1.2 Quantitative versus qualitative inheritance

There is a continuum of traits being inherited as a Mendelian trait with simple inheritance and traits having quantitative inheritance without well separated classes and with many genes involved.

Classification of traits in relation to mode of inheritance and environmental tolerance are shown in Figure 1.2. First there are the well known traits with simple Mendelian mode of inheritance. The trait with quantitative genetic inheritance is caused by segregation of many gene pairs, each with small effect. At the same time the trait is influenced by a lot of minor environmental effects.
Diseases will often be 'either/or traits' as the simple Mendelian traits. Cases in which the severity of the disease has a normal distribution can also be found. In many production diseases the disease only occurs when a genetically prone individual is exposed to adverse environmental effects. See Figure 1.2, produced by prof. emeritus Erik Andresen.

Figure 1.2. Classification of traits in relation to mode of inheritance and environmental tolerance.

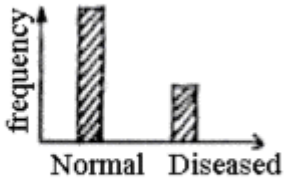
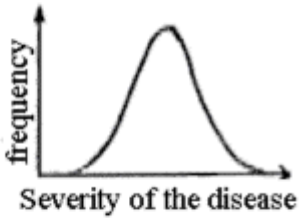
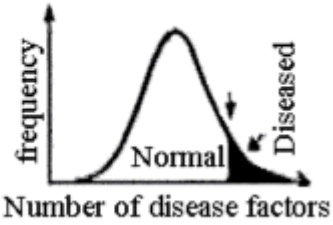
Trait	Mode of inheritance	Environmental effects	Diseases
Qualitative, Blood and serum types Enzyme defects	Simple Mendelian (monogene)	Little	
Quantitative, Stature height Intelligence Milk yield	Complex (polygene)	Moderate to great	
Threshold, Hare lib Pylero stenosis Many diseases	Complex (polygene)	Moderate to great	

Figure 1.3 gives an illustration of how one or two Mendelian segregating gene pairs control the milk yield. For each A or B allele an individual has a yield increase of one kilogram. The alleles A and a have the same frequency in the distributions. For a realistic picture of the genetic background for milk yields, hundreds of gene pairs have to be involved. The milk yield has by selection been changed just as dramatically as the fat-% in the milk, as shown in section 1.4. To make this possible there has to be an effect from numerous gene pairs. In the present example using only two gene pairs, they could be fixed after one generation of selection.

Figure 1.3. Illustrating how one and two gene pairs can influence milk yields. In reality, numerous gene pairs have to be involved for selection to be carried out generation after generation without the genetic variation diapers when selecting .