

# Ontology Development and its Utility in QTL Data Annotation

## A.S. Leaflet R2866

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### Summary and Implications

Two ontologies have been developed to characterize traits in vertebrate species. The Vertebrate Trait Ontology (VT) is a vocabulary of terms describing measurable or observable characteristics related to the morphology, physiology, or development of vertebrates. The livestock Product Trait Ontology (PT) defines those characteristics relevant to products produced by or obtained from animals maintained for use and/or profit. Both ontologies are being used to annotate data in the Animal QTL Database, providing a common basis for comparisons across databases or between species. The VT and PT will benefit the livestock production industry by implementing standardized trait nomenclature to enhance animal improvement accuracy and to unambiguously utilize research outcomes.

### Introduction

Biological databases are growing at an increasingly rapid pace to accommodate vast amounts of data generated by genomic studies. While these databases may be able to facilitate analysis and data comparisons, the inability to accurately compare data across databases may leave some important connections unexplored. For this reason, the use of ontologies (structured, hierarchical vocabularies delineating the relationships between terms related to a particular topic) is becoming widespread in biology. Ontology terms used to annotate database content provide a common basis to standardize and compare information across databases.

Ontologies have previously been developed to describe phenotypes and measurements, but not traits. A trait is a measurable or observable characteristic (e.g., body mass), whereas a phenotype describes how a trait is manifested (e.g., decreased body mass), and a measurement indicates how the trait is assessed (e.g., body weight). The Vertebrate Trait and Product Trait ontologies were created to fill a need for standardized trait vocabularies to help transfer information across species and aid in the exploration of the genetic basis of traits.

### Materials and Methods

VT development is a collaborative effort between the Rat Genome Database (RGD), Mouse Genome Informatics, and Animal QTLdb. As a result, terms relevant to a variety of vertebrate species were included at the outset. Because the scope of the VT does not include traits specific to

products like meat or eggs that are of interest to livestock geneticists and producers, the Product Trait Ontology was created. The VT and PT ontologies are used in the Animal QTLdb to annotate QTL and SNP association data for pigs, cattle, chickens, sheep, and rainbow trout (<http://www.animalgenome.org/QTLdb>). The VT and PT are available at [www.animalgenome.org/bioinfo/projects/vt](http://www.animalgenome.org/bioinfo/projects/vt) and [www.animalgenome.org/bioinfo/projects/pt](http://www.animalgenome.org/bioinfo/projects/pt) respectively.

### Results and Discussion

The use of common ontologies across databases provides a framework upon which to base comparisons of published QTL and association studies. This is especially helpful for comparison of data from multiple species, experiments, populations, or locations, when varying terms have been used to refer to the same concept. The ability to compare data across species may prove instrumental in the accurate elucidation of the genetic basis underlying livestock traits and phenotypes.

### Acknowledgements

This project was supported by National Research Initiative Competitive Grant no. 2008-35205-18765 from the USDA National Institute of Food and Agriculture. The authors wish to thank the teams at Rat Genome Database and Mouse Genome Informatics for their collaboration and assistance.