

COLOR PATTERNS IN BEEF CATTLE

F. David Kirkpatrick, Professor
Animal Science Department, University of Tennessee

Color of feeder cattle and especially color patterns affect the price of feeder cattle. Generally feeder cattle that are uniform in color will sell for a higher price than those that are less uniform in color. Breeding decisions made by cow-calf producers impact the color of the calf crop. Cow-calf producers should have some knowledge of what those breeding decisions will have on their calf crop.

Color in beef cattle is a qualitative trait that is influenced by only a few pairs of genes whereas growth traits are quantitative traits that are influenced by a number of pairs of genes. That is why it is easier to fix color patterns in cattle than it is to increase performance traits.

Most breeds of beef cattle have a fixed color pattern that is characteristic for that breed because of previous selection. For example, all Hereford cattle have a red body color with a white face, all Charolais are white and Red Poll are red. However, some other breeds may have more than one basic body color such as red or black Angus and red, white or roan Shorthorn. Other breeds have multiple colors which are not predictable; for example spotting, brindling or solid colors in Longhorn.

Some knowledge of inheritance of color coupled with experience, allows one to predict with some degree of accuracy the color patterns to expect among calves when using different breeds in a crossbreeding program. Due to chance segregation and the fact that more than one pair of genes affect many color patterns there will be some exceptions.

Many of the available breeds of cattle are characterized as to basic body color categories. They are identified with the color pattern that is most common in each breed. The Simmental can

be categorized with spotted cattle or solid red or solid black. Limousin, Salers and Gelbvieh are both classified with red and black. Those breeds in the Black category are: Angus, Brangus, Chiangus, Galloway, Welch Black, Limousin, Gelbvieh, Salers and Simmental. Breeds in the Red body color are: Barzona, Devon, Gelbvieh, Hereford, Polled Hereford, Limousin, Lincoln Red, Norwegian Red, Red Angus, Red Poll, Salers, Santa Gertrudis, Senepol, Scotch Highland, Shorthorn, South Devon and Simmental. The White or cream colored breeds are: Shorthorn, Charolais, White Park and Blonde'd Aquitane. Spotted color patterns are represented by the following breeds: Beef Friesian, Hays Converter, Holstein, Maine Anjou, Pinzgauer and Simmental. Mixed colored breeds are: Beefmaster, Braford and Longhorn. The brownish red to reddish black colors are in the Jersey, Brown Swiss and Brahman. Breeds that have light colored hair coats with dark pigment skins are: Brahman, Brown Swiss, Chianina, Marchigana, Murray Grey, Romagnola, Jersey and Tarentaise.

There are basically three different colors in cattle. Those being black, red and brownish red to reddish black. The brownish red to reddish black colors are represented in the Jersey, Brown Swiss and Brahman. The mode of expression is that black is dominant to both other colors. That is if an animal has at least one gene for black then it will be black. The brownish red to reddish black is dominant to red. That means if an animal has at least one brownish red to reddish black gene with the other gene not being black, the animal will be brownish red to reddish brown. Since red is the recessive, a red animal will only be red if it possesses both genes for red. An animal that is solid red is said to be homozygous(both genes of the same pair are the same).

Along with these three basic color genes, there are different modifying genes that influence white spotting patterns, level of expression of the color pigment and roaning. A homozygous pair of dilution genes can dilute the solid colored animal to almost white or cream colored. Most solid white or cream colored cattle are genetically red or black but are

homozygous (both genes the same) for the dilution genes that dilute the pigmentation to white or cream color. An animal which is heterozygous for the dilution gene (one gene for dilution and the other for non-dilution) can influence the intensity of red pigmentation in red cattle and black pigmentation in black cattle. The offspring of a black animal bred to a white animal will most likely produce gray offspring. Likewise, red cattle mated to animals whose pigment is diluted can produce light yellow colored offspring.

Breeds that are known to possess the dilution gene are: Simmental, Charolais, Longhorn, Gelbvieh, Blonde'd Aquitaine, Murray Grey and Scottish Highland. Charolais are homozygous for the dilution gene as evidenced by their white color. Using them in a crossbreeding program will always partially dilute the color of the breed to which they are mated. For example, Charolais X Angus crossbreds are always gray. The Simmental that are homozygous for the dilution gene are very light fawn colored. When very light fawn colored Simmentals are used in a crossbreeding program, they will always contribute a dilution gene to partially dilute the color of breed they are mated to. Medium red colored Simmentals are most likely heterozygous for the dilution gene and when used in crossbreeding, they may or may not dilute the color of the breed they are mated with. Deep dark red Simmentals are homozygous for the non-dilution gene and when used in a crossbreeding program, they will not dilute the color of the breed of which they are mated. On many markets cattle are sold with little, if any information available about breed or performance. Most buyers will estimate performance (gain, yield, livability, etc.) in relation to the reputation of the breed; thus they look for signs that indicate a certain breed or breeds making up crossbred cattle. Some breeds are prone to produce calves that have certain distinguished color markings, such as white-faced, droopy ears, brindling, skunk-backs and white stocking legs. Those breeds that indicate white faced or blaze faced calves are Hereford, Polled Herefords and Simmentals. Brindling may indicate breeds such as: Jersey, Brown Swiss, Brahman, Chianina, Tarentaise or Longhorn. Skunk-backs are indications of either Charolais or

Pinzgauer. Stocking legs can come from: Holstein, Beef Friesian, Maine Anjou, Simmental, Hays Converter, Hereford or Polled Hereford. Droopy ears and larger navels are indications of Brahman, Brangus, Santa Gertrudis or Braford.

Color is an economic trait in some situations, but should not be a substitute for the more important traits of beef cattle production such as growth, reproduction and carcass traits. Not all breeds are reported in this article and it should not be construed in any manner that they are minor breeds. Information was not available on color inheritance of those breeds.

The following appendix illustrates mode of inheritance of different colors and spotting patterns along with expected color patterns of different breeding programs.

APPENDIX

BASIC COLORS

**BLACK
RED
REDDISH BROWN TO BROWNISH BLACK**

**MODE OF EXPRESSION
(DOMINANCE)**

BLACK > RDSHBRWN-BRNSHBLK > RED

> = DOMINANT

EXPECTED COLOR FROM MATING:

BLACK X RED	BLACK (some red possible)
BLACK X RDSHBRWN-BRNSHBLK	BLACK (brindle)
RDSHBRWN-BRNSHBLK X RED	RDSHBRWN-BRNSHBLK (brindle)
RED X RED	RED

POSSIBLE GENETIC MAKEUP & COLOR

<u>COLOR</u>	<u>GENE PAIR</u>
BLACK	2 BLACK OR 1 BLACK & 1 RED
RDSHBRWN-BRNSHBLK	2 RDSHBRWN-BRNSHBLK OR 1 RDSHBRWN-BRNSHBLK & 1 RED
RED	2 RED

SPOTTING COLORATIONS

PATTERN

WHITE FACE (WF)

SPOTTED (Sp)

DORSAL STRIPED (DS)

SOLID COLORED (S)

BREEDS FOUND IN:

HEREFORD

SIMMENTAL, HOLSTEIN, ETC.

PINZGAUER, CHAROLAIS, LONGHORN

SOLID COLORED BREEDS

SPOTTING COLORING MODE OF EXPRESSION

WHITE FACE = DORSAL STRIPED <> SOLID > SPOTTED

<> = INCOMPLETE DOMINANCE > = DOMINANT = NO DOMINANCE

POSSIBLE GENETIC MAKEUP & COLOR PATTERN

PATTERN

HEREFORD MARKED

DORSAL STRIPED
WITH WHITE UNDERLINE

DORSAL STRIPED & WF

SOLID COLOR

PARTIAL SKUNK TAIL

BWF OR RWF

SPOTTED

GENE PAIR

2 WF GENES

2 DORSAL STRP GENES

1 DORSAL STRP & 1 WF

2 SOLID COLOR

OR

1 SOLID & 1 SPOTTED

1 SOLID & 1 DORSAL STRP

1 WF & 1 SOLID

2 SPOTTED

PIGMENTATION

DILUTANTS **RED to YELLOW,
BLACK to GRAY**
FOUND IN SIMM. & CHAR.

BRINDLING **STRIPES**
**FOUND IN JERSEY, BRAHMAN, BROWN SWISS
BRAUNVIEH, CHIANINA**

EXPECTED COLOR OF CALVES FROM MATING:

BLACK X BLACK	BLACK(maybe some red)
BLACK X RED	BLACK(maybe some red)
RED X RED	ALL RED
BLACK X BRWNSHBLK-REDSHBRWN	BLACK (some BRINDLED)
RED X BRWNSHBLK-REDSHBRWN	BRWNSHBLK-REDSHBRWN (some BRINDLED)
BLACK X HEREFORD	BWF (maybe SOME RWF)
BWF X BLACK	BWF, BLACK MOTTLED (maybe some RWF)
BWF X HEREFORD	50% BWF, 50% RWF(some BWF & RWF HEREFORD marked)
BWF X SOLID RED	BLACK, RED, RWF & BWF
BLACK X YELLOW SPOTTED	GRAY BLZ FACE (maybe some YELLOW BLZ)
BLACK X DARK RED SPOTTED	BLK & CHARCOAL BLZ FACE
BLACK X CHAROLAIS	GRAY(BLK NOSE) (maybe some LT YELLOW)
HEREFORD X CHAROLAIS	LT YELLOW WF
BLACK X CHAROLxANGUS	BLACK, GRAY & LT YELLOW (SOME WITH SKUNK TAILS)
CHAROLAIS X BWF	GRAY & YELLOW (SOME WF) & SOME WITH SKUNK TAILS, POSSIBLY SOME BLACKS & BWF