Difference between two fecal egg count methods and estimation of genetic parameters for gastrointestinal parasite resistance traits in sheep

M. N. Boareki*, O. Willoughby*, D. Kennedy†, A. Suarez-Vega*, L. R. Schaeffer*, F. S. Schenkel*, A. Cánovas*

*University of Guelph, Department of Animal Biosciences, Centre for Genetic Improvement of Livestock, Guelph, Ontario, Canada.

†Ontario Ministry of Agriculture, Food and Rural Affairs, Elora, Ontario, Canada

mboareki@uoguelph.ca

INTRODUCTION

- Fecal egg count (FEC) is an indicative measurement for gastrointestinal (GI) parasite infection in sheep and other small ruminants
- There are different methods to measure FEC, which may provide differently distributed records
- It is important to account for distinct distributions between methods for purpose of genetic evaluation

OBJECTIVES

- **Evaluate the differences in mean and variances between two FEC methods: the "Modified McMaster" and the "Triple Chamber McMaster"**
- **Estimate the genetic and phenotypic correlations between FEC records using the two different methods**
- **Estimate the genetic parameters for FEC and other GI parasite resistance traits (i.e. FAMACHA, body condition score, and bodyweight)**

MATERIALS AND METHODS

- Fecal samples and phenotypic records for GI parasite resistance traits, including FAMACHA eye score (n = 1,048), body condition score (n = 1,054), and bodyweight (n = 1,103), were collected from a commercial sheep farm in Ontario, Canada
- The FEC was performed using two methods: 1) Modified McMaster (LMMR) (n = 998); and 2) Triple Chamber McMaster (LTCM) (n = 678)
- Differences in means and variances between the two method were compared using t-test and Levene's test, respectively
- Genetic and phenotypic correlations were estimated between two FEC methods treating each method as separate traits
- FEC records were integrated using LMMR records when available and replacing missing records with standardized LTCM records and then, log transformed (LFEC) (n=1,474)
- Genetic parameters for integrated FEC records and other GI parasites resistance traits were obtained

RESULTS

- The mean and the variance were significantly different between the two FEC method ($P < 0.0001$), but phenotypic and genetic correlation were high (0.88 and 0.94, respectively)
- Heritability estimates were 0.12, 0.07, 0.17, and 0.24, for LFEC, FAMACHA©, BCS, and the WT, respectively
- Genetic correlations between fecal egg count and the other parasite resistance traits were low with FAMACHA© (0.24), BCS (-0.03), and WT (0.22)

Table 1. Means, variances and test results for the two FEC methods

Methods Compared	T-test			Levene's test		
	Mean ± SD	t	P - value	Variance ± SD	F	P - value
LMMR	5.86 ± 0.05	1.86	< 0.0001	2.37 ± 0.11	118.98	< 0.0001
LTCM	4.34 ± 0.08			4.58 ± 0.25		

Table 2. Estimates of heritability (diagonal), genetic correlations (below diagonal), and phenotypic correlations (above diagonal)

	LFEC	FAMACHA	BCS	WT
LFEC	**0.12**	0.11	-0.14	-0.00
FAMACHA	0.24	**0.07**	-0.09	0.04
BCS	-0.03	-0.02	**0.17**	0.46
WT	0.22	-0.01	0.43	**0.24**

CONCLUSIONS

- **In order to integrate FEC data from different methods (LMMR and LTCM) it is important to account for the difference in means and variance**
- **The low genetic correlation between FEC and other GI parasites resistant traits suggest little benefit in using them as single indicators for FEC**