The aim of this Thesis is to examine the opportunities for genetic improvement of intramuscular fat (IMF) content by selection, and its consequences on other economically relevant traits. For this purpose, a divergent selection experiment on IMF content was performed in rabbits. Near infrared reflectance spectroscopy (NIRS) was used to measure IMF content, protein content and fatty acid composition during the selection process.

Accurate NIRS prediction equations were developed for measuring IMF content (R^2_{CV}=0.98 and SECV=0.07 g/100g muscle). Prediction models for saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), the main individual fatty acids of rabbit meat (C16:0, C18:1 n-9 and C18:2 n-6) and other minor fatty acids such as C14:0, C15:0, C16:1, C17:0, C18:0 and C18:3 n-3 were also accurate. Less accurate predictions were obtained for polyunsaturated fatty acids (PUFA), n-6, n-3, fatty acid ratios and protein content.

The application of NIRS in rabbit selection programmes for IMF content was studied. NIRS could be a proper technique to compare different groups or treatments because no differences were found when comparing IMF content measured by chemical analyses and that predicted by NIRS. However, regression statistics between chemical and predicted values of IMF showed that NIRS may not be accurate enough to predict individual genetic values for ranking animals, where a higher accuracy is needed. Nevertheless, NIRS could be applied in truncated selection. Intramuscular fat content of parents that would be selected by applying the chemical method was compared to that of parents that would be selected by applying NIRS, and no differences were found for both females and males. Thus, the response to selection using NIRS should be similar to the response using chemical methods.

A divergent selection experiment on IMF was carried out. Selection was based on the phenotypic value of IMF content measured in 2 full sibs of the first parity. Data were analyzed using Bayesian methodology. The difference between high and low lines for IMF content after 3 generations of selection was 0.09 g/100g of muscle. This difference represents a direct selection response of 9% of its mean. The estimated heritability for IMF content was 0.37 with a probability of 97% of being higher than 0.2. The selection response on IMF content was symmetrical, with values of 0.054 g/100g of muscle in

the high line and -0.051 g/100g of muscle in the low line in the third generation. The fitted animal model was validated, and results confirmed that this trait can be modified through selection in rabbits.

There was a correlated response on perirenal fat content, indicating that selection on IMF content may affect carcass quality. However, the estimated correlated response on this trait was not accurate. Meat quality was also modified by selection on IMF content. Muscle pH, SFA percentage, MUFA percentage and the n-6/n-3 ratio increased, while n-6 percentage, n-3 percentage and PUFA/SFA ratio decreased in the line with higher IMF content.