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## **Survival Analysis applied to Animal Breeding and Epidemiology**

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**Station de Génétique Quantitative et Appliquée , INRA , France**

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### Objectives

Replacement costs represent a major component of production costs, especially when culling is involuntary (e.g., due to health or fertility problems). Therefore, animal scientists (animal breeders, epidemiologists, economists, etc...) are often studying ways to increase the average length of productive life of domestic animals or to decrease the frequency of involuntary cullings.

Survival analysis represents a special field in statistics because it deals with two types of information : « complete » records, when the culling date of the animal is known exactly, and « censored » records corresponding to the « current » length of life when the animal is still alive at the end of the study period. Sophisticated methods have been developed in the biomedical world to better use all the information available (from both uncensored and censored records). The use of such methods in animal breeding and epidemiology appears particularly promising.

The objective of the week is to present the basic methodology of survival analysis. To facilitate the understanding of the concepts involved and to stimulate the use of these techniques in data analyses, practicals will be included each day. These practicals will make use of the « Survival Kit », (Ducrocq and Sölkner, 1998), a software specifically developed for survival analysis in animal breeding and epidemiology. In particular, it can be used to study the influence of time-dependent effects (such as milk production, disease occurrence or herd characteristics). Random (e.g., genetic) effects can be included and their variance can be estimated. Some recent applications will also be presented.

### Program outline :

Day 1 : Introduction to survival analysis ; analysis of homogeneous populations

Day 2 : Parametric and non parametric regression models

Day 3 : Generalization (use of time-dependent covariates) ; some computational aspects

Day 4 : Frailty (mixed) models ; estimation of genetic parameters

Day 5 : Applications in animal breeding and epidemiology : some examples

### Requirements :

The presentation of the methodology of survival analysis will assume some knowledge about probability distributions and basic statistics concepts. But the main requirement is that the participants should already have some experience with data analysis.