

1914

Sex-Linked Factors in the Inheritance of Rudimentary Mammae in Swine

Edward N. Wentworth
Kansas State Agricultural College

Let us know how access to this document benefits you

Copyright ©1914 Iowa Academy of Science, Inc.

Follow this and additional works at: <https://scholarworks.uni.edu/pias>

Recommended Citation

Wentworth, Edward N. (1914) "Sex-Linked Factors in the Inheritance of Rudimentary Mammae in Swine," *Proceedings of the Iowa Academy of Science*, 21(1), 265-268.

Available at: <https://scholarworks.uni.edu/pias/vol21/iss1/40>

This Research is brought to you for free and open access by the Iowa Academy of Science at UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

SEX-LINKED FACTORS IN THE INHERITANCE OF RUDIMENTARY MAMMAE IN SWINE.

EDWARD N. WENTWORTH.

Characters fall into four classes when related to sex. The first type is represented by horns in cattle, and red, black and white coats in swine, their appearance being entirely independent of sex. At the opposite extreme are those characters that are confined to one sex only, as the male plumage of the Brown Leghorn or pheasant. Similarly, although exhibiting different behavior somatically, are characters like mammae or tusks that exist in a rudimentary condition, or at least a relatively undeveloped condition, in one sex. Characters of this sort are intimately related to the sex glands and removal of the gland in the young animal will usually cause such characters to remain in the juvenile stage.

The third category approaches this type of inheritance in the sense of being affected somatically by sex, and is represented by the transmission of horns in sheep, as reported by Professor T. B. Wood, and of rudimentaries in swine, as reported by the writer (1912-13). The essential feature of this type of heredity is that the character is dominant in one sex and recessive in the other. When Wood crossed the hornless Suffolk sheep with the Dorset Horn, he obtained horned males and polled females in the first generation. When he inbred these individuals, he found a ratio of three horned to one polled in the males and one horned to three polled in the females. Apparently there was something about femaleness that prevented the horn from developing in this sex except when it was in the duplex or pure condition.

The fourth type of inheritance in relation to sex is where the character is linked or coupled with the sex-determining factor. There are two kinds, one where the female carries two sex factors (XX) and the male carries one (XO), and the other where the female carries one and the male none. Since swine apparently fall under the first type only, attention will be directed toward it alone. In the light of present knowledge there is no difference, apparently, in the general mechanism of inheritance between the two types, except as to a reversal of the sexes in relation to the sex-linked character; hence Morgan's paper on *Drosophila* with reference to the transmission of red and white eyes will illustrate the point. The difference between the red eye and the white is that the red eye carries a color-base that the white eye lacks.

Referring to this as C, when a red-eyed male (XC-O) is mated to a

Published by UNI ScholarWorks, 1914

white-eyed female ($Xc-Xc$)¹ all the male progeny are white-eyed ($Xc-O$) and all the female progeny are red-eyed ($XC-Xc$). When these are inbred half of each sex in the resultant generation are red-eyed ($XC-Xc$ and $XC-O$), and half are white-eyed ($Xc-Xc$ and $Xc-O$). The reciprocal cross of white-eyed male ($Xc-O$) to red-eyed female ($XC-XC$) gives all red-eyed progeny ($XC-O$ and $XC-Xc$). When these red-eyed individuals are inbred all of the females and half of the males are red-eyed ($XC-XC$, $XC-Xc$ and $XC-O$), and the remaining males are white-eyed ($Xc-O$). These results are accounted for very nicely if we assume that the color base is linked to the sex-determining factor in inheritance.

When the writer first reported on the rudimentary mammae of swine (1912), he felt that they belonged to the third category. In glancing over the work, Dr. Cole, of the University of Wisconsin, suggested that there were probably no homozygous males. Search to date has confirmed his suggestion and forced a modification of interpretation. The rudimentary mammae discussed are located to the rear of the inguinal pair, and are on the lower part of the scrotum of the male and the inner part of the rear thighs of the female. So far as the writer has observed in upwards of 2,000 cases, they are never functional.

When boars possessing rudimentaries are mated to sows possessing them, the following results were observed:

I.

	Males with rudimentaries	Males without	Females with	Females without
Observed -----	60	0	26	32
Expected ² -----	59	0	29.5	29.5

When boars having the rudimentaries were mated to sows lacking them, these results obtained:

II.

	Males with rudimentaries	Males without	Females with	Females without
Observed -----	205	169	72	293
Expected -----	208.57	131.34	71.19	327.90

¹Lower case letters represent the absence of factors, thus C means that the color base is present and consequently red eyes; c refers to the absence of the color base and consequently white eyes.

²These expectations are based on theory discussed later in the article. They are inserted here for comparison.

The excess of males lacking the rudimentaries and the deficiency of females without them is large enough to be significant, but in the face of the agreement with expectation elsewhere, it is difficult to interpret this without further material.

Boars lacking the rudimentaries sired pigs from sows possessing them as follows:

III.

	Males with rudimentaries	Males without	Females with	Females without
Observed -----	25	0	0	13
Expected -----	25	0	0	25

The deficiency of females is due only to chance modification of the proportion of births between the sexes.

Where both sexes lacked the rudimentaries, the progeny were grouped as indicated.

IV.

	Males with rudimentaries	Males without	Females with	Females without
Observed -----	19	48	0	48
Expected -----	16.34	50.66	0	67

Again the deficiency of females is due to a modification of the birth ratio and not to hereditary effect of the characters.

The inheritance is apparently a combination of the sex-linked and sex-limited types discussed as the fourth and third categories. It appears sex-linked in so far as the transmission of the genetic factor for rudimentaries is concerned, and is sex-limited in so far as there is apparent repression somatically of the rudimentaries of the female sex when they are in a simplex condition. This would make two classes of females in tables II and IV, those heterozygous for the rudimentaries and those lacking them hereditarily. In figuring the expectation the relative frequency of each class has been allowed for. Letting X represent the

sex-determining factor and R the factor for rudimentaries, the following types of each sex exist:

Boars.	Sows.
XRO	XRXR
XrO	XRrXr
	XrXr

Only the first type under each sex would have rudimentaries somatically. Males lacking the rudimentaries when bred to the two classes of females lacking them, show the following:

	Males with rudimentaries	Males without	Females with	Females without
XrO-XRrXr -----	19	16	0	17
XrO-XrXr -----	0	32	0	31

Barring variations in the birth ratio (a deficiency of females) in the third type of mating, the expectation is realized within practical limits. On the whole, the figures come close enough to expectation to support the assumptions that the female carries two sex factors to the male's one, that the hereditary factor for the rudimentaries is linked to the sex factor, and that the rudimentaries must be present in a duplex condition in the female to develop somatically.

LITERATURE CITED.

Wood, T. B., "Note on the Inheritance of Horns and Face-Colour in Sheep." *Journal Agricultural Science*, Vol. I, part 3, p. 364.

Wentworth, E. N., "Another Sex-Limited Character." *Science*, N. S., Vol. XXXV, No. 913, p. 986 (1912).

Wentworth, E. N., "Inheritance of Mammas in Duroc-Jersey Swine," *Amer. Nat.*, Vol. XLVII, pp. 257-278.

DEPARTMENT OF ANIMAL HUSBANDRY,
KANSAS STATE AGRICULTURAL COLLEGE,
MANHATTAN, KANSAS.