Harnessing the power of genomics for genetic selection of Seeing Eye dogs

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Outline

- Overview of the genetics program at The Seeing Eye

The Seeing Eye

- Breeding Program
  - 60 breeding dogs
    → 500 puppies born per year
- Puppy raisers until ~ 14 months of age
- Training ~ 5 months

Genetics at The Seeing Eye

- Currently use pedigree based estimated breeding values (EBVs)
- Entering the genomics era
  - High density single nucleotide polymorphism (SNP) chips – 170k SNPs
  - More accurate selection decisions
- Two projects : Addison's Disease and Phenobarbital Responsive Sialadenosis

Outline

- Overview of the genetics program at The Seeing Eye
- Addison's Disease in Labrador Retrievers

Addison's Disease

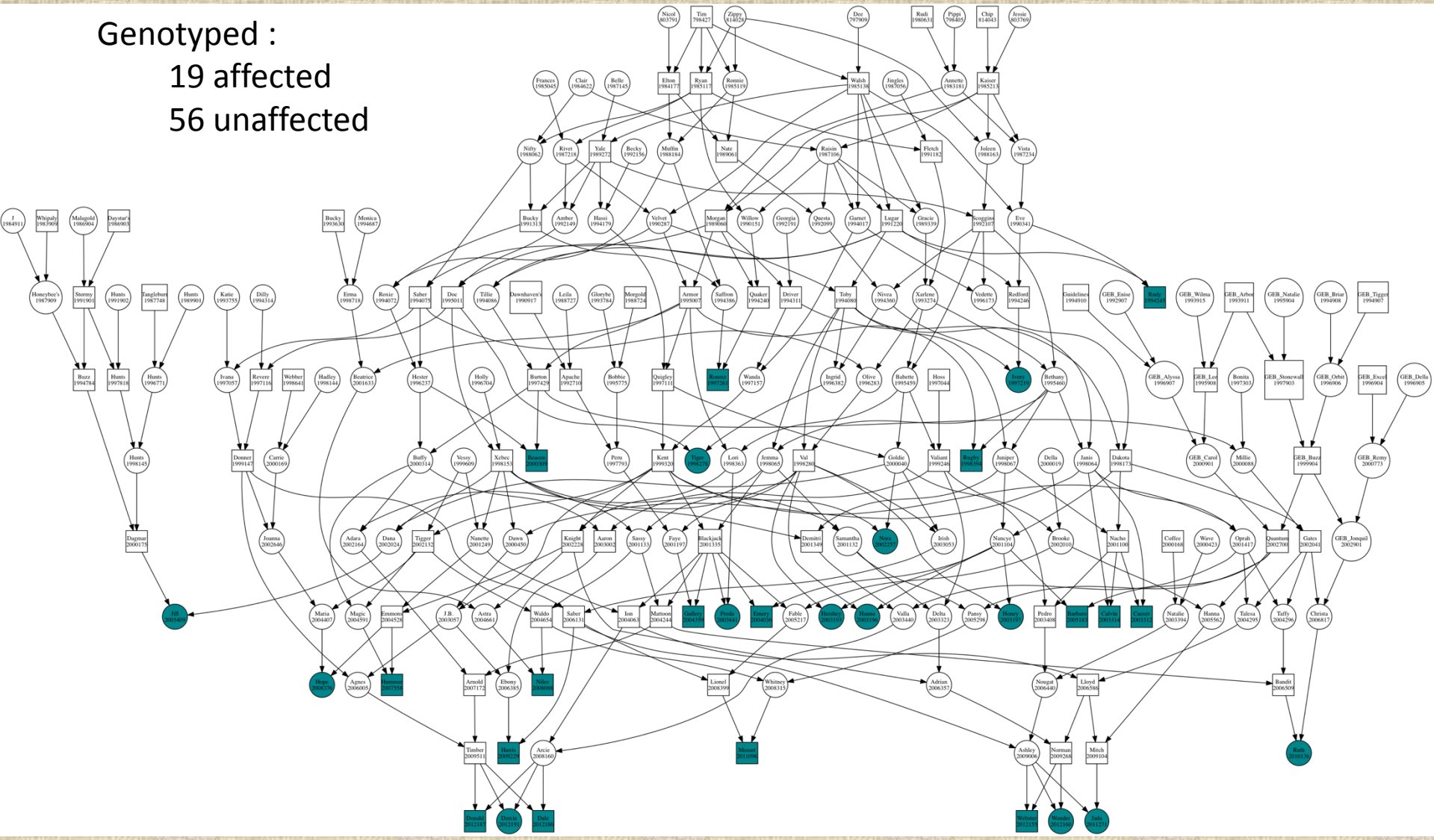
- Hypoadrenocorticism seen in TSE Labrador Retrievers
  - Dysfunctional adrenal gland
  - Inadequate corticosteroid hormone secretion
  - Possibly an autoimmune disorder (Falorni et al., 1995)
- Diagnosis ~4-6 years of age
  - Clinical signs exacerbated by stress
  - Treatment : lifelong hormone replacement therapy

Addison's Disease

Genotyped :

19 affected

56 unaffected

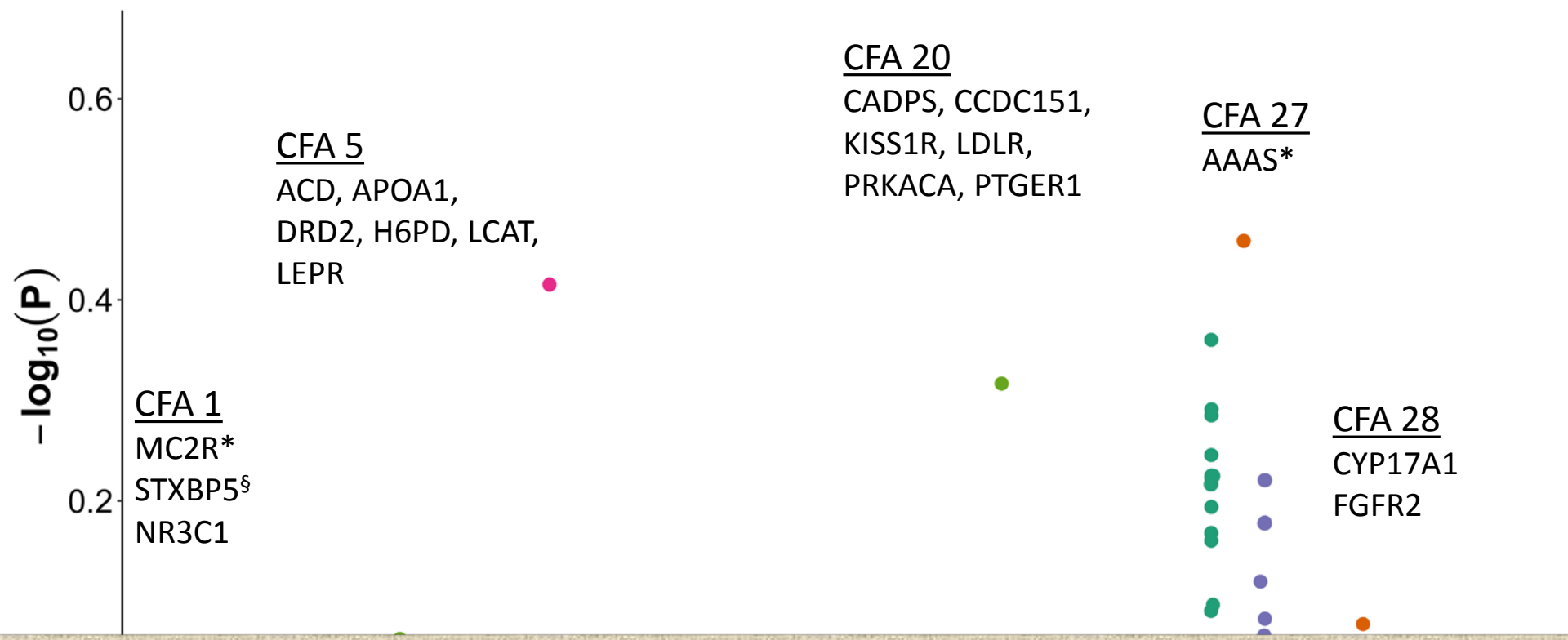


Genetic Analysis

- Dogs genotyped with Illumina CanineHD Beadchip
  - 170k single nucleotide polymorphisms (SNP)
- Statistical analysis performed using PLINK (Purcell et al., 2007)
  - assoc option : allele frequency differences between cases and controls
  - 10k permutations

GWAS : Addison's Disease

* Assoc. with Addison's in humans
§ Assoc. with Addison's in LR



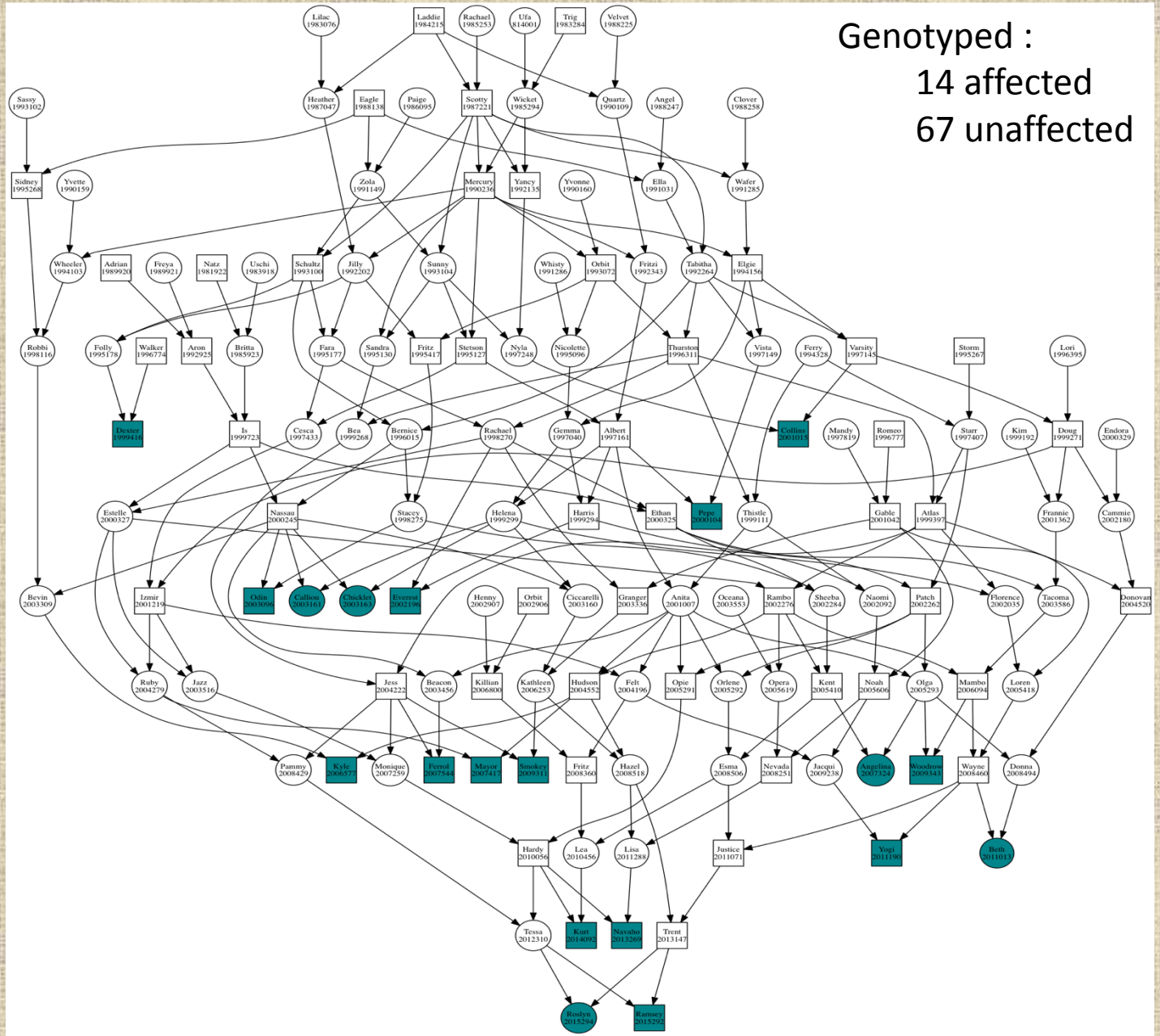
Outline

- Overview of the genetics program at The Seeing Eye
- Addison's Disease in Labrador Retrievers
- Phenobarbital Responsive Sialadenosis in German Shepherd Dogs

Phenobarbital Responsive Sialadenosis (PRS)

- Alimentary disorder in German Shepherd Dogs
  - Symptoms : gulping, reverse sneezing, retching, etc.
  - Possibly a form of limbic epilepsy (Stonehewer et al., 2000)
- Clinical signs appear ~6 weeks of age
  - Clinical from weeks to years with severity differences
  - Treatment : Phenobarbital or other anticonvulsants

PRS



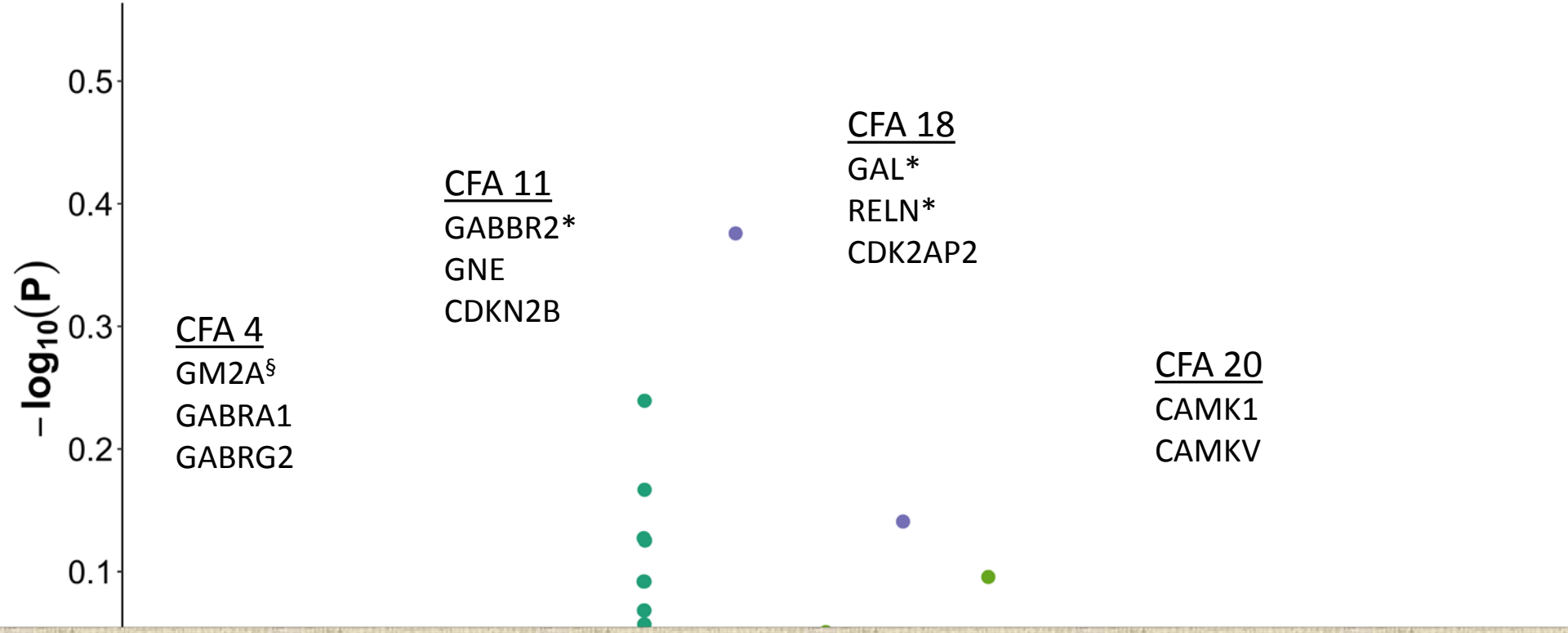
Genotyped :

14 affected

67 unaffected

GWAS : PRS

* Assoc. with TLE in humans
§ Abnormal TL development in mice



Summary

- GWAS identified several genomic regions with candidate genes for each disease
  - Addison's Disease
    - Genes associated with Addison's Disease and adrenal gland development/function in humans and dogs
  - Phenobarbital Responsive Sialadenosis
    - Genes associated with epilepsy and temporal lobe development in humans and mice

Thank you!