



Mapping QTL for white striping in relation to breast muscle yield and meat quality traits in broiler chickens

Eva Pampouille, Cécile Berri, Simon Boitard, Christelle Hennequet-Antier, Stéphane Beauclercq, Christophe Praud, T. de Bretagne, Y. Jégo, Elisabeth Le Bihan-Duval

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Background

White striping (WS) is an emerging **muscular defect** occurring on breast and thigh muscles of **broiler chickens** and characterized by the presence of **white striations** parallel to the muscle fibers. This defect has significant consequences on **meat quality**, altering both its appearance, nutritional values and technological properties. The etiology of WS remains unknown but previous studies demonstrated that the prevalence of this defect is directly related to **broiler growth** and **muscle yield**. Moreover, recent studies showed **moderate to high heritability** values of WS, which emphasized the role of genetics in its determinism.



The aim of this study was to specify the genetic and molecular mechanisms involved in the appearance of WS by identifying the first QTLs for WS as well as breast muscle yield and meat quality traits

Materials

Methods

- Chicken **divergent lines** selected for **meat quality** through *Pectoralis major* **ultimate pH (pHu)** and concerned by **WS** defect
- 558** birds of the 6th generation of selection (**278** pHu + and **280** pHu -)
- Phenotyping** : WS, breast yield, color parameters of meat (L^* , a^* , b^*), drip and cooking loss, intramuscular fat, TBARS...
- Genotyping** : Illumina chicken SNP 57K Beadchip

Figure 1 : Phenotypic evolution of pHu

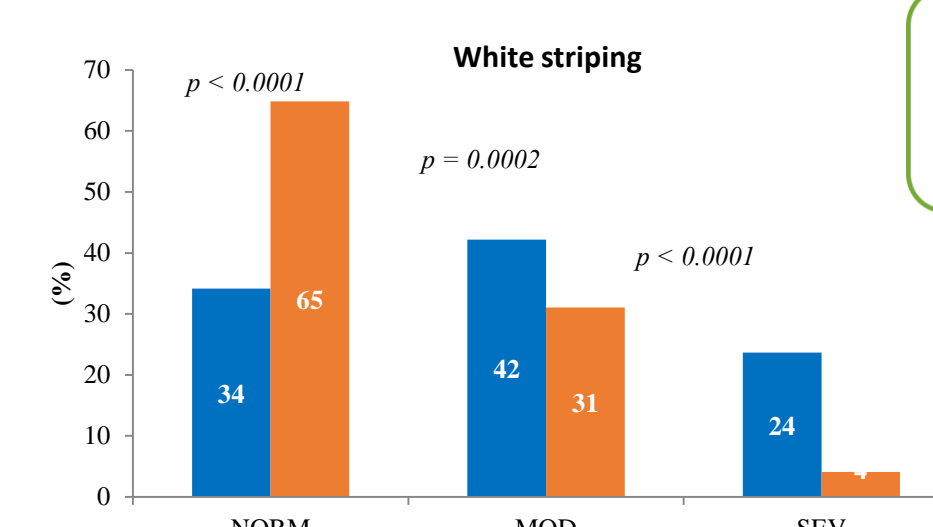
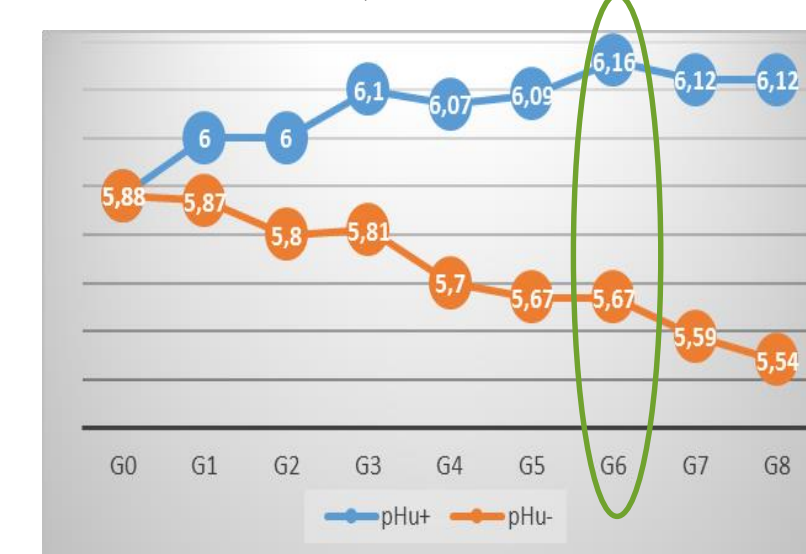
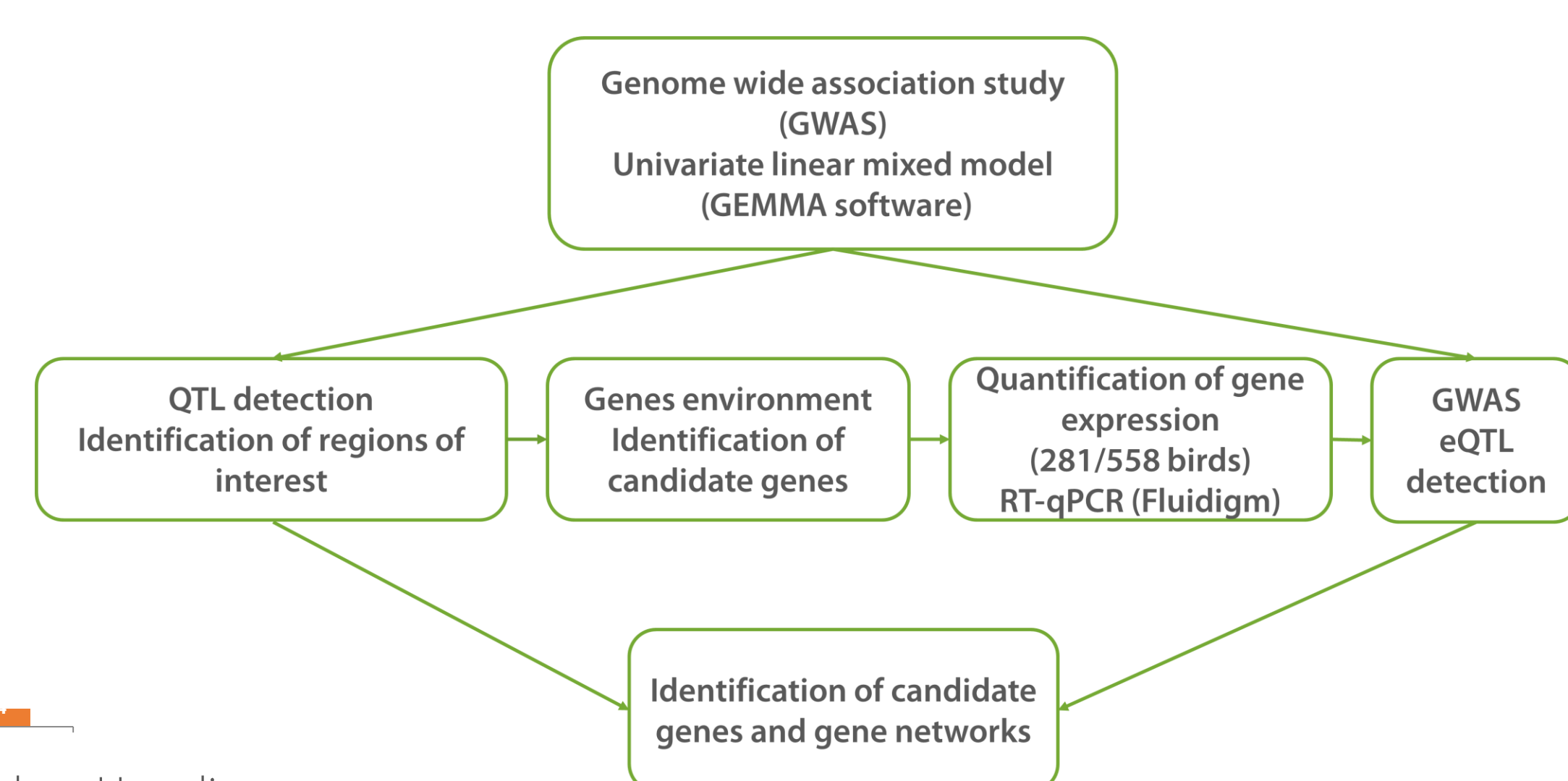


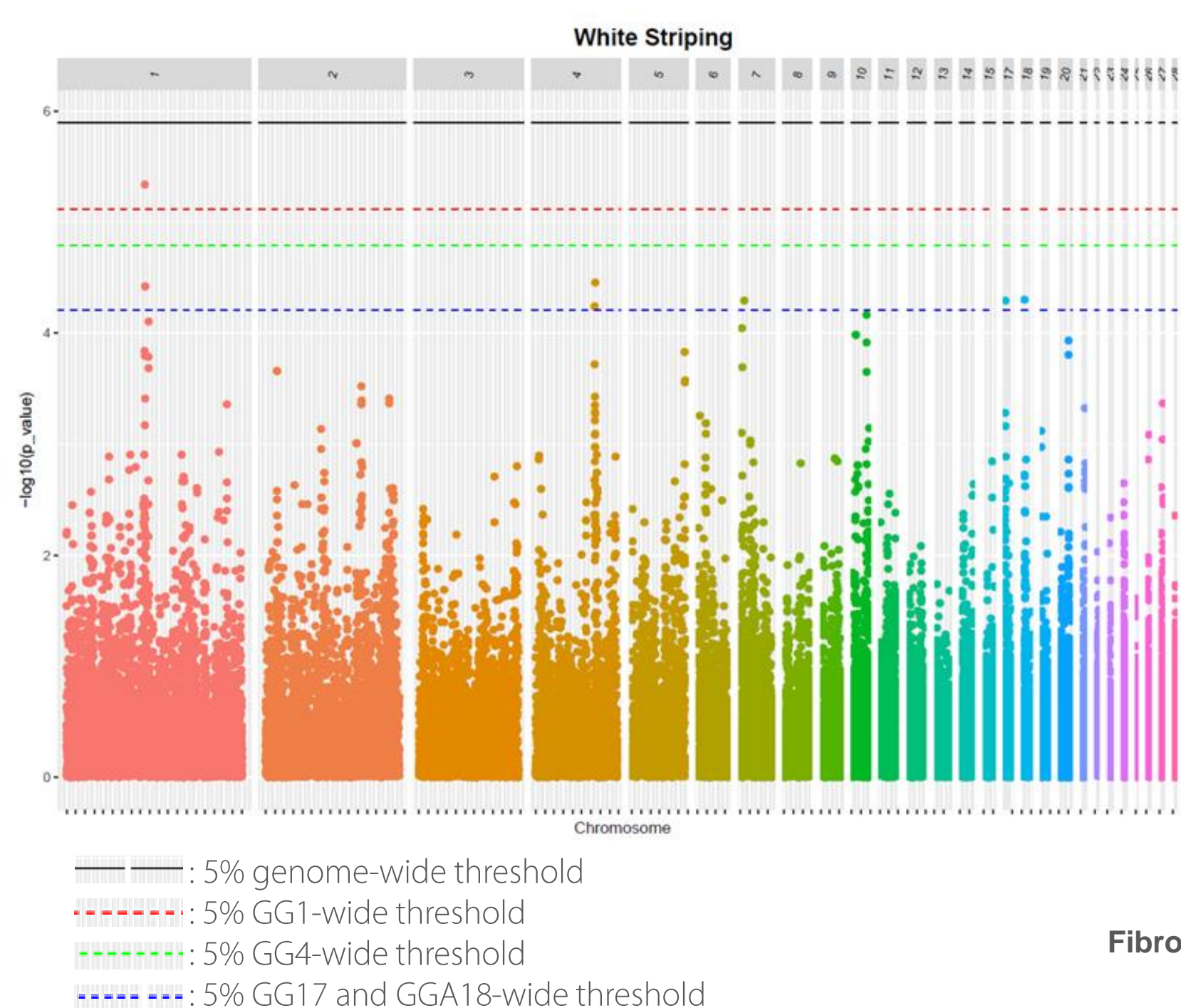
Figure 2 : Incidence of WS is **higher** in the pHu + line
NORM : normal, MOD : moderate WS, SEV : severe WS



Results & Discussion

- 20** QTLs identified including **5** associated with **WS** on GGA **1, 4, 7, 17** and **18**

Figure 3 : Manhattan plot showing the association between SNPs and WS



- 16** candidate genes identified including **13** for **WS** mostly involved in :

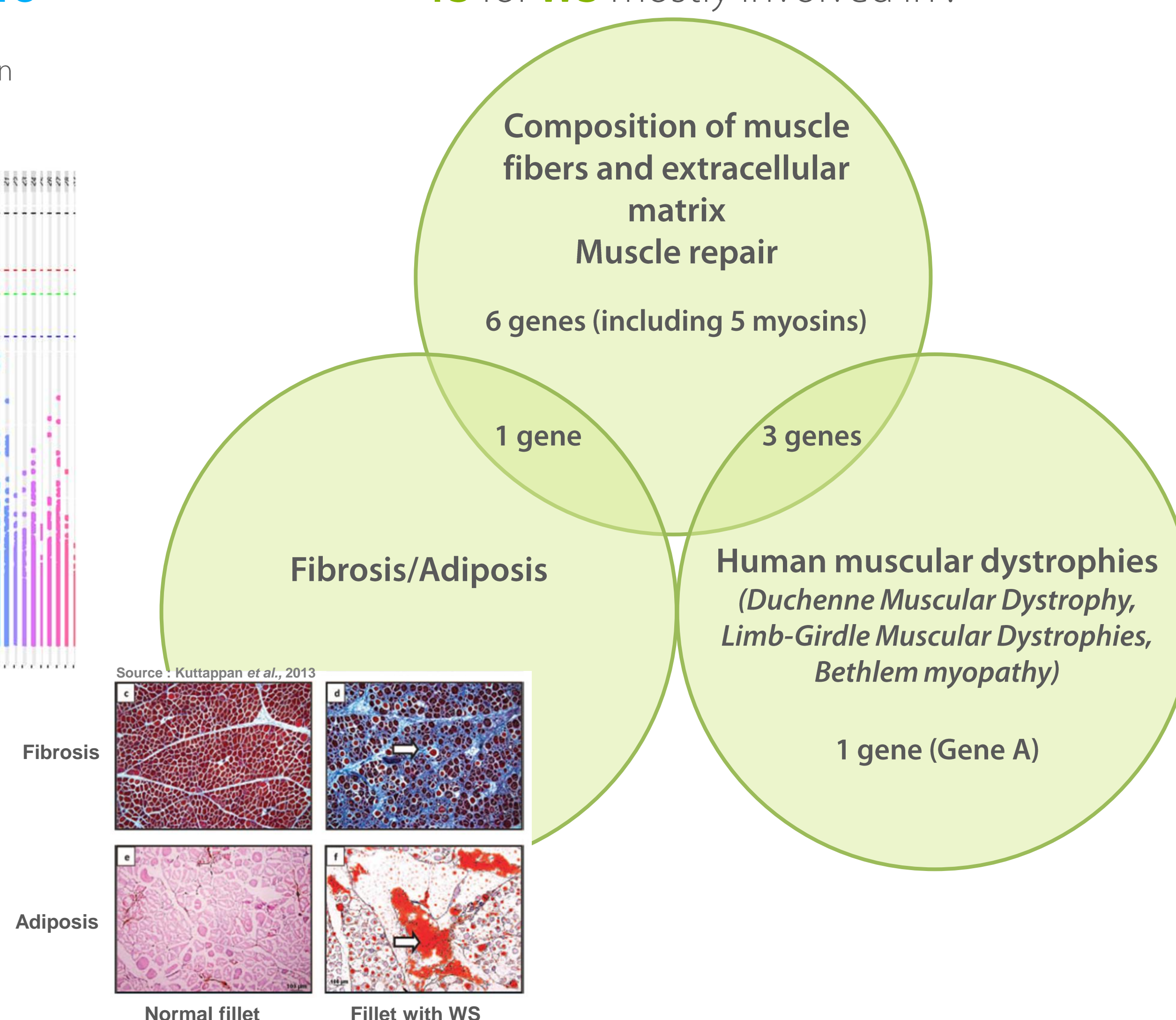
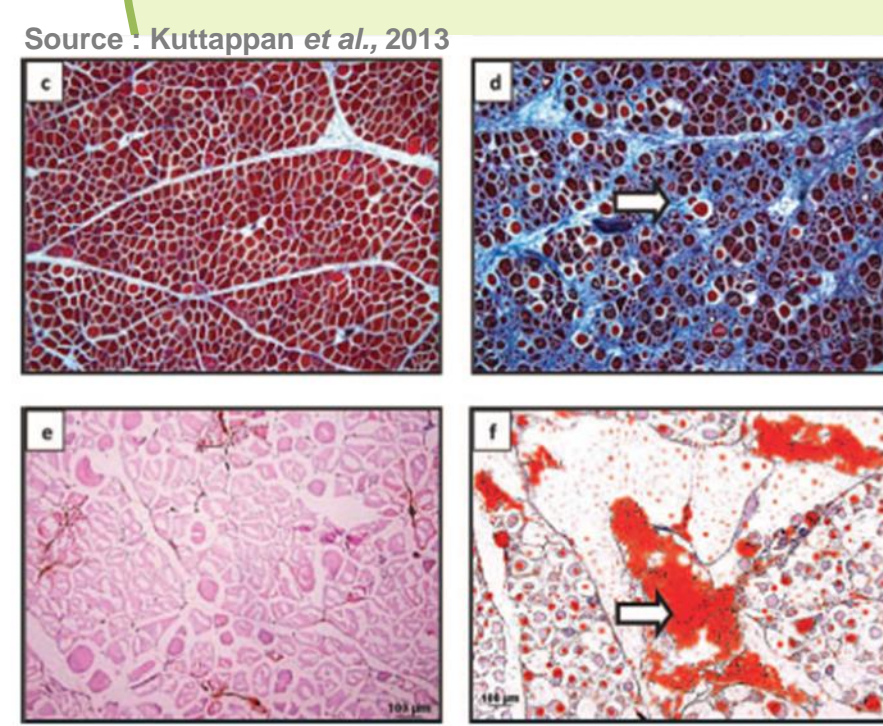


Figure 4 : Transversal cross section, normal fillet vs WS fillet



- 19** eQTLs identified including **2** *cis*-eQTLs

Figure 5 : Identification of *cis*-eQTL for a Myosin

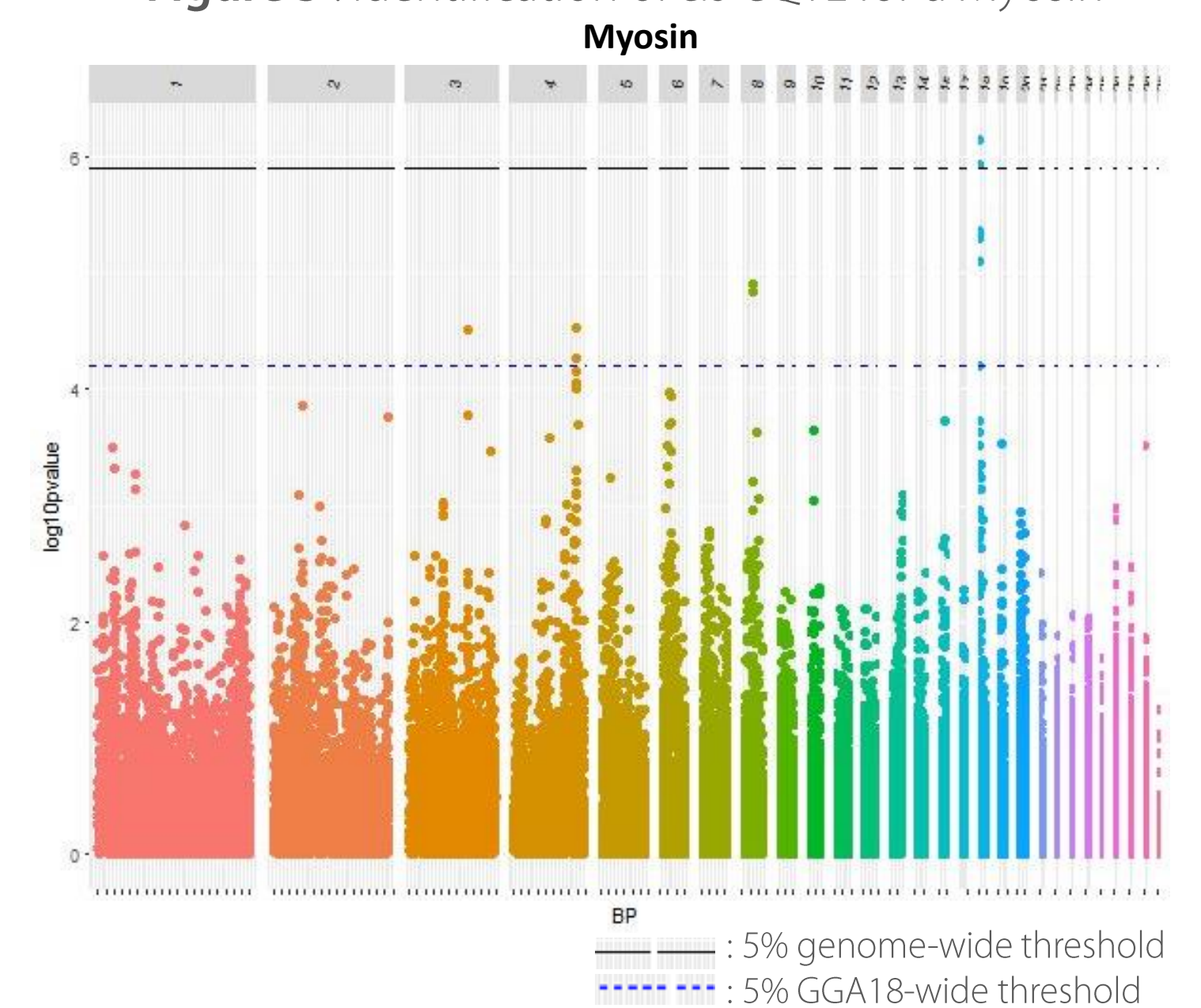
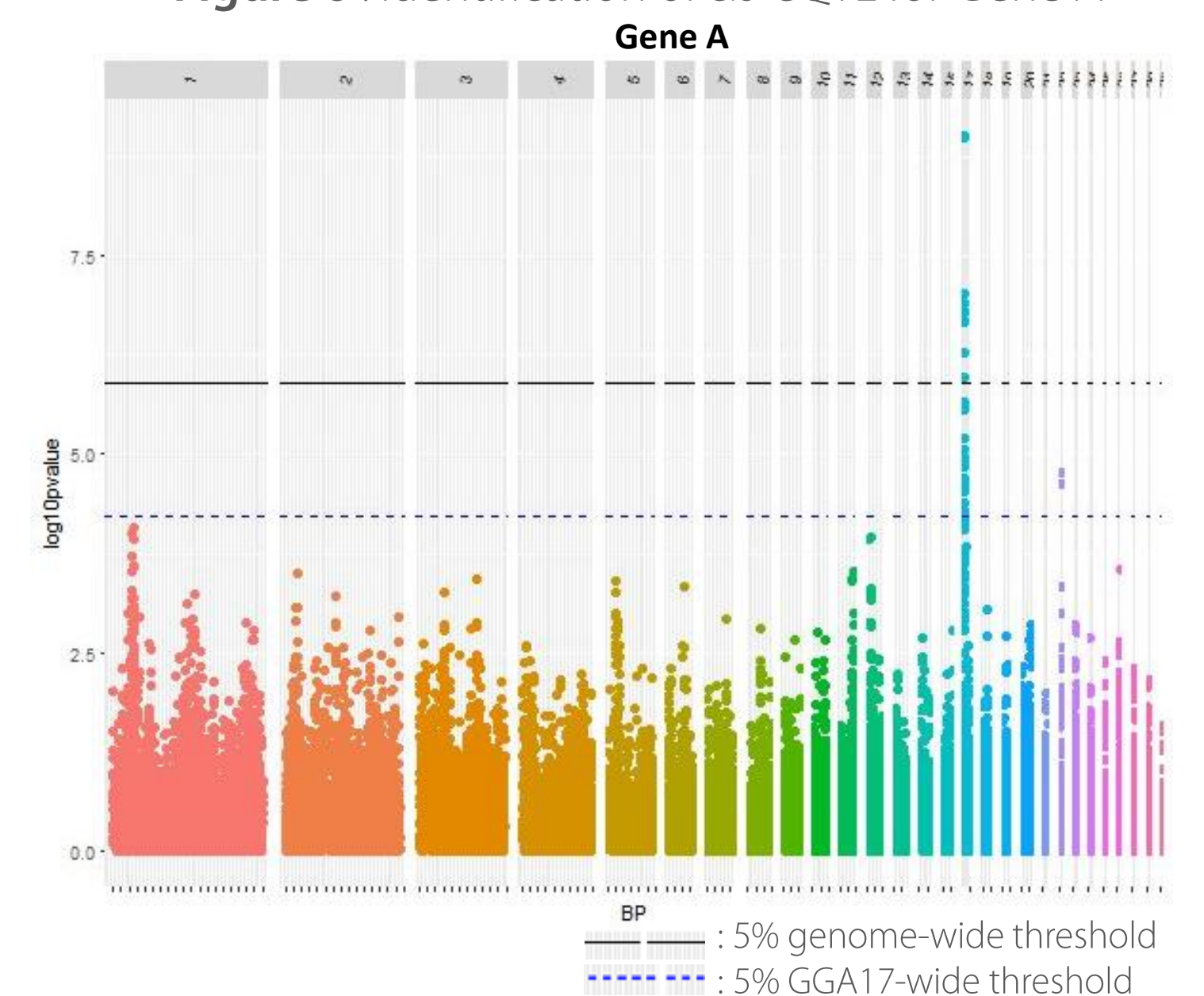


Figure 6 : Identification of *cis*-eQTL for Gene A



- Several **co-localizations** between QTLs and eQTLs :

- On **GGA17** between WS-QTL and Gene A *cis*-eQTL
- On **GGA4** between a pleiotropic region associated with 4 meat quality traits and *trans*-eQTL for 4 different genes
- On **GGA18** between WS-QTL and myosin gene

POLYGENIC DETERMINISM OF WS AND MEAT QUALITY TRAITS

CANDIDATE GENES INVOLVED IN COMPOSITION OF MUSCLE FIBERS, MUSCLE REPAIR, FIBROSIS, ADIPOSIS AND MUSCULAR DYSTROPHIES
SEVERAL CO-LOCALIZATIONS QTLs/eQTLs WHICH SUGGEST CAUSATIVE GENES AND GENE NETWORKS INVOLVED IN THE VARIABILITY OF MEAT QUALITY TRAITS AND BREAST MEAT YIELD

¹URA, INRA, 37380, Nouzilly, France, ²Hubbard SAS Mauguérand, 22800, Le Foeil - Quintin, France

³GenPhySE, Université de Toulouse, INRA, INPT, INP-ENVT, 31320, Castanet Tolosan, France