identify “hints” of each of these patterns of inheritance. These “hints” will allow you to make a hypothesis about the pattern demonstrated in a pedigree.

Step 2:

Pick at least one mated couple from the pedigree, then complete possible Punnett Squares that match your hypothesized pattern of inheritance. Compare predicted phenotypic ratios of offspring to those actually displayed on the Pedigree. If these match, then your hypothesis is supported. If they don’t match, then your hypothesis is refuted.

Step 3: Carry out this step if your hypothesis is refuted OR if there is a second equally likely pattern.

Set up Punnett squares for at least one mated couple in the pedigree using genotypes matching a different likely pattern of inheritance. Compare the predicted phenotypic ratios to those actually displayed in the pedigree. If these match, then this hypothesis is supported. If they don’t, test a second hypothesis with punnett squares.

**The patterns of inheritance commonly displayed in Pedigrees:**

**Autosomal Recessive** (**AR** )–trait is coded by a gene located on chromosomes 1-22 in humans, two recessive alleles present in family members expressing the affected phenotype

For example, for hitchhiker thumb:

HH not affected, Hh not affected but is a carrier, hh is affected

**Autosomal Dominant** (**AD** )—trait is coded by a gene located on chromosomes 1-22 in humans, One or two dominant alleles present in family members expressing the affected phenotype

For example, for Widow’s peak:

WW affected, Ww affected, ww NOT affected NOTE there are no carriers!

**Sex linked recessive (SR)--** trait is coded by a gene located on Sex chromosomes X in humans, One recessive allele in males or two recessive alleles present in females results in family members expressing the affected phenotype

For example, for colorblindness:

XcXc affected ♀, XCXc an unaffected carrier ♀ , XCXC NOT affected and not a carrier ♀, XcY affected ♂, XCY not affected not a carrier♂

**Sex linked dominant (SD)—**trait is coded by a gene located on Sex chromosomes X or Y in humans, One dominant X linked allele in either males or females results in family members expressing the affected phenotype

For example, for Aicardi syndrome in which affected individuals do not develop the part of the brain connecting its two halves:

XAXa affected ♀, XAXA affected female ♀ , , XAY affected ♂, XaY unaffected ♂

For example, for Hypertrichosis pinnae (very long hair on outside edges of ears)

XX unaffected ♀, XYA affected ♂, XYa unaffected♂

**Identifying the patterns—Looking for Hints:**

**Pedigree one**

\_\_\_\_\_one or more instances of 2 parents who do ARE NOT affected with AFFECTED offspring (R)

\_\_\_\_\_skipped generations (no affected individual in one generation, but affected individuals before/later (R)

\_\_\_\_\_every AFFECTED child has at least one AFFECTED parent (D)

\_\_\_\_\_no skipped generations (D)

\_\_\_\_Similar #s of boys & girls are affected; phenotype can be passed to either sex child by either sex parent (A)

\_\_\_\_ALL affected individuals are males and there are no carrier females (Y linked)

\_\_\_\_far more males are affected than females, but females can be carriers, while males are not (X linked R)

\_\_\_boys & girls are affected, but there are **no male carriers**, males pass phenotype only to daughters (X linked R)

**Pedigree two**

\_\_\_\_\_one or more instances of 2 parents who do ARE NOT affected with AFFECTED offspring (R)

\_\_\_\_\_skipped generations (no affected individual in one generation, but affected individuals before/later (R)

\_\_\_\_\_every AFFECTED child has at least one AFFECTED parent (D)

\_\_\_\_\_no skipped generations (D)

\_\_\_\_Similar #s of boys & girls are affected; phenotype can be passed to either sex child by either sex parent (A)

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\_\_\_boys & girls are affected, but there are **no male carriers**, males pass phenotype only to daughters (X linked R)

**Pedigree three**

\_\_\_\_\_one or more instances of 2 parents who do ARE NOT affected with AFFECTED offspring (R)

\_\_\_\_\_skipped generations (no affected individual in one generation, but affected individuals before/later (R)

\_\_\_\_\_every AFFECTED child has at least one AFFECTED parent (D)

\_\_\_\_\_no skipped generations (D)

\_\_\_\_Similar #s of boys & girls are affected; phenotype can be passed to either sex child by either sex parent (A)

\_\_\_\_ALL affected individuals are males and there are no carrier females (Y linked)

\_\_\_\_far more males are affected than females, but females can be carriers, while males are not (X linked R)

\_\_\_boys & girls are affected, but there are **no male carriers**, males pass phenotype only to daughters (X linked R)

**Pedigree Four**

\_\_\_\_\_one or more instances of 2 parents who do ARE NOT affected with AFFECTED offspring (R)

\_\_\_\_\_skipped generations (no affected individual in one generation, but affected individuals before/later (R)

\_\_\_\_\_every AFFECTED child has at least one AFFECTED parent (D)

\_\_\_\_\_no skipped generations (D)

\_\_\_\_Similar #s of boys & girls are affected; phenotype can be passed to either sex child by either sex parent (A)

\_\_\_\_ALL affected individuals are males and there are no carrier females (Y linked)

\_\_\_\_far more males are affected than females, but females can be carriers, while males are not (X linked R)

\_\_\_boys & girls are affected, but there are **no male carriers**, males pass phenotype only to daughters (X linked R)

**Pedigree five**

\_\_\_\_\_one or more instances of 2 parents who do ARE NOT affected with AFFECTED offspring (R)

\_\_\_\_\_skipped generations (no affected individual in one generation, but affected individuals before/later (R)

\_\_\_\_\_every AFFECTED child has at least one AFFECTED parent (D)

\_\_\_\_\_no skipped generations (D)

\_\_\_\_Similar #s of boys & girls are affected; phenotype can be passed to either sex child by either sex parent (A)

\_\_\_\_ALL affected individuals are males and there are no carrier females (Y linked)

\_\_\_\_far more males are affected than females, but females can be carriers, while males are not (X linked R)

\_\_\_boys & girls are affected, but there are **no male carriers**, males pass phenotype only to daughters (X linked R)

**Pedigree six**

\_\_\_\_\_one or more instances of 2 parents who do ARE NOT affected with AFFECTED offspring (R)

\_\_\_\_\_skipped generations (no affected individual in one generation, but affected individuals before/later (R)

\_\_\_\_\_every AFFECTED child has at least one AFFECTED parent (D)

\_\_\_\_\_no skipped generations (D)

\_\_\_\_Similar #s of boys & girls are affected; phenotype can be passed to either sex child by either sex parent (A)

\_\_\_\_ALL affected individuals are males and there are no carrier females (Y linked)

\_\_\_\_far more males are affected than females, but females can be carriers, while males are not (X linked R)

\_\_\_boys & girls are affected, but there are **no male carriers**, males pass phenotype only to daughters (X linked R)