EXPERIMENTAL CELL RESEARCH

SUPPLEMENT 9 · 1963

Proceedings of

THE AMERICAN CANCER SOCIETY CONFERENCE

ON

THE NUCLEUS OF THE CANCER CELL

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FOREWORD

FOLLOWING a day-long meeting of the Advisory Committee on Research on the Pathogenesis of Cancer in June 1961, Harris Busch, one of its members, over dinner casually remarked that it might be appropriate to hold a conference devoted exclusively to the nucleus of the cancer cell.

From this offhand remark emerged a two-and-a-half day conference which was viewed by the majority of the participants as one of the most exciting and instructive meetings they had ever attended. "The Nucleus of the Cancer Cell" meeting was held in Rye, New York, on October 18 through 20, 1962. The proceedings are presented here.

Conferences have been devoted to the cancer cell, but none before have concentrated exclusively on its nucleus. Many felt that this was a propitious time for such an undertaking. The rapid development in the field of nucleic acid biochemistry has been termed a modern revolution. Cancer cells transmit their distorted genetic code from cell to cell via the nucleus and the nucleic acids. Thus, a thorough understanding of coding and messenger mechanisms has a direct and important bearing on the cancer problem.

The American Cancer Society believes that affording scientists an opportunity to discuss new developments of potential significance to cancer research is one of its more important functions. Because of this, the Board of Directors appropriated necessary funds. Since 1956 the Society has held five similar symposia on important subjects [1–5].

In selecting participants for the present conference, the Society drew from the best scientific talent available in the world. Of the forty-five participants, eleven were from outside the United Sates. The need for closer communication on an international scale is very real and the foreign guests added greatly to the lively and rewarding exchange of new information.

The sessions were attended only by participants. In the Society's experience this format offers an ideal opportunity for sharing information. The complete account of these sessions is offered for those members of the larger scientific community who were not participants but who are interested in this fast-moving field.

Sam R. Hall
American Cancer Society

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1. Symposium. A Critical Appraisal of the Biochemical Characteristics of Morphologically Separable Cancers. *Cancer Research* **16**, 639 (1956).
2. Symposium. Role of Hormones in the Origin and Control of Abnormal and Neoplastic Growth. *Cancer Research* **17**, 421 (1957).
3. Symposium. The Possible Role of Viruses in Cancer. *Cancer Research* **20**, 669 (1960).
4. Conference on Research on the Radiotherapy of Cancer. University of Wisconsin, 1960. Proceedings. New York, American Cancer Society, 1961. 198 pp.
5. Symposium. The Possible Role of Immunology in Cancer. *Cancer Research* **21**, 1165 (1961).

ACKNOWLEDGEMENTS

Many individuals contributed very much to the successful development of this conference. Of course, one should express special appreciation to the participants, whose willingness to put in extremely long hours, that is, from 9:00 a.m. to 10:00 p.m. each of the days of the conference, made it possible to cover such a large amount of material. The generous support of the American Cancer Society made it possible for participants to come from long distances and from many institutions. In particular, the participants in the conference express their appreciation to Dr Sam R. Hall, whose efforts in organization and provision of many small kindnesses aided each of the participants and the organizing committee.

The committee which organized the conference and which I was privileged to chair consisted of Drs Sam R. Hall, Frank M. Huennekens, Avery A. Sandberg, and Robert E. Stowell. These colleagues were members of the committee on Pathogenesis of the American Cancer Society, which voted approval of the concept of this symposium. This distinguished committee observed the potential utility of this conference and unanimously supported it. In the evolution of the symposium, advice was solicited from many individuals, and in particular Dr Edwin Chargaff, of Columbia University, gave generously of his time and broad experience.

We are also deeply indebted to the Chairmen of the various sessions, Drs Robert E. Stowell, Avery A. Sandberg, T. C. Hsu, Saul Kit, Arnold Welch and Theodore S. Hauschka, who rounded out the sessions by summarizing the discussions.

The approach of the Committee was one of great humility, since it is recognized that we are as yet on the threshold of knowledge regarding abnormalities of the cancer nucleus. However, it was thought that such a conference might have value in marking our present state of knowledge and, hopefully, could also provide some direction for future studies in this fundamental area.

HARRIS BUSCH
December 14, 1962
Houston, Texas, U.S.A.

LIST OF PARTICIPANTS

Atchley, William A.
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Dounce, Alexander L.
Frenster, John
Graham, Ruth M.
Hall, Sam R.
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Heidelberger, Charles
Hnilica, Lubomir
Hotchkiss, Rollin D.
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Hurlbert, Robert B.
Hsu, T. C.
Irvin, J. Logan
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Siebert, Günther
Simon, Edward
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Stenram, Unne
Stich, H. F.
Stowell, Robert E.
Swift, Hewson
Taylor, J. Herbert
Upton, Arthur C.
Wang, T. Y.
Welch, Arnold D.

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PART I

MORPHOLOGY OF THE CANCER NUCLEUS

Experimental Cell Research, Suppl. **9**, *3–14 (1963)*

THE NUCLEUS OF THE CANCER CELL

A HISTORICAL REVIEW

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At the beginning of the 19th century, the use of improved microscopes led to the discovery of the cell nucleus by Robert Brown in 1830 and consequently, to a more satisfactory description of the unit components of various tissues and organs culminating in the formulation of the cell-theory of Schwann and Schleiden in 1838. According to this theory: "there is one universal principle of development for the elementary part of organisms, however different, and this principle is the formation of cells". The discovery that cells and nuclei of cells are derived from cells, served as a tremendous stimulus to research, and the manifestations of disease began to be viewed in relation to cells. Amongst the many scientists: e.g. Johannes Mueller, Henle, Rokitansky, Lebert and several others, who studied various diseases, Virchow was the most eminent. In his many years of pioneering research in new and untried fields, Virchow collected a great number of observations and formulated stimulating ideas. He planned to write a three-volume book on cancer; unfortunately, however, only the first volume appeared in 1863 [50]. Virchow may be considered to be the founder of Cellular Pathology as a new science, in which the role of a cell in disease takes a prominent place.

Research in the field of Cellular Pathology gained further impetus when the mechanism of cell divisions was clarified and the important role of the nucleus and its components in the process of mitosis was demonstrated by Flemming in 1880. Following this discovery, the cell and cell division in cancerous tissues became the subject of many investigations (e.g. Arnold in 1879 [1], von Hansemann in 1890 [18], Pianese in 1896 [41]) the chief aim being to obtain information from which the malignant nature of cells could be identified.

The purpose of the present paper is to spotlight some of the early observations which primarily concern the nucleus of the cancer cell, to draw attention to certain methods which were introduced into the study of malignant cells and to show how far or to what extent they helped research workers in the field of cancer.