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Editorial

The complex world of sterols: Many threads find their way through cells

The present issue of *European Journal of Lipid Science and Technology* includes contributions which cover multiple aspects of a class of lipids that we collectively call ''sterols.'' The complexity of the topic, the need of multiple scientific competences for its understanding, and, at the same time, the necessity to pull the threads together, were very clear as early as the investigations on cholesterol and related compounds began, more than 100 years ago.

In this context, I believe that the concepts expressed by Professor H. G. Söderbaum in the ceremony when the Nobel prize in Chemistry was awarded to Heinrich Wieland and Adolf Windaus in 1928 for their studies on ''sterols'', are still up-to-date and represent the ideal introduction to this Special issue.

> *The so-called sterols are also an extremely interesting group from the physiological viewpoint. They too occur both in vegetation and in animals. Most numerous are the vegetable sterols, the so-called phytosterols, but the best-known is certainly cholesterol, which occurs in the animal organism, and which was first found about 150 years ago in gall stones. This substance occurs not only in bile but also in the brain, in nerve substance, in the egg, in blood, and presumably in all cells. Thus we can conclude that it plays an extremely important part in the life process of man and the animals, just as the phytosterols play an extremely important part in the life process of plants*
> [http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1928/press.html].

''*This substance (cholesterol) … occurs … presumably in all cells.*''

The insightful observation of Professor Söderbaum has become one of the basic concepts of modern cell biology. ''Occurrence'' does not mean that cholesterol simply exerts structural or passive roles.

Thanks to the continuing efforts of several groups, we have now achieved a comprehensive view on how cholesterol and other sterols are involved in the fine-tuning of their own homeostasis and trafficking, by means of multiple complementary mechanisms. In this issue, A. Brown provides us with an updated and critical overview on the topic, also proposing the challenges we are going to face in the future [1].

Coherently with their lipophilic nature, cholesterol and sterols find their way through cells and exert their biological activities by interacting with a variety of proteins. Cytoplasmic oxysterol-binding proteins represent an emerging class of proteins, whose functions span from binding sterols and phospholipids to signal transduction. EJLST's readers will find a critical appraisal of recent findings in this specific topic by V. Olkkonen and coworkers [2].

''*The so-called sterols are also an extremely interesting group from the physiological viewpoint.*''

If Professor Söderbaum had spoken in more recent years, I think he would have chosen the term ''patho-physiological viewpoint.'' In the last decades, numerous experimental and clinical studies have demonstrated the causal link between hypercholesterolemia and cardiovascular diseases. Cholesterol metabolism can be pharmacologically modulated at different levels, and the well-known HMG-CoA reductase inhibitors represent a first choice medication to reduce blood cholesterol. Nevertheless, the search of new therapies in this area continues and recent advances in the understanding of cholesterol biology and metabolism have unveiled novel potential targets. Parini and coworkers [3] describe the biology of acyl-coenzyme A:cholesterol acyltransferases (ACAT), a class of enzymes responsible for esterification of intracellular cholesterol, and critically discuss promises and pitfalls of ACAT inhibitors.

''*This substance (cholesterol) . . . occurs . . . in the egg, . . .*''

By browsing any kind of printed magazines, TV programs, and electronic sources, you will easily find lists of foods that have been blamed or ''banned,'' because of their ''dangerous'' cholesterol content. One behavioral consequence of this trend is that having eggs and bacon for breakfast or a juicy hamburger for lunch may now be considered a sort of ''nutritional sins.'' Although reduced consumption of both fats and cholesterol rich foods displays documented beneficial effects, it is worthwhile to mention that, typically, the amount of cholesterol synthesized by the body is higher than its dietary intake [4].

More recently, another threat associated with cholesterol-rich foods has emerged: the presence of oxidation products that are formed during food processing, packaging, and storage. Rodriguez-Estrada and coworkers address this topic with an overview on muscle foods, which constitute a large part of human diet [5]. An additional level of complexity that may influence the susceptibility of food cholesterol to oxidation is its interaction with other food components and/or additives. Conjugated linoleic acids may represent an interesting class of molecules because they combine intrinsic nutritional properties with potential antioxidant activities [6].

''*Most numerous are the vegetable sterols, the so-called phytosterols . . .*''

In 1928 the only recognized role of these derivatives was restricted to plant biology. In the last decades, studies on the nutritional value of vegetable food components have revealed the biological properties of phytosterols and their potential beneficial effects on human health. This field has cought the interest of a large number of scientists and technologists and a great deal of data have been collected. Interested readers will find a comprehensive and updated overview on the topic by MacKay and Jones [7]. Nevertheless, these compounds still deserve to be investigated in depth, as discussed by Jiménez-Escrig in his commentary [8].

We hope that our readers will enjoy this Special issue. In the end, sterols are old molecules with a glorious past, a very active present, and a promising future!

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