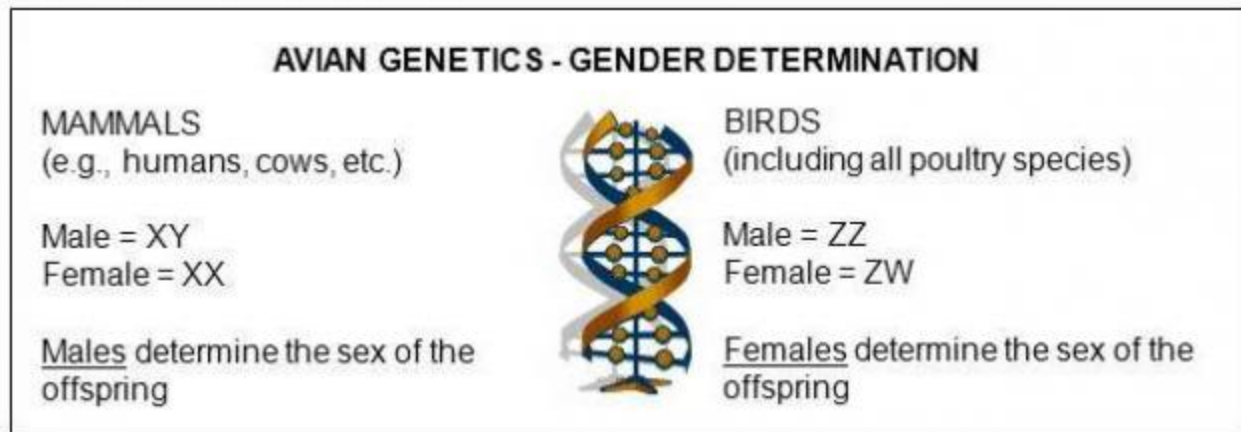


Sexing Day-Old Chicks on Small and Backyard Flocks

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Figure 1. Genetic basis for sex determination in mammals and birds



With most animals, it is relatively easy to determine the sex of the newborn. The male reproductive organs are located on the outside of the body and are relatively easy to see, even in newborns. This is not the case with poultry. In male birds, the reproductive organs are inside the body cavity. This makes sexing newly hatched chicks difficult.

There are two methods of sexing chicks that can be used at hatcheries: vent sexing and feather sexing.

Vent sexing was developed in Japan and brought to North American poultry producers in the 1930s. Vent sexing is a skill that takes a long time to develop. It involves holding the chick upside down in one hand, expelling the fecal material, and everting (turning outward) the vent area. The producer can then look for the presence or absence of a rudimentary male sex organ. This process sounds much easier than it actually is. To accurately sex chicks in this way, you need to be well trained and to have had a great deal of practice. There are very few schools that still teach chick sexing.

Feather sexing is possible for some chicken breeds.

- The Rhode Island Red and New Hampshire breeds can be sexed by wing color at hatching. Male chicks have a white spot on the down over the wing web. This spot is lost when the chick down is shed and replaced with feathers. However, there is considerable normal variation in the size of the spot, so sexing in this way is not always accurate.
- The Barred Plymouth Rock breed carries a gene for barring (B) that is carried on the Z chromosome (see Figure 2). This gene produces a white bar on an otherwise black feather. The gene is incompletely dominant over the non-barring gene (b). In adults, the male, with two barring genes (BB), has feathers with broader white bars than those of the female, who has only one of the barring genes (B₁). As a result, females are overall lighter in color. The sex of purebred Barred Plymouth Rocks chicks can be determined on the basis of the size and

shape of a light-colored spot on the top of the head. At hatch, males have a large white spot. The spot is much smaller and narrower in females. This has been found to be about 80% accurate.

Photo of a Barred Plymouth Rock chick with white spot on top of the head. The spot is much smaller and narrower in females. Source: Jacquie Jacob, University of Kentucky

Sex-linked crosses are based on the color or growth rate of feathers, characteristics carried on the sex-determining chromosomes of chickens. To understand how this works, it is important to have a basic understanding of the genetics involved. It takes a pair of sex-related chromosomes to determine the sex of the offspring. The mother contributes one sex chromosome to the offspring, and the father contributes the other. In mammals, males carry an X and a Y chromosome, while the females carry two X chromosomes. It is the male that, genetically, determines the sex of the offspring. In birds, it is the other way around—females carry a Z and a W chromosome, and males carry two Z chromosomes. It is the female, therefore, that, genetically, determines the sex of the offspring (see Figure 1).

Most breeds do not have this type of sex-linked characteristic, but crossing certain breeds can result in different feather characteristics for the offspring.

- The sex-linked trait of barring has been used in such sex-linked crosses. When a non-barded male is crossed with a barred female, the resulting females will be non-barded like their father, while the resulting males will be barred like their mothers (see Figure 3). At hatch, both sexes have dark-colored down, but the males have a white spot on the top of their head. It is this specific cross that must be used. Crossing a barred male with a non-barded female will not work. Common breeds used as the non-barded male include Rhode Island Red or New Hampshire.
- Another characteristic that has been used in some commercial strains is the silver (S) and gold (s) color genes. Gold males are mated to silver females. The resulting males will be silver, while the females will be gold (see Figure 4). The silver and gold genes have been used in both the egg and meat chicken (broiler) industries.
 - Some of the strains of brown-shelled egg layers have the silver/gold sexing characteristics. In broiler crosses, the down of day-old female chicks is gold or buff, while the male chicks have down that is light yellow or white. The females will feather out gold and white, but the gold is in the outer portion of the feathers. The undercoat and quills are usually white, so there is no negative effect on the appearance of the resulting

Figure 2. Genetic basis for sexing day-old Barred Plymouth Rock chick:

B = Barred b = non-barded

		FEMALE	
		Z ^B	W
MALE	Z ^B	Z ^B Z ^B	Z ^B W
	Z ^b	Z ^b Z ^b	Z ^b W

Z^BZ^B = Barred male with broad white bars

Z^BW = Barred female with more narrow white bars



carcass. The males are white, or almost white, at processing.

- o The gold/silver and barred/non-barred genes have been combined and used in some commercial brown-shell egg layers. A gold, non-barred Rhode Island Red male is crossed with a silver, Barred Plymouth Rock. The females resulting from the cross are black and red and non-barred, while the males are black and white barred (see Figure 5).

- Another sex-linked characteristic that is used commercially in the United States is the rapid-feathering, or fast-feathering, gene. A rapid-feathering male is crossed with a slow-feathering female (see Figure 6). The resulting males will be slow-feathering, while the females are rapid-feathering. As a result, the males have wing feathers that are relatively shorter than those of the females. In the females, the covert feathers are always shorter than the primary feathers. In the males, the covert feathers are always as long as, or longer than, the primary feathers (see Figure 7). Some training is required to develop accuracy and speed in sexing on the basis of wing-feather length. However, the amount of training is considerably less than that required for vent sexing.

Figure 3. Genetic basis sex-link cross of barred female to non-barred male:

B = Barred b = non-barred

		FEMALE	
		Z ^B	W
MALE	Z ^b	Z ^B Z ^b	Z ^b W
	Z ^b	Z ^B Z ^b	Z ^b W

Z^BZ^b = Barred male

Z^bW = Non-barred female

Figure 4. Genetic basis for sex-linked cross of silver/gold genes:

S = silver s = gold

		FEMALE	
		Z ^S	W
MALE	Z ^s	Z ^S Z ^s	Z ^s W
	Z ^s	Z ^S Z ^s	Z ^s W

Z^SZ^s = Silver male

Z^sW = Gold female

Figure 5. Genetic basis for sex-linked cross of silver/gold with barring genes:

B = Barred b = non-barred
S = silver s = gold

		FEMALE Barred Plymouth Rock (silver, barred)	
		Z ^{SB}	W
MALE Rhode Island Red (gold, non-barred)	Z ^{sb}	Z ^{SB} Z ^{sb}	Z ^{sb} W
	Z ^{sb}	Z ^{SB} Z ^{sb}	Z ^{sb} W

Z^{SB}Z^{sb} = Black and white barred male

Z^{sb}W = Black-red, non-barred female

Figure 6. Genetic basis for sex-linked cross of rapid/slow feathering gene:

K = slow-feathering
k = rapid-feathering

		FEMALE	
		Z ^K	W
MALE	Z ^k	Z ^K Z ^k	Z ^k W
	Z ^k	Z ^K Z ^k	Z ^k W

Z^KZ^k = Slow-feathering male
Z^kW = Rapid-feathering male

Figure 7. Comparison of the wing feathers of a slow feathering male and a rapid-feathering female at hatch



Source: Jacquie Jacob, University of Kentucky

Throughout embryonic development, there are no external characteristics that identify the sex of the chick. At hatch, male and female chicks are the same weight, and—except for the down color and feather length mentioned earlier—neither males nor females show any distinguishing secondary sexual characteristics. The most accurate way to sex chicks is to watch them grow. As the chicks get older, they will exhibit differences in behavior and feathering.

- The males switch from chirping, which is common to all chicks, to attempting to crow.
- The males have larger bodies, combs, and wattles than the female.
- In single-comb birds, such as Leghorns, the male's comb stands upright and the female's typically flops over on one side.
- The males develop larger spurs than the females.
- The males have longer, more pointed, and narrower hackle feathers (located on the neck). The hackle feathers typically have a rounded oval shape in females.
- The males and females both have main tail feathers, but only the males have saddle feathers.
- In crested chickens such as Polish, Sultans, and Crevecoeurs, the crest feathers of the females are curved and form a soft topknot. The crests of the males are pointed to give a more punk-like appearance.
- The combs of young roosters begin to develop earlier than those of females. The timing of this varies from breed to breed. In most breeds with large combs, it is relatively easy to distinguish

the two sexes. For some of the breeds with small combs, such as those with pea combs, distinguishing the sexes may be more difficult.

There are, of course, exceptions to these differences.

- Males of the Campine and Sebright breed have female plumage. They are said to be "hen feathered." This makes distinguishing the sexes difficult.
- Sexing silkies can be difficult. The feathers of silkie chickens do not have barbs, making it look as though they have hair instead of feathers. The lack of barbs also masks the sex-related difference in the structure of hackle and sickle feathers.

Myths and Old Wives' Tales

- It is a common misconception that you can candle an egg to determine whether it is fertile. You cannot candle an egg and determine whether it is fertile. If the egg is fertile, you can't determine whether the embryo is male or female (see Figure 8).
- There are some old wives' tales about how to sex baby chicks prior to hatch, but the chances of being right using these traditional or folk methods are fifty-fifty.
 - One such method involves observing the shape of the egg. According to this method, eggs that have a longer, narrower shape will yield male chicks, and eggs that are rounder will yield female. In reality, the shape of the egg is not related to the sex of the offspring, nor does it indicate whether the egg is fertile.
 - Another method involves tying a needle or weight to the end of a piece of string and holding it over the chick. If the string moves in a circular pattern, it indicates a female chick (pullet). If the string moves back and forth, the chick is male (cockerel).

Source: Jacquie Jacob, University of Kentucky

