

## **Breeding Implications – Copper Toxicosis & Genetic Markers Guidance for Kangal / Anatolian Shepherd Owners & Breeders**

At present, the ATP7B and ATP7A copper metabolism markers reported by Embark have been validated primarily in Labrador Retrievers. There is currently no published evidence showing that these variants reliably predict copper-associated liver disease in Kangal Dogs or Anatolian Shepherd–type livestock guardian dogs.

**As additional research emerges in the coming years, we expect to develop a clearer understanding of the significance and predictive value of ATP7A and ATP7B copper transport gene mutations in relation to copper-associated hepatitis in the Kangal Dog.**

Therefore, at this time, **the KDCA / Health Committee does not recommend removing dogs from breeding or making restrictive breeding decisions based solely on these genetic results.**

Breeding decisions should continue to prioritize overall health, temperament, structure, working function, and preservation of genetic diversity. Copper concerns in our breed should be addressed through appropriate veterinary diagnostics (including quantitative liver copper testing when clinically indicated), pedigree tracking, and responsible monitoring.

### **What Embark is reporting**

Embark currently reports **two markers related to copper metabolism**, developed primarily from research in **Labrador Retrievers**:

#### **ATP7B** – “Copper Toxicosis” mutation

- Associated with increased risk of copper-associated hepatitis in **Labrador Retrievers**
- Dogs with two risk copies have a significantly higher chance of accumulating excess liver copper

#### **ATP7A** – “Modifier / Protective Variant”

- Appears to reduce severity of copper accumulation in Labradors that have ATP7B risk mutations
- Does **not** independently *cause* disease; it modifies risk

### **Important reality check:**

These markers have been validated in Labrador Retrievers and studied to a limited extent in a few other breeds. However, they have not yet been validated in Kangal Dog or Anatolian Shepherd Dog populations. At this time, no published research demonstrates

that these mutations are predictive of disease in our breed. As a result, while Embark Veterinary, Inc. may report a result, its clinical significance for Kangals remains unknown.

### **What this means for breeding decisions**

#### **We strongly advise against:**

- ❌ Declaring a Kangal “diseased” because of ATP7B status alone
- ❌ Removing dogs from breeding based on a DNA copper marker result alone
- ❌ Choosing breeding partners based only on these variants
- ❌ Treating these markers as equivalent to known, breed-validated mutations (like PRA, DM, etc.)

This is exactly how rare breed genetics get damaged: Good dogs get eliminated based on **uninformative or misapplied tests**, reducing genetic diversity and potentially worsening real heritable problems.

#### **How Health Committees & breeders should use these results**

Until data exists for Kangals, these results should be treated as interesting emerging information that may become meaningful in the future—but is NOT currently diagnostic or predictive in our breed.

#### **Recommended use today**

- ✓ Keep the information in breeding records
- ✓ Track pedigrees where copper issues actually occur
- ✓ If a dog with suspicious genetics develops liver problems, include copper analysis in work-ups
- ✓ Participate if future breed-specific copper research or DNA studies are launched

#### **If a Kangal develops liver disease or high copper**

Then genetics *may* become relevant, but health management is still based on **clinical reality**, not just genotype.

If a dog has:

- chronically elevated liver enzymes
- biopsy-confirmed hepatitis
- quantitative liver copper elevation

Then:

- discuss long-term management
- track related dogs and breeding lines
- consider adjusting breeding plans thoughtfully, case-by-case
- involve a veterinary internist and a canine geneticist if needed

Do not automatically blame ATP7B unless supported by evidence in our breed.

### **The bigger takeaway**

Right now the **biggest copper threat** to dogs appears to be:

- Modern diet formulation & environmental exposure  
Not a single breed-specific gene.

So for Kangals, the higher-impact strategies are:

- Sensible diet selection
- Avoid unnecessary copper supplementation
- Proactive liver health monitoring
- Educating owners
- Not panicking about unvalidated DNA markers