In memory of Hermann Esterbauer

First of all, Hermann was a good friend. We admire him for his scientific contributions, and we cherish his friendship, now continuing on in our memories. Hermann had joined the Editorial Board of this Journal in 1989 and had been an extremely valuable member ever since. However, the links are from long before that. Hermann was a Member of the Organizing Committee of the Society for Free Radical Research Third Biennial Meeting, held at the University of Dusseldorf in 1986, and many of the papers from that meeting were peer-reviewed and subsequently appeared in the Journal, then called 'Free Radical Research Communications'. Hermann played a pivotal role in that activity.

Of his numerous publications, several appeared in this Journal, including the now classic paper 'Continuous Monitoring of in vitro Oxidation of Human Low Density Lipoprotein, by H. Esterbauer, S. Striegl, H. Puhl and T. Rotheneder (*Free Rad Res Comms* 6, 67–75, 1989).

Further details ofis many scientific accomplishments and a more extended personal account are given here and elsewhere by other close friends and associates of Hermann Esterbauer. We will miss him as a person, and we will miss his congenial presence and help, given so generously whenever it was needed.

HELMUT SIES
BARRY HALLIWELL

The Society for Free Radical Research deeply regrets losing Prof. Hermann Esterbauer, one of its most respected members.

Apart from his scientific achievements, I would like to mention his personal enthusiasm for fostering research in free radicals. Last July, when he was already aware of his fatal illness, he accepted an invitation to participate in a Symposium on Free Radicals in the context of the FEBS' 96 meeting in Barcelona. I recall his keen interest to know if the attendance at the Symposium would be numerous and also his happiness after the sessions, when he saw that free radical research was still a "popular" issue in the frame of general biochemistry.

We at the society, and doubtless all his other friends, will miss him dearly for although we shall still be able to refer to his work in this scientific field, we shall no longer be able to enjoy his verve for research nor his extraordinarily pleasant company. I feel certain that we shall all feel his absence deeply.

PROF. DR. JOSE VIÑA

Obituary

HERMANN ESTERBAUER

Another big loss occurred recently in the field of free radical research: Hermann Esterbauer, one of the leaders of this subject, died on January 7th, 1997, at the age of 61. It is for me a great honour, but much more important a matter of tremendous sadness, to commemorate him in his Journal. In fact, Hermann was one of my best friends, and collaborated with Trevor Slater and with me for very many years.

Hermann Esterbauer was born at Ach, province of Upper Austria. He studied at the University of Graz, where he graduated in Chemistry in 1962. Just after graduation, he became Post-doctorate in research and Assistant Professor in the Institute of Physical Chemistry, where he remained officially until 1968. His interest was, however, the study of fats and fat-containing structures.

For this reason, he gravitated towards Erwin Schauenstein, professor of Biochemistry, who dedicated all his scientific life to the study of fats and fat-related substances. Schauenstein, at that time, was mainly interested in the study of the products of the autoxidation of polyene fatty acids, with special consideration for the α-β-unsaturated aldehydes and/or their toxic action. In 1967 Hermann, together with W. Weger, developed a new method for the synthesis of such substances. Suitable amounts of these important carbonyl products of fat autoxidation were produced by this new synthesis, starting from 4-hydroxy-pentenal to 4-hydroxy-octenal and to 4-hydroxy-nonenal, and to other higher aldehydes. The study of their biological actions thus became possible. In 1968 Hermann moved from the Institute of Physical Chemistry to that of Biochemistry, directed by Schauenstein.

He held the same position here as he had previously in the other Institute, Assistant Professor. The chemical work on the 4-hydroxy-α-β-unsaturated aldehydes continued in the new laboratory and Hermann became one of the most distinguished collaborators of Schauenstein. In 1972 Hermann published a paper on the reaction between such aldehydes and thiols, showing that a cyclic hemiacetal is formed. Schauenstein was very interested in studying the toxicity of the aldehydes and Hermann collaborated with him. One of the most interesting results they obtained was their demonstration of the anti-cancer activity of the aldehydes 4-hydroxy-pentenal, a synthetic non-natural carbonyl, and 4-hydroxy-2,3,trans-octenal. At relatively high concentrations, these substances were shown to block cell multiplication and to inhibit thymidine incorporation into DNA. Hermann, who was mostly a chemist, thus started to show interest in medical problems.

In 1973–74 he completed his scientific studies in the United States, remaining for one year each at the School of Public Health at the University of Pittsburgh, and then in the Department of Biochemistry of the University of Michigan.

Most of the papers of the Schauenstein group were published in German in journals not widely read among the English-speaking scientific world. So, they remained little known until 1977, when Trevor Slater edited the translation into English of a German book by Schauenstein, Esterbauer and H. Zollner. This book, entitled "Aldehydes in biological systems" was published by Pion and is still one of the most important reference publications for the chemistry and toxicity of the aldehydes.

At the time I was collaborating with Trevor Slater on CCl_4-induced lipid peroxidation. Stimulation of lipid peroxidation by CCl_4 had already been described by my group (Comporti, Saccocci and Dianzani) and practically at the same time, by Richard Recknagel and Ghoshal in 1965. In 1959–60 Together with my Ph. D. student L. Congiu I discovered that thiols can prevent the aggregation of mitochondrial proteins occurring after treatment with CCl_4 i.e. a pro-oxidant effect

FIGURE 1 Hermann Esterbauer detecting biogenic aldehydes by h.p.l.c. (1980).

of CCl_4. Trevor Slater confirmed our results and put forward the idea that the onset of lipid peroxidation is afforded by $CCl_3^{\cdot}$ free radical, formed during CCl_4 metabolism by microsomes. The collaboration between my group and Trevor's started practically at that time. In order to study the biological meaning of lipid peroxidation, as well as the mechanism of its damaging action on cell structures, the isolation of the end products of the peroxidative deterioration of membrane lipids was necessary. This was the reason why we proposed to Professor Schauenstein and to Hermann that we pool our researchers: they accepted, and the results have been fruitful. The main lines of our collaboration were drawn up at a private meeting in Venice. On that occasion I was able to introduce Hermann to my former scholar Mario Comporti, Professor in Siena.

Comporti had studied the separation by paper chromatography of the toxic compounds produced by peroxidizing microsomes. He had seen that a "yellow" spot on the paper was responsible for most of the toxicity.

The Venice group thus linked Hermann and Comporti. The "yellow spot" mainly contained 4-hydroxynonenal, which was thus first isolated and this allowed the study of its toxicity. These studies were mainly done in Turin. Three papers in the Biochemical Journal published in 1980, 1982 and 1985, report the most important fruits of the collaboration between the Institutes of Brunel, Graz and Turin. More than 30 carbonyl substances were separated by HPLC and about 24 of them were identified in Graz by mass spectrometry. The collaboration with Hermann continued for a long time on related subjects, as he was Guest Professor in Turin from 1984 to 1989, Guest Professor in Siena in 1989, and Visiting Professor in Brunel from 1987 to 1993. The collaboration with Turin especially regarded the study of the mechanisms of leukocyte chemokinesis and chemotaxis stimulated by 4-hydroxy-nonenal, and also the nature of the bond between serum albumin and 4-hydroxynonenal. We thus showed that the HNE-albumin adduct can release the bound aldehyde when the concentration of the free aldehyde in the incubation medium is low. In this way it was established that albumin can work as a carrier for the aldehyde in the blood and can release it to distant targets; when bound to albu-

FIGURE 2 The group of Venice. From the left Pippo Poli, Hermann Esterbauer, Trevor Slater, Erwin Schauenstein, Mrs. Schauenstein, Mario Umberto Dianzani and Mario Comporti.

min, HNE is protected from the action of destroying enzymes.

4-hydroxynonenal attracted the attention of an increasing number of scientists and Hermann generously supplied the aldehyde, synthesised in his own laboratory, to every scientist asking for it. This increased his network of collaborations. His main interest moved to the field of lipid peroxidation occurring in circulating lipoproteins; he became one of the most important supporters of the idea that atherosclerosis may be a consequence of this type of damage, and especially of the fact that the aldehyde-containing lipoproteins form rather stable bonds with their specific receptors located on endothelial cells, allowing an easier endocytosis. This might be the real cause of the formation of atheroma. The problem is not fully resolved, but the hypothesis has attracted a number of scientists who have provided considerable proof for it.

Hermann was nominated Professor of Biochemistry in Graz in 1974, and Full Professor in 1990, when he became "Ordinarius".

He received an "honoris causa" degree in Medicine and Surgery from the University of Turin in 1992 for his high merits in the field of lipid peroxidation. He was President of the Austrian Biochemical Society from 1993 to 1995 and member of the Board of the Society for Free Radical Research-European Region from 1989 to 1994. Until his death, he was "speaker" of the Joint Research Project of the University of Graz on "Biomembranes and their interactions with lipids and lipoproteins".

His irreversible disease became evident early last year, and he underwent several cycles of chemotherapy and two operations. Nevertheless, his activity did not decrease. Death caught him still standing in the field.

I think, however, that he will remain alive in our minds and in our research for a very long time. Death may take away a man, but not his ideas or his work.

MARIO UMBERTO DIANZANI