



Basic Turkey Color Genetics

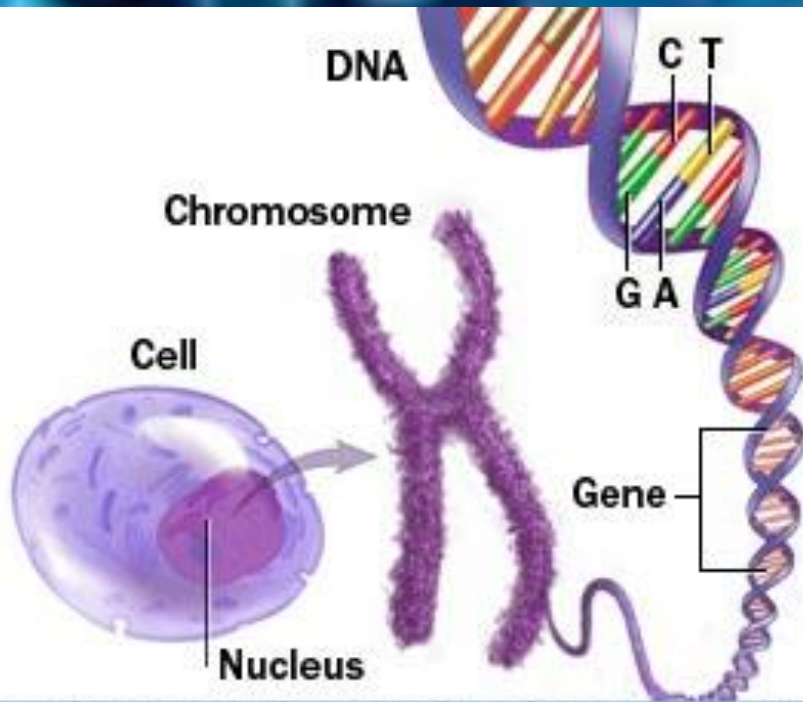
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The purpose of this Power Point is to give a basic understanding of color genetics and assist in identifying Genotype through Phenotype.

Thankyou to Daryl Deutscher, Kevin Porter, Dana Manchester and Sharon Jones for all your help and information.

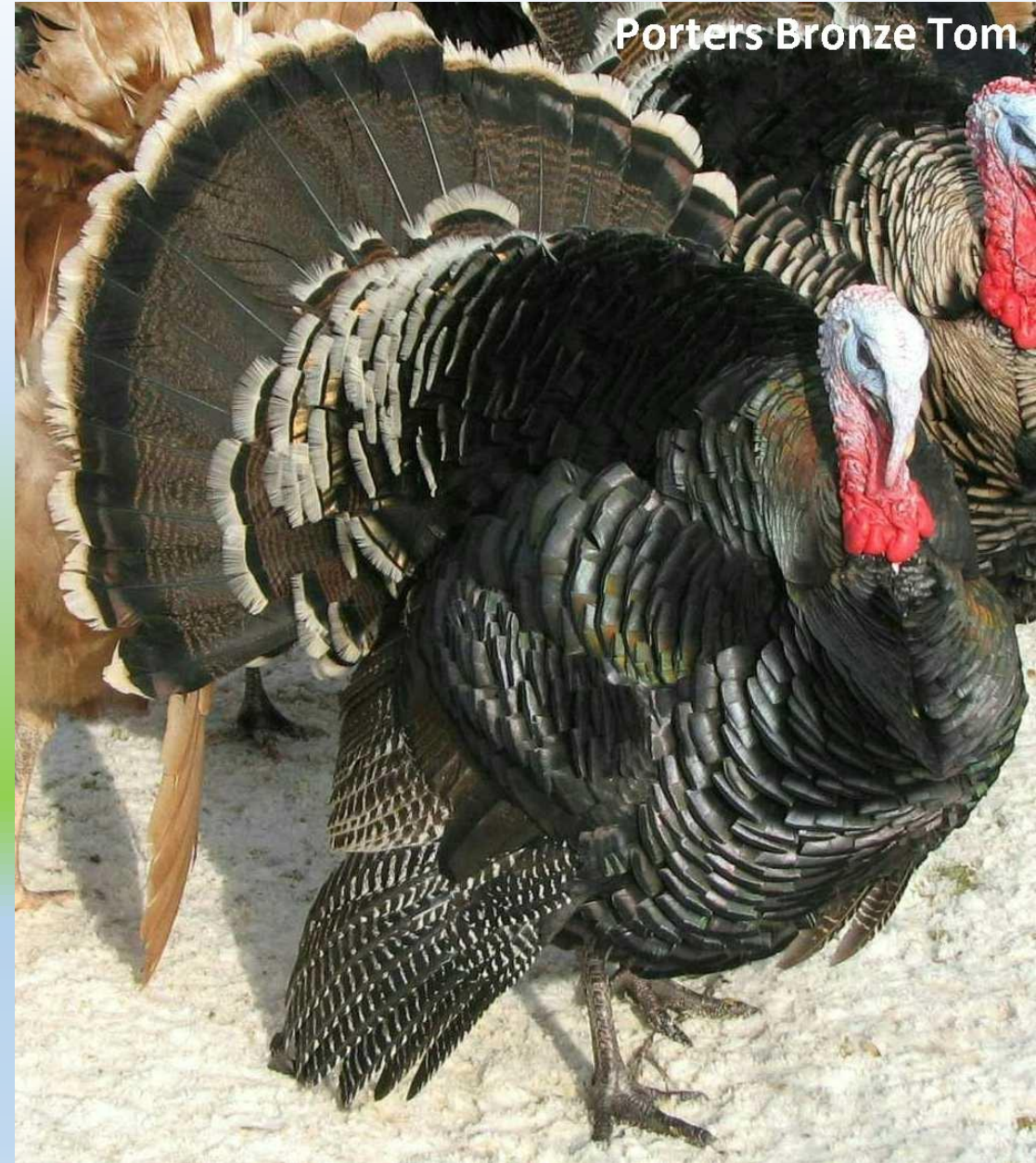
Need to know terms.

- Gene- a portion of DNA molecule that is responsible for a trait. They occur in Pairs.
- Chromosome- aggregate of genes that carries heredity information, situated inside the Nucleus of cells.
- Locus- the position of a gene on a Chromosome
- Allele- a variant gene on the same Locus.
- Homozygous- Pair of matching Allele on a Locus
- Heterozygous- non-identical Allele on a Locus
- Genotype the group of Genes responsible for a particular trait.
- Phenotype- the Physical expression of a trait. Phenotype may be different from Genotype depending on what genes are dominant and recessive. E.g. Black that is Heterozygous for Recessive Slate.



Genotype, Is that normal?

- The Genotype for the original turkey color Pattern (without Mutation) is that of Bronze. It is written like this.
- **b+b+ CC dd EE NN RR SISI SpSp PnPn**
- The abbreviation of this is **b+b+**. Only writing the genes that have changed simplifies the writing of Genotype. Eg **b+b+ nn** = Narragansett.
- Note that each Gene comes Pairs on each Locus.
- Upper case letters represent Dominant genes, lower case are Recessive.
- Color genes in turkeys are not always totally dominant or recessive. Some in Heterozygous (single factor) are still visible on Phenotype, for example Red (Rr).



The first site is the bronze site.
Three alleles for this Locus. Possibly more.
b+ bronze (normal)
B black (mutation)
b1 black winged bronze (mutation)

2nd Locus Grey, White and Normal.
Three alleles at this locus. More under investigation.
C (normal),
cg gray (mutation)
c white. (mutation)

3rd Locus Dominant Slate. (not in AU)
d (normal)
D Dominant Slate (mutation)

4th Locus Brown.(not in AU)Sex Linked
E (normal)
e brown (mutation)

5th Narragansett site: Sex Linked
Ng (normal)
ng Narragansett (mutation)

6th Locus Red.
R (normal)
r Red (mutation).

7th Locus Recessive slate.
Sl (normal) and **sl** recessive slate (mutation)

8th Locus Spotting (Yet to be determined)
Sp (normal) and **sp** spotting(mutation)

9th Locus for Penciling

Pn (normal) and **pn** Penciling (Mutation)
The Penciling Locus is still being studied to see if this mutation is actually located at a different locus of it's own or just a modifier of **b1**

What about modifiers?

All gene that are mutations are modifiers, these mutant genes can modify phenotype in unexpected ways. For example White bird with Blue eyes also has at least one **B** Black gene. Brown eyes has a bronze base **b+**. Hazel eyes has a Black Wing Bronze base **b1**.

- Any color variety can be modified by white **c**, Red **r** and Recessive Slate **sl** when Homozygous for these genes.
- Penciled Pattern **pn** is only visible on Black Wing Bronze Based Turkeys **b1** .

What use are all these letters?

We use the abbreviations to easily identify what genes a variety is comprised of.

They are universal, common names vary from country to country and can cause confusion.

They allow us to use Punnet squares and the Turkey Calculator to help work out the results of particular crosses.

<http://www.porterturkeys.com/turkeycolorcalculator.htm>

Sex Linked Genes in Turkeys

- Recessive Sex-linked genes are located only on the Z sex-chromosome.
- Hens have one Z and one W sex chromosome (ZW).
- If she has a Sex-linked gene on the Z chromosome it will be expressed even if it is recessive. She will only give the available Z genetics to her sons, whereas her daughters will not receive any genetic material from her in the sex-linked gene. This is because her daughters can only receive the W chromosome material, which does not influence the sex-linked trait.
- Males have two sex-chromosomes (ZZ), one from their Dam and one from their Sire. In males, the sex-linked factor will be visible if it is located on both sex-chromosomes (Homozygous).
- In females, if they have the sex-linked gene, the factor will be visible, as they have only one Z sex-chromosome on which the sex-linked gene is located.
- The factor is not visible in males if only one Z sex-chromosome carries the recessive gene.(Heterozygous)
- If a male carries only one Z gene with the recessive factor, then he is split for the recessive factor.

Females never can be split for a sex-linked gene.

Here are some mating examples:
ng = Sex linked Narraganset (recessive)
b+b+ ngng

Tom: **b+b+ ngng** Narraganset = visible for the recessive Narraganset.

Hen: **b+b+ ng-** = visible for the recessive factor

Results:

50 % males, **b+b+ ngng** double-factor = visible for Narraganset

50 % females, **b+b+ ng-** single-factor = visible Narraganset

Tom: **b+b+ ngng** Narraganset = visible for Narragansett.

Hen: **b+b+** Bronze

Results:

50 % males, **b+b+ Ngng** single-factor = Not Visible Narraganset

50 % females, **b+b+ ng-** = Visible Narraganset

Bibliography

1. <http://www.porterturkeys.com/>
2. <https://www.facebook.com/groups/Turkeycolorgenetics/?ref=bookmarks>
3. <https://academic.oup.com/ps/article/89/8/1599/1563378/Variability-of-the-melanocortin-1-receptor-MC1R>
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