

# Gene-environment interactions

## Introduction

Common diseases such as diabetes, cancer, cardiovascular diseases, mental disorders, and neurodegenerative disorders are the main causes of mortality in developed countries.

These disease usually don't show a simple pattern of inheritance, but rather are a manifestation of both genetic and environmental factors.

It is very uncommon for genetic factors or environmental factors to be the sole cause of a disease, although some examples exist :

- Duchenne muscular dystrophy - exclusively genetic disorder, where environment plays little to no role.
- Infectious diseases - almost entirely based on environmental factors.
- Thus we can view the manifestation of most common diseases as a combination of genetic factors and external environmental factors.

## Genetic susceptibility to common disease

- As said, most common diseases result from a combination of :
  - Polygenic inheritance - complex interaction of different genes.
  - Multifactorial inheritance - environmental factors and influences.
- Some individuals may be more susceptible to certain diseases than others, due to an inherited abnormal gene.
- Example : in the case of familial hypercholesterolemia (FH) - the FH gene is involved in a metabolic pathway. A mutation in this gene can lead to an early coronary artery disease. Yet, this susceptibility can either be magnified or reduced by environmental factors : reduced cholesterol diet, obesity, exercise, smoking.

Reference :

Emery's elements of medical genetics - 14th edition.

Thieme - genetics color atlas.