

# **Dietary phenolic compounds have an impact on noncommunicable diseases**

March 15 2021, by Rosa Direito Ph.D.

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Micrograph showing inflammation of the large bowel in a case of inflammatory bowel disease. Colonic biopsy. Credit: Wikipedia/CC BY-SA 3.0

Recently, novel dietary approaches have been developed which aim to preserve health and prevent noncommunicable diseases (NCDs) such as rheumatoid arthritis and inflammatory bowel disease. An extensive body of scientific work indicates that dietary phenolic compounds have antioxidant, anti-inflammatory and antiproliferative activities that

impact human health, literature which was featured in an extensive review recently published in *Pharmaceutics* by myself (Rosa Direito, Ph.D., of the Research Institute for Medicines (iMed.U LISBOA) in Lisbon, Portugal) with the help of my colleagues (Prof. João Rocha, Ph.D., Prof. Bruno Sepodes, Ph.D., and Prof. Maria Eduardo-Figueira, Ph.D., all from the Faculty of Pharmacy at the University of Lisbon). In a special issue dedicated to Complementary and Alternative Medicine (CAM) and Nanomedicine: Advances in Cancer and Cardiovascular Diseases, we exemplified that new delivery systems within the field of nanotechnology could improve the efficiency of phenolic compounds when ingested by humans, providing their health benefits in well-established ways of prevention, treatment or as a complement to conventional pharmacological treatments.

NCDs are chronic diseases that are non-infectious and non-transmissible, the most common of which are obesity, diabetes, cardiovascular, cancer, chronic respiratory and neurological diseases. Altogether, they are the most common causes of debility and death in the modern world, especially in the more industrialized countries. These illnesses have increased exponentially with the consumption of diets very high in fat, salt and sugar, not to mention stress and physical inactivity. The potential impact of suboptimal diets on NCDs' morbidity and mortality rates brings to the forefront the necessity for new forms of improving dietary habits.

These illnesses have increased exponentially as a result of the adherence to certain lifestyles, seeing the number of deaths from NCDs increasing globally from 65% in 2005 to 71% in 2015. At an international level, significant advances have been made against this health threat, through the 2011 United Nations' political declaration on NCD prevention and control, the World Health Organization's Global Action Plan for the Prevention and Control of NCDs 2013–2020 and the integration of NCDs in the United Nation's Sustainable Development Goals for 2030.

According to the WHO, premature deaths could have been prevented through, for example, healthier eating habits with the ingestion of fruits and vegetables which are the primary source of active phenolic compounds and some vitamins and may thus be a protection for population health. The review also points out that epidemiological studies have time and again demonstrated that diets rich in fruits and vegetables, as well as whole grains, are deeply related to a reduced risk of developing NCDs.

The review points out that oxidative stress, inflammation, and mitochondrial alterations are inextricably linked, performing a major part in the beginning and development of NCDs and it is due to this that they are typically referred to as inflammatory chronic diseases. There is a possibility that nutritional or pharmacological manipulation of inflammation and oxidation permits for a significant decrease in the debility and mortality associated to these diseases.

We aimed the review at explaining the beneficial effects of some food compounds such as phenolic compounds have on physiologic processes that underlie the origin of NCDs such as inflammation and oxidation.

Given the enormous human and economic toll that these diseases brought on by unhealthy diets, longevity of modern populations, sedentary behaviors, pollution, etc., developing measurable and reliable quality dietary habits and supplementation could be used for nutrition guidelines across various regions of the world.

Phenolic compounds are found across a wide diversity of foods available for the human diet, and these compounds act as antioxidants which protecting human tissues against oxidative stress and conditions associated with this state.

These compounds can provide an excellent model for the development

of more effective and, most importantly, safe future chemopreventive compounds. These dietary compounds also have a direct effect on gut microbiota, which influences its composition in terms of diversity and abundance, which in turn impacts the healthy state of individuals. New nutritional approaches may be adopted by constructing a personalized diet following microbiota analyses, in order to modulate and repair a healthy gut microbiota.

It is my belief that the link we find between inflammatory processes and illnesses, and diet, is increasingly clear. Beyond what our lab has already researched in the past couple of years, we need to do a lot of additional work to establish how these promising new delivery systems can boost the efficiency of these phenolic compounds in the hopes of ameliorating the symptoms or even preventing the development of this kind of illnesses.

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**More information:** Direito R, Rocha J, Sepodes B, Eduardo-Figueira M. Phenolic Compounds Impact on Rheumatoid Arthritis, Inflammatory Bowel Disease and Microbiota Modulation. *Pharmaceutics*. 2021; 13(2):145. [doi.org/10.3390/pharmaceutics13020145](https://doi.org/10.3390/pharmaceutics13020145)

Rosa Direito earned her PhD in 2019, before that, she earned a BSc and MSc in Biochemistry from University of Coimbra in Portugal. Her PhD in Pharmacy (Food Science) was awarded with the highest grade, having been awarded a fellowship by the Dean of the University of Lisbon. While working towards her PhD, she was an active contributor to her coordinator's research group at the Research Institute for Medicines and Pharmaceutical Sciences (iMed.Ulisboa), collaborating with universities

and institutes throughout the years. In the past 5 years she has been the author or co-author of 12 publications (11 scientific journals, 1 book chapter), the co-author or lead communicator of 11 abstracts/posters at scientific conferences nationally and internationally. Her work is focused on the following: colorectal cancer, colitis, phenolic compounds, food science, inflammation, inflammatory bowel disease, noncommunicable diseases, animal models, and clinical nutrition.

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