

# **FFD, R-software tool for the design of risk based sampling schemes to substantiate freedom from disease**

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## **Abstract:**

In order to meet the standards of trading partners or international organizations, livestock populations are often required to be proven free of certain diseases. Due to the tendency of diseases to cluster at herd level, two-stage sampling schemes (cluster sampling, individual sampling, limited sampling; see Ziller et al., 2002) are often the methods of choice. These sampling schemes allow for an adjustment of the sample sizes at herd-level and individual-animal-level, while maintaining a constant overall alpha error. Sample size calculations are performed using the modified hypergeometric formula by Cameron and Baldock (1998) for every sampling stage and can be quite intricate.

The package “FFD” for the Open-Source Software R was developed in order to facilitate the design and the analysis of surveys to substantiate freedom from disease using two-stage sampling. The functionality of the package comprises sample size calculations, tools for cost optimization and methods for the validation of the surveys by evaluating the a-posteriori overall sensitivity of the sampling scheme, i.e., the sensitivity induced by the specific sample. Furthermore, the package provides means of “dynamic sampling”, where the overall alpha error is directly controlled during the sampling procedure.

In order to further reduce the required resources, risk groups for targeted sampling can be defined on herd basis and the risk of infection can be quantified using relative risks. Based on the methodology of the “scenario trees” (Martin et al., 2007), the package “FFD” provides tools for sample size computation and sensitivity evaluation for risk based sampling.

The key features of the package will be presented using a data example of *Brucella melitensis* in the Austrian sheep population.

## **Literature:**

Cameron, A. R., Baldock, F. C., Two-stage sampling in surveys to substantiate freedom from disease. *Prev. Vet. Med.* 1998, 34: 19-30.

Martin, P.A., Cameron A.R., Greiner, M., Demonstrating freedom from disease using multiple complex data sources 1: a new methodology based on scenario trees. *Prev. Vet. Med.* 2007, 79: 71-97

Ziller, M., Selhorst, T., Teuffert, J., Kramer, M., Schlüter, H., Analysis of sampling strategies to substantiate freedom from disease in large areas. *Prev. Vet. Med.* 2002, 52: 333-343.