

Tox Nickel C o l o g y

edited by
Stanley S. Brown
and
F. William Sunderman Jr

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Jovanovich, Publishers*
London New York Toronto
Sydney San Francisco

NICKEL TOXICOLOGY

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1980

ACADEMIC PRESS



A Subsidiary of Harcourt Brace Jovanovich, Publishers

LONDON NEW YORK TORONTO SYDNEY SAN FRANCISCO

ACADEMIC PRESS INC. (LONDON) LTD.
24/28 Oval Road,
London NW1

United States Edition published by
ACADEMIC PRESS INC.
111 Fifth Avenue
New York, New York 10003

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British Library Cataloguing in Publication Data
International Conference on Nickel Toxicology,
2nd, Swansea, 1980
Nickel Toxicology
1. Nickel – Toxicology – Congresses
I. Title II. Brown, Stanley S
III. Sunderman, Frederick William, b. 1931
615.9'25'625 RA1231.N/ 80-41429

ISBN 0-12-137680-X

Printed in Great Britain

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FOREWORD

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1. INTRODUCTION

The Swansea Conference on Nickel Toxicology was held at the University College of Swansea in Swansea, Wales, UK, on September 3 to 6, 1980, under the joint sponsorship of the IUPAC Subcommittee on Environmental and Occupational Toxicology of Nickel and the Association of Clinical Scientists. The Swansea Conference continued the traditions of scientific excellence and interdisciplinary exchange that were established at four previous conferences (London, UK, 1975; Farmington, USA, 1976; Monte Carlo, Monaco, 1977; Kristiansand, Norway, 1978). Papers on several aspects of nickel toxicology were presented at both the Monte Carlo and Kristiansand Conferences (see Brown, 1977; Sunderman, 1978).

The Swansea Conference was attended by 118 participants from 19 countries, including many of the world's authorities on nickel in the areas of trace analysis, physiology, pharmacology, toxicology, pathology, industrial hygiene, occupational medicine, dermatology, and epidemiology. The Conference facilitated the exchange of new scientific data on biological effects of nickel, and it promoted international collaboration by workers in this field of endeavour. An important accomplishment of the Swansea Conference was critical evaluation and unanimous approval by the IUPAC Nickel Subcommittee of a Reference Method for analysis of nickel in serum and urine by electrothermal atomic absorption spectrometry (Brown *et al* , 1981). Synopses of the scientific papers that were presented at the Swansea Conference are published in this volume to facilitate rapid communication of advances in nickel toxicology to the scientific community throughout the world.

2. RECENT DEVELOPMENTS IN NICKEL BIOCHEMISTRY

Salient recent developments in nickel biochemistry are mentioned in this Foreword, as a background to the considerations of nickel toxicology in the body of this book. Mackay and Pateman (1980) demonstrated that nickel is required by a urease-deficient mutant of *Aspergillus nidulans*. Addition of nickel ions to the culture medium restored urease activity *in vivo* and enabled the strain of *A. nidulans* to utilize urea. This study indicated that nickel was necessary for the activity of microbial urease, just as nickel was previously shown to be essential for the activity of plant ureases (Dixon *et al.*, 1975, 1980; Polacco, 1977). Drake *et al.* (1980) found that carbon monoxide dehydrogenase from *Clostridium thermoaceticum* is a nickel-containing metalloenzyme. Whitman and Wolfe (1980) and Diekert *et al.* (1980) discovered that nickel is an essential constituent of coenzyme F430 isolated from methanogenic bacteria. Coenzyme F430 is the first specific nickel-containing organic compound of low molecular weight that has been identified in biological materials. The chemical structure of coenzyme F430 has not been elucidated, but its chemical properties are similar, in certain respects, to vitamin B₁₂. To date, no clear-cut biochemical role of nickel has been identified in animals, with the possible exception of *Octopus vulgaris*, which possesses chromatophores that contain pigment granules of nickel sulfides (Froesch and Packard, 1979). Metabolic functions of nickel in animals and man will probably be identified since nutritional essentiality of nickel has been demonstrated in rats, swine, and goats (Schnegg and Kirchgessner, 1975; Nielsen *et al.*, 1975; Anke *et al.*, 1977), and since pathological alterations of nickel metabolism have been observed in common diseases of man (McNeely *et al.*, 1971). For example, Howard (1980) has confirmed earlier reports (D'Alonzo and Pell, 1963; Sunderman *et al.*, 1970) that serum nickel concentrations become increased in patients following acute myocardial infarction.

3. RECENT SCIENTIFIC LITERATURE ON NICKEL

To illustrate the recent growth of interest and research on nickel in biology and medicine, the annual citations on nickel in Cumulative Index Medicus from 1960 to 1979 are plotted in Fig. 1. For comprehensive reviews of the scientific literature on nickel analysis, metabolism, toxicology, and health effects, readers may consult monographs and articles by Nriagu (1980), Nieboer and Cecutti (1980),

Norseth and Piscator (1979), and Sunderman (1980 a-d). Readers should be aware that another International Conference on Nickel was held in Jena, DDR, in July 1980, sponsored by Karl Marx University and Friedrich Schiller University. The Proceedings of the Jena Conference will soon be published (Anke and Schneider, 1981).

CITATIONS / YEAR

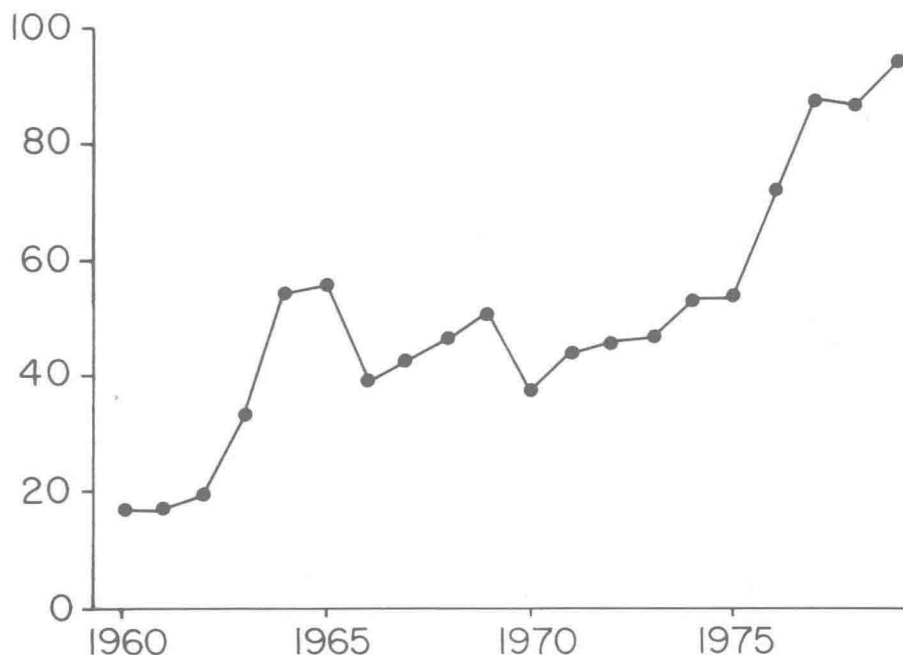


Fig. 1. Annual number of citations on nickel in the cumulative Index Medicus from 1960 to 1979

ACKNOWLEDGEMENTS OF HELP AND SUPPORT FOR THE SWANSEA CONFERENCE

The author gratefully acknowledges the help of Dr. Lindsey G. Morgan (Co-Chairman of the Conference); Dr. Brian Davison and Mr. Anthony Shadford (Hosts); Mr. Douglas B. Adams, Mr. Paul J. C. Rouge, and Mr. Derek W. B. James (Committee on Local Arrangements); Dr. Stanley S. Brown (Co-Editor of these Proceedings); Sir Richard Doll (Plenary Lecturer); Dr. Ralph Gräsbeck (President, IUPAC Clinical Chemistry Division); Dr. David Tonks (Member, IUPAC Bureau); and Dr. F. William Sunderman Sr. (Director of Education, Association of Clinical Scientists). Financial support for the Swansea Conference was provided by industrial sponsors: Amax, Inc. (USA); Falconbridge (Norway and Canada); Höganäs AB (Sweden); INCO Europe Ltd. (UK); and Société Le Nickel (France). The Chairmen of the Scientific Sessions were Dr. Ernest Mastromatteo (Canada); Dr. Jan Sjöholm (Sweden); Mr. Stewart G. Luxon (UK); Dr. Stanley S. Brown (UK); Dr. John Savory (USA); Dr. Markus Stoepler (FRG); Dr. Tor Norseth (Norway); Dr. Lindsey G. Morgan (UK); and Dr. Richard Barton (USA). By scholarly discussions of the papers, these scientists contributed significantly to the intellectual climate of the Swansea Conference on Nickel Toxicology.

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