
Preface

The objective of this Atlas is to introduce the structure and distributions of interstitial cells of Cajal (ICC) to researchers, clinicians and students of bio-medical fields who are interested in the motility of the gastrointestinal (GI) tract and the regulatory mechanism of the smooth muscle in general. Recent development of ICC studies have broadened the research horizon from only the GI tract to other hollow organs with smooth muscle coats outside GI tract, and the presence or absence of ICC and their functional states in these organs are often discussed in the context of a variety of diseases.

However, there have been difficulties to understand whole morphological characteristics of ICC by conventional histological sections or ultrathin sections because of their peculiar shape, the presence of long slender processes projecting from the cell bodies similar to neurons. This is a reason why earlier histologists misunderstood ICC as neurons. Another reason for the difficulty is the presence of ICC subtypes that show different distributions and different ultrastructural features depending on the levels of the GI tract. Therefore, a detailed morphological guide for ICC in each organ of the GI tract is necessary for starting to understand ICC

A stable morphological foundation is essential for understanding the function of tissues and organs and for interpreting their changes in disease.

For this Atlas, I assembled many images of whole-mount stretch preparations stained with immunohistochemistry. Such preparations are among the most useful to reveal the whole shape of ICC in a similar way to the silver impregnation method for nerves used in traditional histology. Stereo-micrographs reconstructed from confocal microscopic images of ICC are especially helpful for understanding their three-dimensional (3D) structures *in situ* to readers who are unfamiliar with the morphology of GI tract in general and ICC in particular. Electron micrographs contained in this book reveal a more precise character of ICC as a peculiar cell type and provide clues for discussing their functional aspects. The approaches presented here effectively display the whole characteristics of ICC. Some functional aspects of ICC are described in the relevant sections and a minimal number of literature citations are listed.

I still remember the strong impression I got when I read the paper on ICC and his pacemaker hypothesis by Lars Thuneberg (1982), since I had also published a small paper on ICC in the extension of the studies of the enteric nervous system at almost the same time. My work was based simply on my cytological interest using modern ultrastructural observations of ICC trying to get an answer to a long-standing puzzle of whether ICC are neurons or glial cells or connective tissue cells. This great shock made me determined

to examine Thuneberg's hypothesis rather skeptically. However, I gradually accumulated evidence to support his idea.

As described above, modern ICC research has developed as the study of the regulatory system of the smooth muscle movement of the muscle coat, mainly focusing on peristalsis. However, the recent demonstration of ICC associated with the submucosal plexus (ICC-SP) suggests that ICC are also involved in mucosal functions, such as secretion and absorption, which are more fundamental and peculiar to each level of GI tract. This may also give useful hints to the approach and interpretation of the study of the visceral organs outside of the GI tract.

I would like to thank Professor Yasuo Uehara, the Chairman of the Anatomy Department in Ehime, Japan, who stimulated active, independent research projects by all members of the department, including my ICC studies at that time. Further progress in my studies of ICC ensued in my laboratory in Waseda University with the cooperation of several PhD students and research associates. I feel proud that except for a few of my own pictures, all of the figures contained in this Atlas have been obtained by these young collaborators in this small laboratory. I am grateful for their stimulation and for their generosity in allowing me to use their valuable figures. I am deeply indebted to Dr Peter Baluk for his reading the manuscript and correction of English. I also acknowledge valuable advice on the technical terms by Dr Menachem Hanani and Professor Hikaru Suzuki. It is my good luck to have good friends and good competitors in carrying out my work for a long time. Above all, the international ICC-meeting truly stimulating. I would like to express my appreciation to the main members of the meeting. In particular, I am cordially grateful to Professor Kenton Sanders for writing a marvelous Foreword for this Atlas. Finally, I cannot miss expressing my appreciation to my wife Yoko, who has continued to make daily lunch boxes for more than 30 years to let her husband work in the laboratory!

Atlas of Interstitial Cells of Cajal in the Gastrointestinal
Tract

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2012, XII, 134 p., Hardcover

ISBN: 978-94-007-2916-2