Inheritance of subaortic stenosis of the Newfoundland

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Key words
Subaortic stenosis, Newfoundland, Dog,

Aim of the study
The Newfoundland is one of the dog breeds where subaortic stenosis (SAS) occurs most often, with probably a high number of unreported cases. Segregation analysis will allow estimating the prevalence of SAS, its inheritance mode and heritability. The results will help to decide, whether development of a gene test is feasible or not and hence, breeding against SAS should be done with the help of breeding values.

Material and methods
For this project, a unique extensive data base of more than 230'000 registered Newfoundland dogs including many founder animals of the Newfoundland breed and large parts of the Western European population including Switzerland was contributed by German and Swiss breeders. In the pedigree, 6'023 dogs had a SAS diagnosis (severely affected, mildly affected or unaffected). Segregation analysis for revealing the most probable inheritance mode and estimating the heritability was done with the program iBay, which uses a Bayesian approach. Other parameters such as prevalence, inbreeding and coancestry were calculated using CFC.

Results and significance
Subaortic stenosis appeared in 4.7% of the diagnosed Newfoundland dogs. Prevalence of SAS did not depend on the sex or inbreeding rate, but on average coancestry. Dogs born to SAS affected parents (one or both) were significantly more often affected themselves.
Single gene models with codominant or partial recessive inheritance or an additive effect a = 1 (dominant, recessive and codominant) fitted the data better than all other single gene, polygenetic or mixed inheritance models. Hence, single gene inheritance (either codominant or fully or partially dominant or recessive) seems to be the most likely inheritance mode for SAS in the Newfoundland dog. There was no evidence that codominance, dominance or recessivity (full or partial) fitted the data better. Heritability of SAS was estimated at 17 - 45% for the substantially better fitting models.
It is very likely that SAS has a monogenic background with moderate heritability and is not only caused by environmental factors. Compulsory cardiac attest for stud breeding animals and exclusion of SAS affected dogs from breeding should be continued. Given the results of the segregation analysis, trying to find a causal gene for SAS – the basis for gene test development - seems promising and may be more effective and efficient than investing in the introduction and estimation of breeding values for better selection against SAS.

Publications, posters and presentations
Reist S, 2010. Forschungsprojekt beim Neufundländer: Wie wird die Subaortenstenose beim Neufundländer verursacht? NEWS June 2010, Schweizerischer Neufundländer- und Landseer-Klub. (Zwischenbericht)
Reist-Marti S.B., Leeb T., Butenhoff-Taufertshöfer K., Kietzmann S., Kottmann S., Dolf G. Analysis oft the Newfoundland dog population with focus on subaortic stenosis. Paper in peer reviewed journal (*in preparation*)
Reist-Marti S.B., Leeb T., Butenhoff-Taufertshöfer K., Kietzmann S., Kottmann S., Dolf G. Genetic background and heritability of subaortic stenosis in the Newfoundland dog. Paper in peer reviewed journal (*in preparation*)
Reist S, 2010. Forschungsprojekt beim Neufundländer: Wie wird die Subaortenstenose beim Neufundländer verursacht? NEWS, Schweizerischer Neufundländer- und Landseer-Klub. (Schlussbericht) (*in preparation*)
Reist S, 2010. Forschungsprojekt beim Neufundländer: Wie wird die Subaortenstenose beim Neufundländer verursacht? Unser Bär, journal of the Deutscher Neufundländer-Klub e.V. (Schlussbericht) (*in preparation*)

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