**Ancestral Studies & Gene Evolution**

**Ancestral State Reconstruction**

* Infer ancestral DNA/protein sequences from present-day sequences.
* Trace evolutionary history of a gene family.
* Example: Hemoglobin → myoglobin divergence.

**Applications**

* Study of **disease origins** (e.g., tracing HIV from chimpanzees to humans).
* Ancestral protein reconstruction for biotech (stabilized enzymes).
* Comparative genomics across species.

**🧪 Lab: Inferring Ancestral States**

* Use MEGA software to reconstruct an ancestral sequence from a small dataset.
* Compare ancestral vs modern sequences.

Activity: Discuss what mutations were gained/lost along branches.

**Quick Review**

1. What does “ancestral sequence reconstruction” mean?
2. Give one medical and one evolutionary application of ancestral studies.