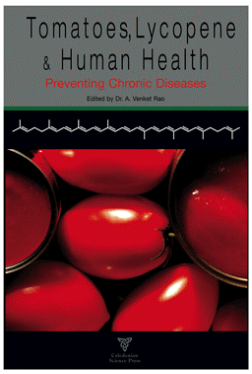

Tomatoes, Lycopene & Human Health
Preventing chronic diseases.

Edited by Dr. A. Venket Rao, University of Toronto 2007

Tomatoes, Lycopene & Human Health is edited by Dr. Venket Rao, Professor Emeritus in the Department of Nutritional Sciences at Toronto University. It is written primarily for a scientific audience, although lay readers will find its many insights accessible.

Tomato products store health-giving compounds, most of which – lycopene, for instance – have been known to science for years. It is only recently, however, that research has focussed on how these different compounds might work together.

Lycopene's qualities are startling. For instance, researchers now know that in the presence of vitamin C, this antioxidant can repair both itself and other antioxidants to restore their antioxidant qualities.

Two dozen of the world's leading nutritional specialists have assembled and reviewed the most recent findings in 13 areas of research in a single volume with three overview chapters. The result is a broad, yet increasingly detailed picture of the inner workings of a dietary wonder.

If we look at the tomato, with its wealth of secondary bioactive compounds, we see the possiblities of synergy that have been exploited by Mother Nature, in ways we do not yet understand fully. These are the insights that have been elegantly described in this book and which will continue to unfold in years to come.

“This book was written in response to a need for scientifically sound and state of the art information addressing the role of lycopene in human health," says Dr. A. Venket Rao. “The contributors include a team of scientists, internationally recognized for their expertise in the area of lycopene and human health. The contents of the book cover all aspects of lycopene including its chemistry, analytical methodology, stability, metabolism and its role in chronic diseases including cancer, cardiovascular disease, osteoporosis, male infertility, hypertension and other related human diseases.”

Industrial readers are catered for too, with chapters written by experienced industrial scientists. The contents of the book address the interests and needs of scientists, health professionals, the food industry and government agencies.

Chapters:

1) Diet and Chronic Diseases: Role of Phytonutrients
Dr. A Venket Rao

The growing importance of diet as a factor in preventing chronic diseases, such as cardiovascular diseases, certain cancers, osteoporosis and diabetes, is recognised by medical scientists around the world. A lack of dietary fibre coupled with high energy and high fat diets has been causally linked to some chronic illnesses. Higher intake of plant-based

foods of all descriptions – fruit, vegetables, cereals and legumes – is a primary target for prevention programmes all over the world.

2) Content, Behaviour and Bioavailability of Lycopene in Processed Tomatoes
Dr. Carlo Leoni

Consumer attitudes towards health include a revival of interest in the nutritional qualities of foods. Nutritional scientists agree that increased intake of a range of fresh produce can help to raise the long term health standards of almost any human population. Tomatoes, in addition to occupying a prominent position in the popular Mediterranean diet, have an important role to fulfill in delivering a protective effect against a number of chronic degenerative diseases.

The relatively low price of tomatoes and their wide use in diets around the world justify the investment of time and research into the benefits they can offer to our diet.

This author looks at the effects of various processing methods, reviewing the implications of treatment on the availability of lycopene and other caretenoids and what form is most readily absorbed by the human digestive system.

Conclusion: lycopene is best absorbed by the human body if tomatoes are cooked, particularly with fat or oil.

3) Lycopene Analysis in Foods
Dr. Montaña Cámara
Dr. MC Sánchez Mata

Lycopene poses a number of procedural challenges in the laboratory, when purifying and analysing samples. This chapter comprehensively reviews developments in the procedures that best meet these requirements.

4) Mechanisms of Action of Lycopene
Dr. David Heber

In addition to lycopene's potent antioxidant effects, its apparent ability to inhibit certain kinds of cancer cell growth is a result of a synergistic effect with genetic components rather than a direct action. Lycopene also displays synergistic qualities with other antioxidants, which are being researched by cancer scientists.

“The emerging science suggests it is now time to make dietary changes as the scientific evidence continues to build".

5) Why Lycopene is Beneficial Against Chronic Disease: The Molecular Mechanisms
Dr. George Truscott
Dr. Ruth Edge

Lycopene's reactions with free radicals are similar to those of other carotenoids and fall into three categories: electron transfer, hydrogen atom transfer and addition.

‘Spent’ lycopene is recycled to lycopene by vitamin C and hence the combination of lycopene and vitamin C may be the best dietary antioxidant system.

Lycopene is an extremely efficient quencher of singlet oxygen in biological environments, and this may well be related to the beneficial role of lycopene in the eye and the skin.

6) Preventing DNA Damage with Tomato Lycopene
Dr. Marissa Porrini
Dr. Patrizia Riso

There is widespread support for suggesting that increased intake of tomatoes and their associated compounds, including lycopene, help to prevent DNA oxidative damage. This chapter reviews DNA protection research findings in healthy subjects and patients on a tomato lycopene-enriched diet.

Despite the difficulties in designing robust studies to demonstrate the role of lycopene in helping to protect DNA from oxidative damage, there is great scientific interest in this dietary aspect of antioxidants, since it lends support to the theory that vegetables can make a day by day contribution to antioxidant protection.

7) Cancer Prevention by Dietary Tomato Lycopene and its Molecular Mechanisms
Dr. Yoav Sharoni
Dr. Yossi Levy

It is now widely accepted that antioxidant enzymes can play a key role in chemoprevention, helping to block the development of cancerous cells. Lycopene is one of the most frequently cited, but its potency seems to require the presence of other tomato carotenoids such as phytoene and phytofluene: its effectiveness is also increased in diets which include a range of phytonutrients from other fruits and vegetables.

8) The Role of Tomato Lycopene in the Treatment of Prostate Cancer
Dr. Omer Kucuk
Dr. Elisabeth heath
Dr. Kazim Sahin
Dr. Soley Seren

According to a number of preclinical studies, dietary intake of lycopene is inversely proportional to the risk of prostate cancer. There is a suggestion that 15mg of lycopene twice daily for three weeks generated a measurable effect on clinical markers in prostate cancer, making it a potentially useful adjunct in treatment schedules. Given the paucity and scale of studies so far, the researchers found that results so far warrant further and more extensive research into the role lycopene can play in preventing prostate cancer, including larger randomised clinical trials.

9) Lycopene and Cardiovascular Disease
Dr. Tiina Rissanen

There is great interest in diets rich in fruit and vegetables, due to their potential health benefits against chronic illness, including cardiovascular diseases (CVD). This chapter reviews the major findings on lycopene in research into CVD.

10) Tomato Lycopene and Bone Health: Preventing Osteoporosis
Dr. Letitica Rao

Oxidative stress is of wide interest as a risk factor in the metabolic bone disease osteoporosis. The role that can be played by lycopene in reducing this risk is not yet fully understood. Dr Rao is engaged in an ongoing clinical study to evaluate lycopene from nutritional supplemnents and tomato juice in the prevention of osteoporosis in postmenopausal women.

11) Reducing Hypertension with Tomato Lycopene
Dr. Esther Paran

Diet modification is a first step in treating the high blood pressure that accompanies cardiac and circulatory disorder. The results of short term treatments with antioxidant-rich tomato extracts have been encouraging, since they have been found to help to reduce blood pressure in mild to moderate hypertensives, within the limited extent of these trials. The continuous effect of this treatment and the long term beneficial effect on cardiovascular risk factors still needs to be demonstrated.

12) Reversing Male Infertility with Tomato Lycopene
Dr. NK Mohanty

Spermatazoa can be susceptible to oxidative stress under certain conditions, which can lead to defective sperm function and male infertility. The role of lycopene in the management of male infertility is promising and warrants further research with randomised trials.

13) The Role of Tomato Lycopene in Photoprotection and Skincare
Dr. Wilhelm Stahl

High doses of ultra-violet radiation can lead to photoxidative damage to the skin. Carotenoids provide light protection for plants and can help to prevent skin damage in humans. However, more research projects are needed to provide additional data on ways in which dietary intervention can improve skin physiology.

14) Lycocard: a promising new project
Dr. Volker Böhm

This five-year EU-funded project is intended to fill the gaps in the development of healthy new foods and nutritional guidelines that can harness existing research data into the beneficial effects of tomato-based antioxidants, primarily lycopene. Adopting a 'total food chain' framework, the project will investigate the role of lycopene in reducing the risk of cardiovascular disease, an important cause of mortality in Europe.

15) Summary and Future Directions
Dr. A Venket Rao

During the past decade, lycopene has been identified as an important factor in reducing the risk of a number of chronic diseases. From just a trickle of articles published 10 years ago, there are now several thousand reviewed papers and articles on many different aspects of this growing body of knowledge.

Tomatoes, Lycopene & Human Health is the first comprehensive summary of the extent of this research data, in which chapters have been contributed by internationally recognised experts in their respective fields. It is of interest to the scientific community, food-related industries, government agencies and consumers.

16) Industrial Perspective
Dr. Zohar Nir
Dr. Dov Hartal

While fresh tomatoes are a welcome addition to any table, it was the advent of industrial canning of tomatoes that made available a distinctly different, stable ingredient that is as popular as it is ubiquitous. The canning process itself both liberates lycopene from the cell walls, while protecting this valuable antioxidant from air and light. Tomato products are unrivalled as primary sources of lycopene, the benefits of which are becoming increasingly widely known.

17) Commentary

The growing body of published and reviewed scientific research into lycopene offers a scientifically based response to a host of healthcare issues for politicians, health authorities and consumers alike.