

9.4 Inbred lines in laboratory animals

Within laboratory animals, as for instance mice, rat and guinea pig, it has been possible to obtain completely inbred lines. When using continued full sib mating it is possible in theory to reach 99.8 % inbreeding after 20 generations. If full sib or parent-offspring mating is continued the coefficient of inbreeding is determined by the inbreeding in two prior generations with the following formula

$F_n = (1 + 2 \cdot F_{(n-1)} + F_{(n-2)})/4$, where F_n is the inbreeding in generation n, see solution to exercise 4.2.

The totally inbred lines have the advantage of being completely uniform genetically. By using inbred animals (instead of out bred ones), in relation to a security test of a new drug, a lower number of test animals are needed due to a lower error variance. To maintain the uniformity the use of full sib mating is necessary. Furthermore, if several animals are used in the trial, it is necessary for the results that the multiplication ensures that the original parents are no more than five generations away. The reason for this rule is that every new individual carries a certain number of new mutations. These mutations are very significant due to the uniform inbred background.

It has not been possible to obtain absolute inbreeding within our common domestic animals. When the inbreeding has reach 60 to 70 %, the fertility has been very low because of the inbreeding depression, that further inbreeding has been impossible. The laboratory animals has passed that barrier and here many of the fully inbred lines have a high and stable fertility, even at 100 % inbreeding.

Every inbred line, that is maintained for commercial reasons, has been specialized for specific lines of research. An example is the diabetes mice which easily acquire diabetes, naturally they are used in diabetes research. Several transgene lines have also been produced in both rats and mice, each specialized for a certain purpose.