Sex-Linked Traits in Poultry

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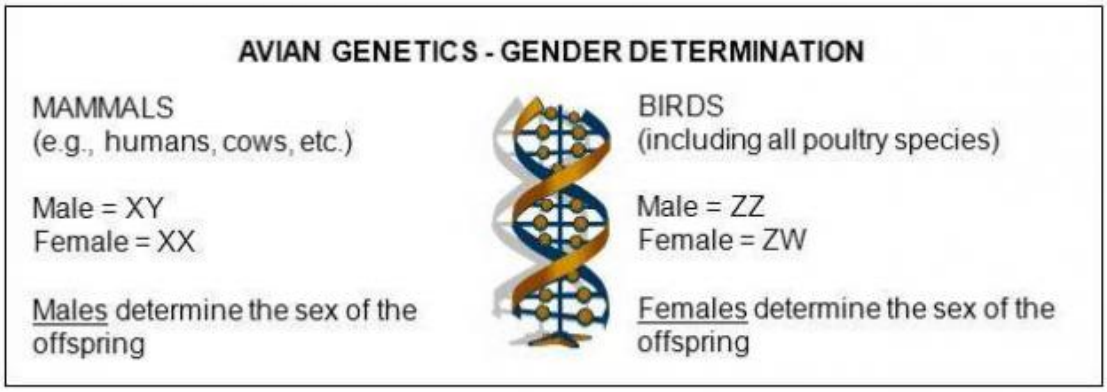
Gender is determined genetically by two sex chromosomes. In mammals these are the X and Y chromosomes, with males having XY chromosomes and females having XX. In a mating, the parents each contribute one sex chromosome. As a result, it is the male that, genetically, determines the gender of the offspring. In birds, however, the sex chromosomes are referred to as Z and W, with females having ZW chromosomes and males having ZZ. In birds, therefore, it is the female that determines the gender of the offspring.



In addition to determining gender, sex chromosomes carry genes that can affect other traits, such as plumage color. These characteristics have been used in sex-linked crosses and can be used to determine the gender of the offspring. Sex-linked crosses can only be produced with male and female chickens of differing breeds in specific combinations. For example, a Delaware female mated to a New Hampshire or Rhode Island Red male results in male offspring that will grow up to have the Delaware feather pattern of their mother, and the females will have the solid red feather pattern of their father. If you mate a Delaware male with a New Hampshire or Rhode Island Red female, all the offspring will have the same Delaware feather pattern. It is also important to note that the offspring of a sex-linked cross cannot themselves be used in a second sex-linked cross.

Examples of Sex-Linked Crosses Used in Egg Production

Black sex-links (also known as Rock Reds) are produced by crossing a barred hen with a non-barred rooster. The male offspring will feather out like their mother, and the female offspring will be a solid color, typically black. A common black sex-linked cross is a Barred Plymouth Rock hen mated with a Rhode Island Red or New Hampshire rooster. At hatch both sexes have black down, but the males can be identified by the white dots on their heads. The female offspring from a black sex-linked cross lay brown-shelled eggs.

Red sex-links can be produced with a number of different crosses. For example, White Plymouth Rock hens with the silver factor are crossed with New Hampshire males to produce the gold comet. The silver gene is on the sex-chromosome and inhibits red pigmentation in feathers. A silver-laced

Wyandotte hen is crossed with a New Hampshire rooster to produce the cinnamon queen. As with the black sex-links, offspring from the red sex-link cross lay brown-shelled eggs.

Lines of commercial white-shelled egg strains are now being produced that utilize sex-linkage to differentiate the cockerels from the pullets when chicks are one day old. These strains utilize the slow-feathering versus rapid-feathering sex-linked crosses discussed below.

Examples of Sex-Linked Crosses Used in Production of Meat Chickens

The speed of feather growth is a sex-linked trait used for sexing day-old broiler chickens. Slow feathering in chickens is caused by a gene on the Z chromosome. The difference in the length of the primary and covert wing feathers can be seen between one and three days after hatching. After this age, however, it is not possible to use this sex-link cross for sexing chickens. When slow-feathering females are crossed with fast-feathering males, the male offspring are slow-feathering like their mother, and the female offspring are fast-feathering like their fathers.

Figure 1. Comparison of the wings of fast- and slow-feathering chicks. Source: Jacquie Jacob, University of Kentucky