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## A dominant sex-limited character.

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A new mutant of the fruit fly, *Drosophila*, characterized by abnormal arrangement of the black bands on the abdomen, proves to be dominant to the normal arrangement of the bands, and since the factor for the character is coupled with femaleness it may be assumed to be contained in the *X*-chromosome. Abnormal ♀ by normal ♂ gives abnormal males and females. These inbred produce in the next, or $F_2$, generation 50 per cent. abnormal ♀, 25 per cent. abnormal ♂ and 25 per cent. normal ♂. No normal females appear in this generation. Thus the *normal character* is sex-limited in relation to the abnormal.

The reciprocal cross, viz., normal ♀ by abnormal ♂ gives abnormal females and normal males. These inbred produce in the next, or $F_2$, generation, 25 per cent. abnormal ♀, 25 per cent. normal ♀, 25 per cent. normal ♂, and 25 per cent. abnormal ♂[1]. The explanation is as follows:

| | | | |
|---|---|---|---|
| Abnormal | ♀ | = Ab. *X* − Ab. *X*. | |
| Normal | ♂ | = N. *X* − ——. | |
| $F_1$ | ♀ | Ab. *X* N. *X*. | |
| | ♂ | Ab. *X* —— | |
| $F_2$ | | Ab. *X* Ab. *X* | = Ab. ♀. |
| | | Ab. *X* N. *X* | = Ab. ♀. |
| | | Ab. *X* | = Ab. ♂. |
| | | N. *X* | = N. ♂. |

It will be seen that the abnormal factor is contained in *X*, hence sex-limited inheritance. The explanation of the reciprocal cross will be clear from this example.

Five other cases of sex-limited inheritance have been found in *Drosophila*, viz., miniature wings, rudimentary wings, black color, bright red eye and orange eye. All of these are recessive characters, and *ex hypothesi* are also present or absent from *X*. By crossing a red-eyed, abnormal type with a white-eyed, normal

[1] Since the abnormal character overlaps the normal some difficulty is found in classifying the $F_2$ generation.

type two points are established: first, that the same chromosome *X* may carry both a recessive (absence) and a dominant character at the same time, and second, that a strong "association" or coupling of characters exists. Thus, when an abnormal red-eyed ♀ is paired with a normal white-eyed male the offspring are abnormal red-eyed males and females. These inbred have given in the second generation:

| | | | |
|---|---|---|---|
| Abnormal | red | ♀ | 18 |
| Abnormal | red | ♂ | 6 |
| Abnormal | white | ♂ | 0 |
| Normal | red | ♀ | 18 |
| Normal | red | ♂ | 6 |
| Normal | white | ♂ | 14 |

A strong tendency for the grandparental combination to reappear in the $F_2$ generation is manifest.

The reciprocal cross, viz., abnormal red-eyed ♂ by normal white-eyed ♀ gives abnormal red-eyed females and normal white-eyed males. These inbred have produced:

| | | | |
|---|---|---|---|
| Normal | white | ♀ | 47 |
| Normal | white | ♂ | 55 |
| Abnormal | white | ♀ | 0 |
| Abnormal | white | ♂ | 4 |
| Normal | red | ♀ | 34 |
| Normal | red | ♂ | 19 |
| Abnormal | red | ♀ | 41 |
| Abnormal | red | ♂ | 48 |

Here also the normal and white combination reappear, while the abnormal and white are scarcely represented.