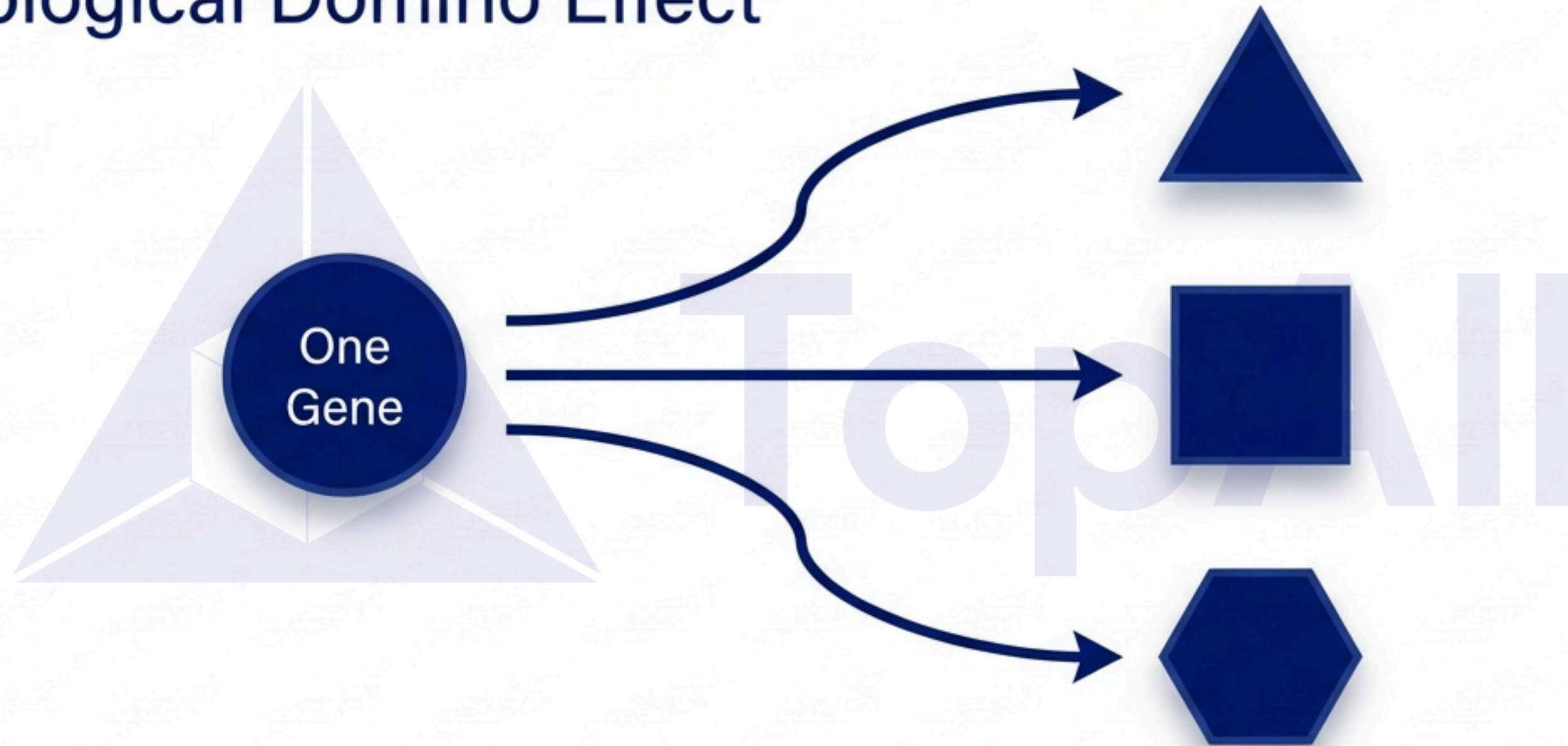


Pleiotropy

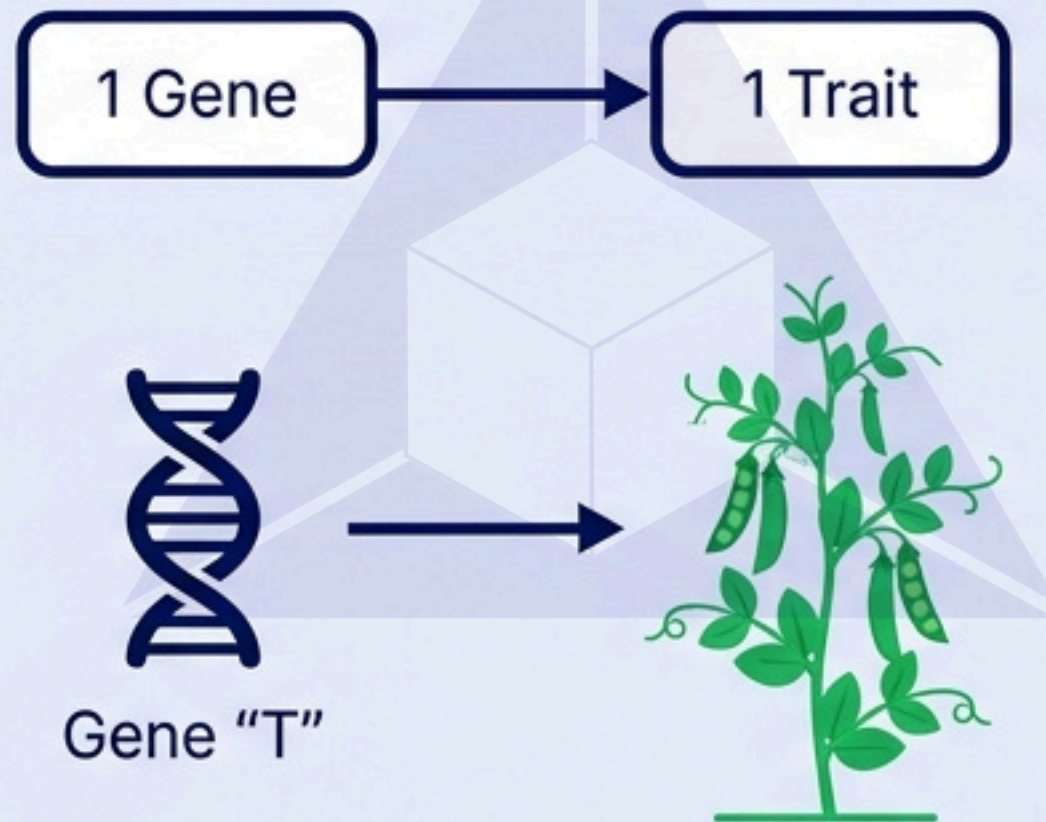
The Biological Domino Effect



How a single microscopic mutation cascades into multiple macroscopic physical traits.

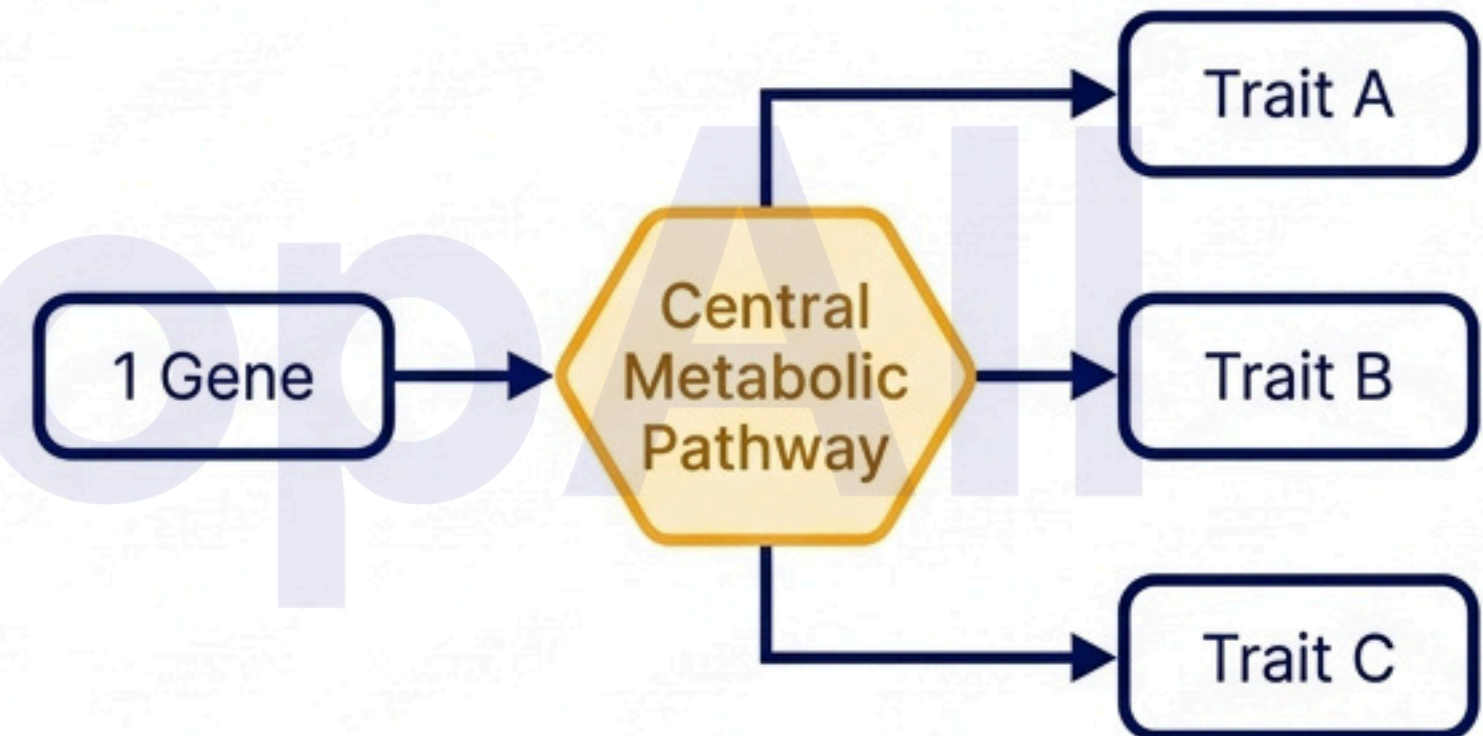
The Conceptual Contrast: Breaking the 1:1 Rule

Monogenic (Standard Inheritance)



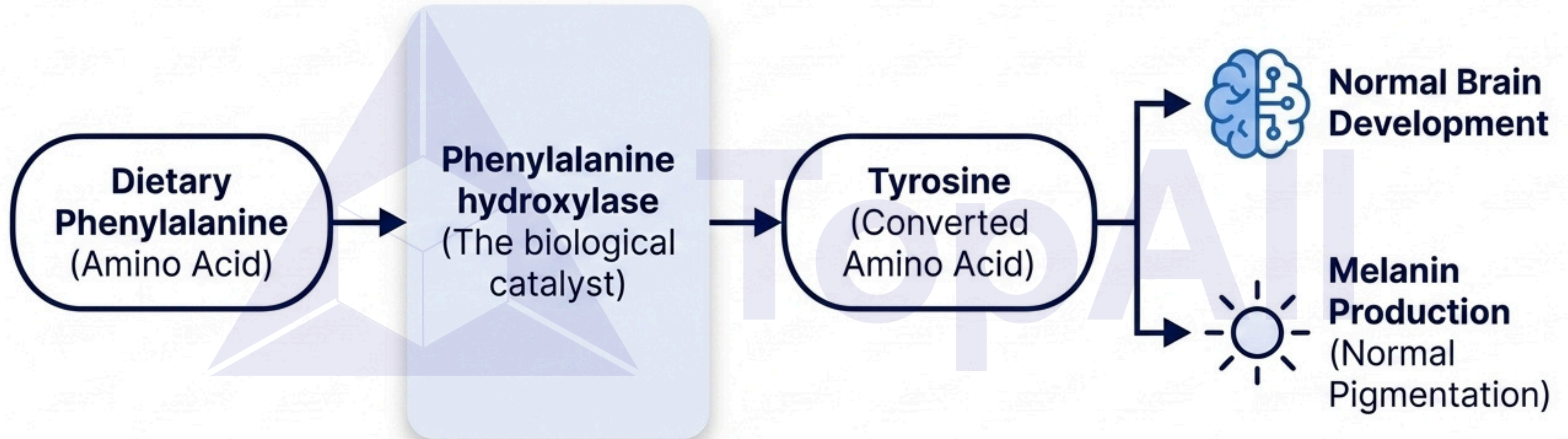
A single gene controls a single, distinct phenotypic expression.

Pleiotropic (The Rule-Breaker)



A single gene influences a central biological mechanism, causing a cascade of multiple, seemingly unrelated phenotypic effects.

The Healthy Baseline: A Smooth Metabolic Pathway



Metabolic pathways function like assembly lines. Enzymes act as the specialized workers moving materials to the next critical stage.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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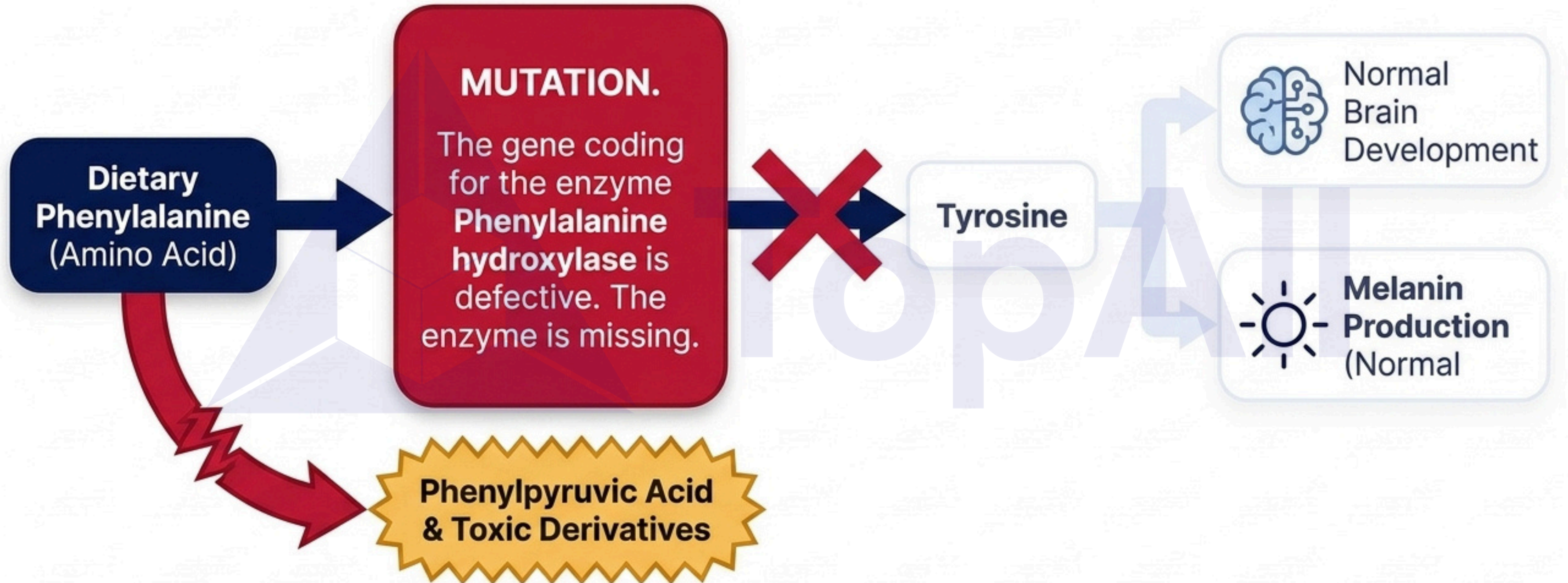
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- » Practice Unlimited MCQs for NEET & JEE
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- » Track Your Performance Smarter



The Mutation: A Roadblock in the Assembly Line



This single gene mutation causes an inborn error of metabolism known as Phenylketonuria (PKU).

The Pleiotropic Cascade: One Error, Multiple Symptoms

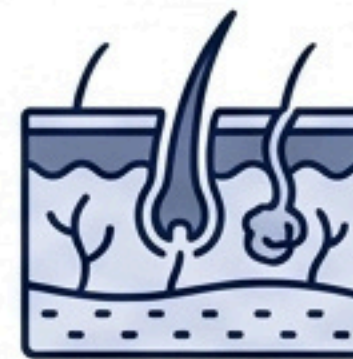
Because the affected enzyme controls a central junction, its failure cascades into distinct systems: neurological function and integumentary pigmentation.

**Accumulation of
Phenylpyruvic
Acid & Lack of
Tyrosine**



Mental Retardation

Phenylpyruvic acid accumulates in the brain. (Also excreted through urine due to poor kidney absorption).



Reduction in Pigmentation

Lack of downstream tyrosine prevents normal melanin synthesis.

One gene can produce many phenotypic effects.



Pleiotropy reveals that genes are not just isolated trait-makers; they are integrated master switches for entire biochemical pathways.



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