

From cells to humans

What different types of studies can and cannot tell us

*More questions.
Healthier choices.
Tomorrow.*

For questions about effects in humans, human evidence is usually more directly applicable. Reliability still depends on study design, conduct and the totality of evidence.

1 Laboratory studies (in vitro)



- Conducted on cells in a controlled environment.
- Show how a substance may affect specific cellular processes (e.g. inflammation, oxidative stress).
- Can provide a useful early step for investigating mechanisms.

Limitations:

- Do not reflect the complexity of the whole organism. The concentrations used are often higher than those realistically achievable through dietary intake.
- Results may not directly apply to humans.

2 Preclinical animal studies



- Show how a substance affects a whole living organism.
- Provide information on metabolism, distribution, possible benefits and risks.
- Help to understand mechanisms of action.

Limitations:

- Animals are not humans.
- There are physiological differences in metabolism and genes.
- Results may not always translate directly to humans.
- Positive effects in animals do not guarantee the same effects in humans.

3 Human studies



- Includes, for example, observational studies and clinical trials.
- Can study outcomes in real-world settings or under assigned interventions.
- Usually more directly applicable to human questions; reliability depends on design, conduct, bias, precision and the wider evidence.

Limitations

- Can be expensive and time-consuming.
- Results can vary between populations.
- May not fully explain cellular mechanisms.

4 From evidence to recommendations



- Recommendations are based on the totality of available evidence.
- They take into account the quality and consistency of results from different types of studies.
- They consider benefits, risks, safety, feasibility and the specific population.

Recommendations are strengthened by:

- well-conducted human studies
- consistent results
- realistic exposures
- consideration of benefits, harms and context

Example: Curcumin and inflammation

In the lab (in vitro)



Curcumin reduces inflammatory markers in cell models.

In animals



Beneficial anti-inflammatory effects are observed in animal models.

In humans



Some studies show small benefits in certain conditions, but the results are not consistent.

Takeaway



Promising substance, but more well-conducted human studies are needed before making categorical recommendations.



Direct applicability increases when a study reflects the target population, realistic exposure and relevant follow-up—provided it is well designed and conducted.

Key questions to ask:

- ☐ Which type of study was conducted? (cells, animals, humans)
- ☐ Can the results be applied to real people?
- ☐ What dose or concentration was used, and is it realistic relative to human exposure?
- ☐ Does the study involve humans and how many?
- ☐ What are the limitations of the study?



Key message:

“Early results are important, but not sufficient.”

Robust conclusions require evidence from well-conducted human studies.

*Science today.
A healthier tomorrow.*

