

### GWAS of meat quality traits using WGS data in a multi-breed sheep population

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## WGS data can be helpful for

- Detecting QTLs and fine-mapping of QTL
  - More variants
  - Variants with low MAF
  - Causative variant?
  - Structural variants
- Increase accuracy genomic prediction
  - Include significant SNPs from GWAS in prediction

work Moghaddar and Khansefid, presented yesterday, session Prediction 1.



## What can we expect from WGS data?

- Detect more QTL, more peaks
- Fine map known QTL, sharper peaks



Directly compare with functional studies such as RNA seq



# What genotype data do we have?

- 726 sequenced sheep
  - 376 Australian sheep
- ~35,000 sheep with genotypes
  - 12/15K: 10,000
  - 50K: 23,000
  - HD: 2,600

 $\rightarrow$  All imputed up to sequence (Friday presentation Bolormaa session Imputation)  $\rightarrow$  27,896,226 variants (Minimac R<sup>2</sup> threshold=0.4)



#### BORDER LEICESTER



#### COOPWORTH



#### DORPER



#### POLL DORSET



MERINO



#### SUFFOLK

















MERINO



11th WCGALP, 2018

## Traits and model

- Pre-corrected for fixed effects
- Single SNP analysis
  - SNP Snappy WOMBAT
- Simultaneously fit
  - Grm (based on HD)
  - Qmatrix (breed proportions)

Trait	Ν
CCFAT	13,644
IMF	11,772
PEMD	21,412
PWT	26,769
SF5	13,363



### **Compare SNP density**

#### FDR of 5%



## Zoom of a region

-log10(Tprob) 9 **50K** 2 • 0 GWAS imf HD -log10(Tprob) 9 HD 2 0 GWAS imf SEQ -log10(Tprob) 9 WGS 2 0 43 41 41.5 42 42.5 Position (Mb) at OAR 23

GWAS imf 50K

# N QTL per trait

Trait	50K	HD	WGS
CCFAT	4	9	41
IMF	2	8	38
PEMD	4	15	49
PWT	5	13	88
SF5	3	7	34
Total	20	52	250

		1
Signifi	cance SNPs	
(min a	nd max –log10(Pval))	
■50K	: 5-15	
■HD	: 5-22	
■WGS	: 5-29	
	her peaks!	
	and higher.	
> More		1





SHEEPCRC







# WGS gives us

- More peaks
- More significant peaks
  - Use more data



- And / or multi-breed pop. LD exists over shorter distances
- The basis for companion studies on functional studies to validate candidate genes and mutations



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**Questions?** 

