

LYCOCARD: Role of lycopene for the prevention of cardiovascular diseases

Cardiovascular diseases and cancer are the main mortality causes in Europe and all developed territories. **Lycopene** is a plant pigment found in high concentration in tomatoes, pink grapefruit, watermelon, and papaya. Tomatoes are Europe's second-most important agricultural crop, and tomatoes and tomatoes products are the main lycopene source in the diet.

Strong supportive data from several epidemiological studies suggest that lycopene may provide important protection against cardiovascular diseases and cancer. However, lycopene content of tomatoes and processed tomato products and lycopene's beneficial effects, have not been sufficiently linked because research has lacked a "total food chain" approach.

The missing links in this chain are:

- + Formulating improved nutritional guidelines
- + The evaluation of *in vivo* effects of healthy new foods

There are also many details regarding bioavailability, metabolism, and molecular mechanisms of lycopene biological activities that are still unknown. LYCOCARD will investigate the role of lycopene in reducing the risk of cardiovascular diseases, adopting a "total food chain" approach by addressing each link in a "farm to fork" approach for future projects to increase the understanding of diet and health.

LYCOCARD's multidisciplinary, intersectorial consortium of scientists, technologists, and patient organisations contains the critical mass to achieve these ambitious aims.

Specifically, LYCOCARD will clarify the following points:

- Effects of technological processing on lycopene
- Interactions between different food ingredients
- Molecular aspects of absorption and metabolism of lycopene
- Biological effects of lycopene isomers and lycopene metabolites

This information will lead to improved nutritional guidelines and healthy new foods based on tomatoes and other dietary sources containing lycopene. These novel dietary guidelines will help consumers select specific diets which protect them against disease risk.

LYCOCARD will therefore improve the health of European consumers and reduce the costs of health systems, while also significantly advancing the state of the art. In addition, the position of the European food industry will be strengthened by increasing the demand for health-related tomato products and other newly developed healthful foods.

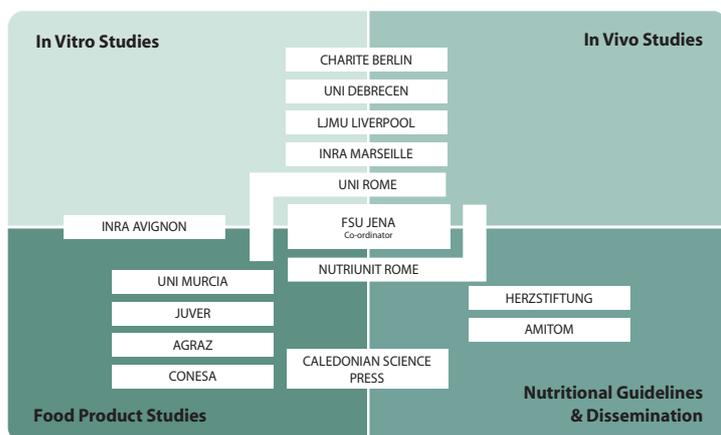


Figure 1: LYCOCARD's results will bridge the gap

The overall goal of LYCOCARD

To study the molecular, biochemical and physiological activity of lycopene and to translate this understanding into development of new foods and nutritional guidelines in order to improve the health and quality of life of European citizens by reducing the risk of cardiovascular diseases.

The specific goals are:

To understand the genetic, molecular, biochemical and physiological functions of lycopene (and related compounds) in protecting against cardiovascular diseases.

LYCOCARD will investigate different aspects of lycopene bioavailability in *in vivo* and *in vitro* models and will look for oxidative catabolism of lycopene. Physiologically relevant isomers and metabolites will be tested on their protective antioxidant potential. Modulation of endothelial functions by these compounds is a further task.

The project will focus on the effects of lycopene and its derivatives on cell signalling pathways involved in cardiovascular health: two negative factors – cigarette smoke and cholesterol – will be investigated in *in vitro* and *ex vivo* models. The possible preventive roles of different lycopene isomers on the modifications induced by these toxic agents on redox status and on redox-sensitive molecular pathways as they affect processes of differentiation, proliferation and apoptosis of vascular cells will be investigated.

To develop new foods high in health-promoting compounds and to test the effectiveness of these foods in promoting health in target populations

These research results will lead to more detailed knowledge of the protective effects of lycopene and tomato products. The industrial partners will use these results to develop products with higher protective impact on cardiovascular health, through the selection of tomato varieties, improving processing conditions and formulating new tomato products. Their protective effects will be tested through human trials to assess the effect of lycopene, or tomato products, on parameters involved in cardiovascular diseases

To develop health and dietary guidelines based on research outcomes

Because studies will be performed in healthy subjects the results will allow to make guidelines for primary prevention. Two patient organisations will use the results of the experiments to develop new dietary guidelines aimed at reducing the incidence of cardiovascular diseases as well as providing guidelines for those people at risk. For example, "Eat five fruits and vegetables, including a tomato product, per day" could be a new health guideline. Because close links may exist among oxidative stress, inflammation, obesity, and cardiovascular disease, the effects of diets enriched with tomato products containing high levels of lycopene will be evaluated in obese patients.

To communicate the results to health professionals, the general public and the food industry

The dissemination of the research results is an integral part of the project. This will be done through effective communication with stakeholders, for example medical associations and other patient advocacy groups. In addition, the project will strengthen the position of the European food industry, mainly by enhancing opportunities for small and medium-sized enterprises (SMEs) through many means of communication including workshops and training courses.