

Keith W. Taylor · Heikki Hyöty
Antonio Toniolo · Arie J. Zuckerman
Editors

Diabetes and Viruses

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Keith W. Taylor
† (Deceased)

Antonio Toniolo
Laboratory of Medical Microbiology
University of Insubria
and Ospedale di Circolo
Varese, Italy

Heikki Hyöty
Department of Virology
University of Tampere
and Tampere University Hospital
Tampere, Finland

Arie J. Zuckerman
University College London Medical School
London, UK

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Foreword



Every house has many builders and is never finished—Paavo Haavikko (Finnish poet, 1931–2008).

To the memory of Keith W. Taylor (Shropshire, 1930—Rye, 2012) who set a wheel in motion in diabetic research with original investigations on the possible role of viral infections. His perspective and judgement contributed greatly to this work, and his spirit pervades this volume. We also wish to recall the wonderful and continuous support given to him by his wife Margareth, his daughter Ann and especially Nick, his son.

This book is also dedicated in everlasting loving memory to Alice Zuckerman (né Adamson; 28 January 1932 to 16 January 2011), who devoted her life, love and energy to her husband Arie, and children Mark and Jane; and who encouraged, supported and inspired them to excel in the science and art of Medicine.

Finally, we acknowledge the generous contribution of Gianni Valcavi, Attorney, and Cariplo Foundation (Milan) without which diabetes research in Varese (Italy) would have been not possible. It is also a pleasure to acknowledge the skilful help and pleasant cooperation of our secretaries Ms. Tanya Shennan, Mrs. Irene Smith and Mrs. Stefania Triballi. Lastly, we gratefully recognize the distinguished skill and patience of Arthur Smilios, Ms. Fabian Shalini and the entire Springer's staff during the preparation of this book.

The Editors

Preface

While the term “the global epidemic of diabetes” is used frequently both by the popular media and in the medical literature, it is not used in the context of infection. The late Keith Taylor reflects on the historical background of the relationship between viruses and diabetes noting that the association between mumps and diabetes was described in the middle of the nineteenth century, but it was not until 1927 that the Norwegian Army physician Edvard Gundersen published a paper in the *Journal of Infectious Diseases* entitled “Is diabetes of infectious origin?”. The subsequent history of virus infection and diabetes in humans and animals is described eloquently in the Chap. 1 of this book, which contains precisely what is stated in the title; that is, information on diabetes and viruses.

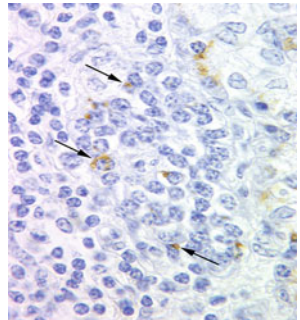
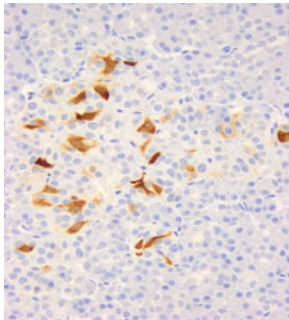
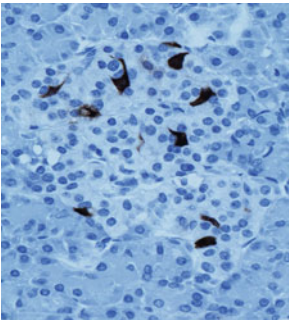
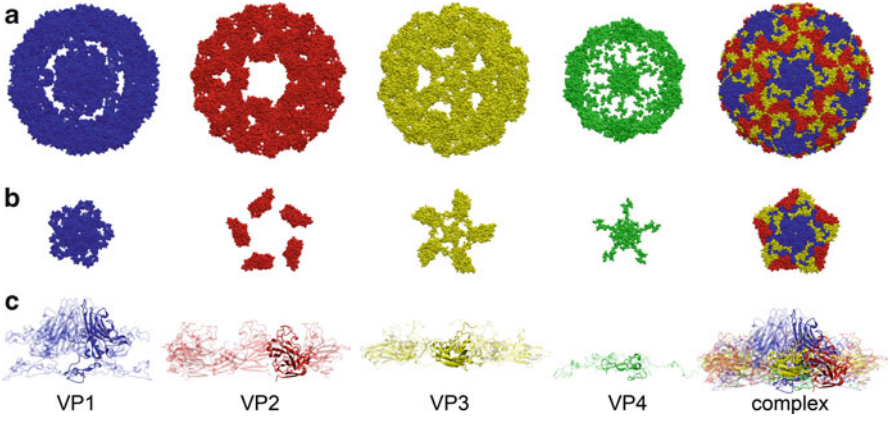
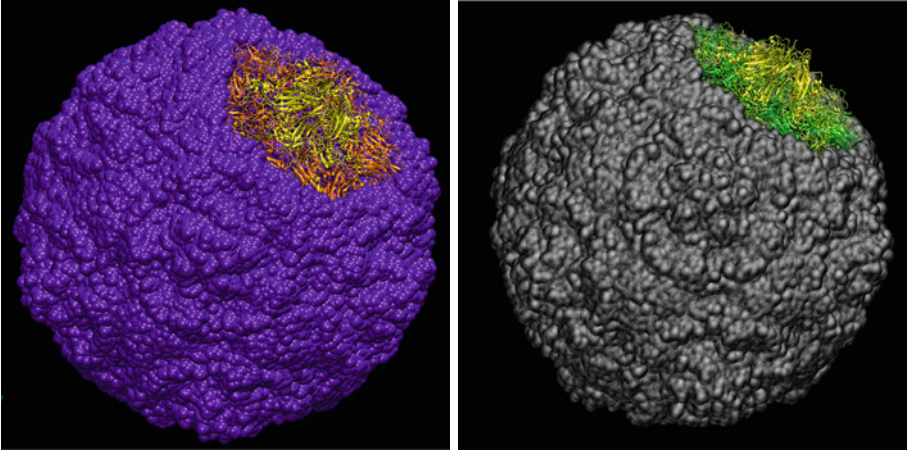
The Editors recruited a galaxy of leading researchers and physicians from many countries including, in alphabetical order, Australia, Cuba, Finland, France, Italy, Japan, Sweden, the UK and the USA, who accepted the challenge to produce rapidly an authoritative account of the current knowledge and research in progress on this important topic, for which the Editors are most grateful.

Many topics are reviewed expertly including the role of autoimmunity, molecular mimicry, genetic factors, immune mechanisms, environmental factors (an ever popular topic on virtually every aspect of human activity), and with a particular emphasis on a number of viruses affecting the pancreas in animals and humans. The text is written in a way that we hope will be understood by general physicians, clinical specialists in diabetes, researchers—especially those involved in immunology and virology—senior nurses, public health workers and medical students. We also hope that the pharmaceutical industry is listening. Throughout we attempted to avoid the description of excessively complex techniques and molecular porn, and simplify technical jargon.

Finally, there is an old military maxim “never attack a revolution”, and—in the context of this book—we should not ignore the direct or indirect role of viruses in the aetiology of diabetes mellitus, but rather continue to explore this intriguing association.

London, UK

Arie J. Zuckerman



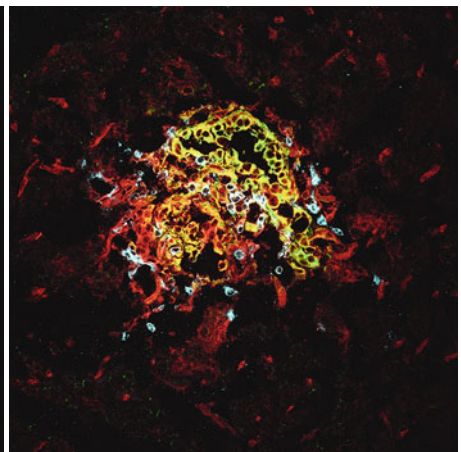
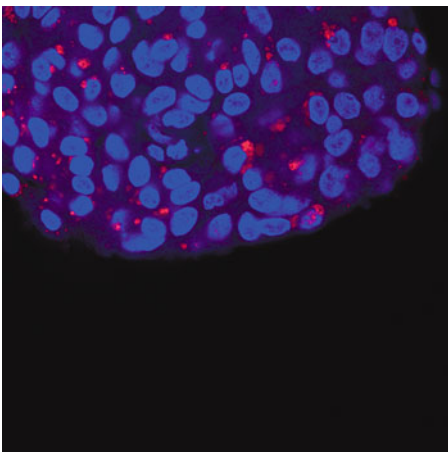
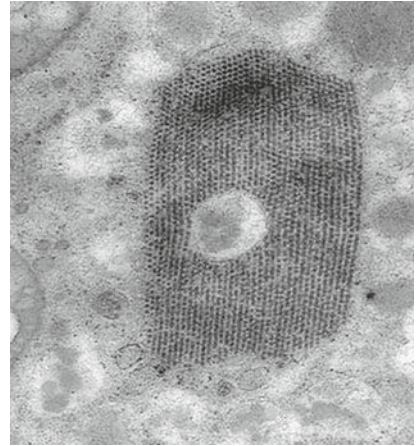
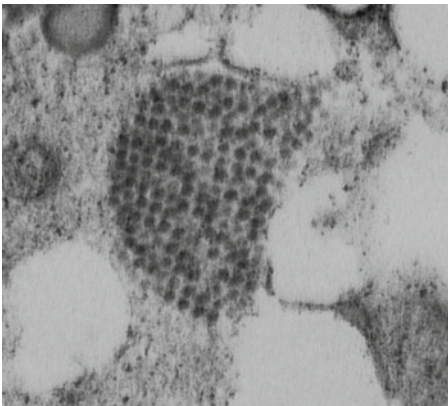
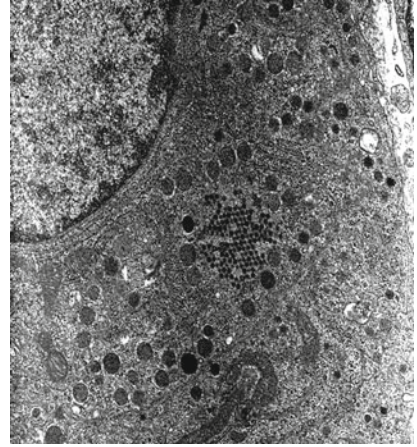
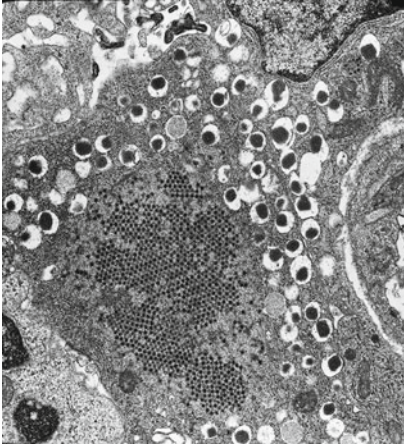


Figure Legends

Figs. 1 and 2 Three-dimensional model of an enterovirus. One pentamer of capsid proteins is shown in detail (two different orientations of the virus particle). The remaining part of the capsid surface is shown as Van der Waals spheres. Reconstruction based on the X-ray analysis of coxsackievirus A9 at 1.2 Å resolution has been performed using the VMD 1.8.7 program (Protein Data Bank access code 1D4M). Courtesy of Vesa Hytönen, University of Tampere, Finland.

Fig. 3 Assembly of the enterovirus capsid. A) The four capsid proteins represented as Van der Waals spheres (VP1, blue; VP2, red; VP3, yellow; VP4, green) are shown as assembled in the capsid. B) The four capsid proteins are shown as assembled in a pentamer. C) Side view of capsid proteins assembled in a single pentamer. As in Figures 1 and 2, the models are based on the X-ray structure of coxsackievirus A9 (courtesy of Vesa Hytönen, University of Tampere, Finland).

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Contributors

Mark A. Atkinson Departments of Pathology and Pediatrics, The University of Florida College of Medicine, Gainesville, FL, USA

Andreina Baj Laboratory of Microbiology, Department of Experimental Medicine, University of Insubria Medical School, Varese, Italy

Huriya Beyan Blizzard Institute, Queen Mary College, University of London, London, UK

Elizabeth P. Blankenhorn Department of Immunology and Microbiology, Drexel University College of Medicine, Philadelphia, PA, USA

Martin Blixt Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden

A.J. Bone University of Brighton, Sussex, UK

Eduardo Cabrera-Rode Department of Immunology of Diabetes, National Institute of Endocrinology, Havana, Cuba

Martha Campbell-Thompson Department of Pathology, Immunology, and Laboratory Medicine, Gainesville, FL, USA

Urs Christen Pharmazentrum Frankfurt/ZAFES, Goethe University Hospital, Frankfurt am Main, Germany

Nora M. Chapman Enterovirus Research Laboratory, Department of Pathology and Microbiology, University of Nebraska Medical Center, 986495 Nebraska Medical Center, Omaha, NE, USA

Serena Wai-Yan Chiu Blizzard Institute of Cell and Molecular Science, Queen Mary College, University of London, London, UK

Maria E. Craig Institute of Endocrinology and Diabetes, The Children's Hospital at Westmead, Sydney, NSW, Australia

Discipline of Paediatrics and Child Health, The University of Sydney, Sydney, NSW, Australia

School of Women's and Children's Health, University of New South Wales, Sydney, NSW, Australia

Rachel Desaillood UPJV CHU, Service d'Endocrinologie-Diabétologie-Nutrition, Amiens, France

Oscar Díaz-Horta Department of Immunology of Diabetes, National Institute of Endocrinology, Havana, Cuba

Francesco Dotta University of Siena Medical School, Policlinico "Le Scoette", Siena, Italy

Martin Eichmann Department of Immunobiology, King's College London School of Medicine, London, UK

Giovanni Federico Unit of Pediatric Endocrinology and Diabetes, Department of Reproductive Medicine and Child Development, University of Pisa Medical School, Pisa, Italy

A.K. Foulis Glasgow University, Glasgow, UK

Gun Frisk Department of Women's and Children's Health, Uppsala University, Akademiska Hospital, Uppsala, Sweden

Letizia Galleri Diabetes Unit, Department of Internal Medicine, Endocrine and Metabolic Sciences and Biochemistry, University of Siena, Siena, Italy

Umberto Di Mario ONLUS Research Foundation, Siena, Italy

Anne Goffard Université Lille 2, CHRU, Laboratoire de Virologie/EA3610, Loos-lez-Lille, France

Fabio Arturo Grieco Diabetes Unit, Department of Internal Medicine, Endocrine and Metabolic Sciences and Biochemistry, University of Siena, Siena, Italy

Umberto Di Mario ONLUS Research Foundation, Siena, Italy

Toshiaki Hanafusa Department of Internal Medicine (I), Osaka Medical College, Takatsuki, Japan

Len Harrison Diabetes Research Center, The Walter & Eliza Hall Institute of Medical Research, Parkville, VIC, Australia

Robert Hermann Immunogenetics Laboratory, University of Turku, Turku, Finland

Toshiharu Hayashi Department of Veterinary Pathology, Yamaguchi University, Yamaguchi, Japan

Lily Ho-Le Blizzard Institute, Queen Mary College, University of London, London, UK

Didier Hober Laboratory of Virology/EA3610, University Lille 2, CHRU Lille Institut Hippocrate, Loos-Lez-Lille, France

Margo C. Honeyman Diabetes Research Center, The Walter & Eliza Hall Institute of Medical Research, Parkville, VIC, Australia

Heikki Hyoty Department of Virology, University of Tampere and Tampere University Hospital, Tampere, Finland

Jorma Ilonen Immunogenetics Laboratory, University of Turku, Turku, Finland
Department of Clinical Microbiology and Immunology, University of Eastern Finland, Kuopio, Finland

Akihisa Imagawa Department of Metabolic Medicine, Graduate School of Medicine, Osaka University, Suita, Japan

Richard Insel Center for Human Genetics and Molecular Pediatric Disease, University of Rochester Medical Center, Rochester, NY, USA

Juvenile Diabetes Research Foundation International (JDRF), New York, NY, USA

Hitoshi Katsuta Department of Medical Science and Technology, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan

Hironori Kurisaki Department of Medical Science and Technology, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan

Katharina Lind The Center for Infectious Medicine, Department of Medicine HS, Karolinska Institutet, Stockholm, Sweden

Sabina Resic Lindehammer Department of Clinical Sciences, Lund University/CRC, Skåne University Hospital SUS, Malmö, Sweden

Åke Lernmark Department of Clinical Sciences, Lund University/CRC, Skåne University Hospital SUS, Malmö, Sweden

R. David G. Leslie Blizzard Institute of Cell and Molecular Science, Queen Mary College, University of London, London, UK

Zhijun Liu Department of Medicine, University of Massachusetts Medical School, Worcester, MA, USA

Giuseppe Maccari Laboratory of Microbiology, Department of Experimental Medicine, University of Insubria Medical School, Varese, Italy

Kazuya Matsuda Department of Veterinary Pathology, School of Veterinary Medicine, Rakuno Gakuen University, Ebetsu, Hokkaido, Japan

John P. Mordes Professor of Eudoeriuology and Metabolism, Department of Medicine, University of Massachusetts Medical School, Worcester, MA, USA

N.G. Morgan Peninsula College of Medicine and Dentistry, University of Exeter, Exeter, Devon, UK

Seiho Nagafuchi Department of Medical Science and Technology, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan

Bo Niklasson Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden,
Apodemus AB, Stockholm, Sweden

Maarit Oikarinen School of Medicine, University of Tampere, Tampere, Finland

Sami Oikarinen School of Medicine, University of Tampere, Tampere, Finland

Takashi Onodera Department of Risk Assessment Science, Research Center for Food Safety, University of Tokyo, Bunkyo-ku, Tokyo, Japan

Mark Peakman Department of Immunobiology, King's College London School of Medicine, London, UK

Myra Poon The Children's Hospital at Westmead, Institute of Endocrinology and Diabetes, Sydney, Australia
Discipline of Paediatrics and Child Health, The University of Sydney, Sydney, Australia

Alberto Pugliese Diabetes Research Institute, University of Miami Miller School of Medicine, Miami, FL, USA

William D. Rawlinson Virology Research Laboratory, Prince of Wales Hospital, Sydney, Australia
School of Biotechnology and Biomolecular Science, University of New South Wales, Sydney, NSW, Australia
School of Medical Sciences, University of New South Wales, Sydney, NSW, Australia

Karena Riedweg Université Lille 2, CHRU, Laboratoire de Virologie/EA3610, Loos-lez-Lille, France

Marian Rewers Barbara Davis Center for Childhood Diabetes, University of Colorado School of Medicine, Aurora, CO, USA

S.J. Richardson Peninsula College of Medicine and Dentistry (PCMD), University of Plymouth, Plymouth, UK

Merja Roivainen Division of Health Protection, Department of Infectious Disease Surveillance and Control, Intestinal Viruses Unit, National Institute for Health and Welfare (THL), Helsinki, Finland

Alessandro Salvatoni Pediatric Endocrinology Unit, Department of Experimental Medicine, University of Insubria Medical School, Varese, Italy

Stellan Sandler Department of Medical Cell Biology, Uppsala University, Uppsala, Sweden

Famara Sane Université Lille 2, CHRU, Laboratoire de Virologie/EA3610, Loos-lez-Lille, France

Luis Sarmiento Department of Virology, “Pedro Kouri” Tropical Medicine Institute, Havana, Cuba

Guido Sebastiani Diabetes Unit, Department of Internal Medicine, Endocrine and Metabolic Sciences and Biochemistry, University of Siena, Siena, Italy

Umberto Di Mario ONLUS Research Foundation, Siena, Italy

Teemu Smura Division of Health Protection, Department of Infectious Disease Surveillance and Control, Intestinal Viruses Unit, National Institute for Health and Welfare (THL), Helsinki, Finland

Isabella Spagnuolo Diabetes Unit, Department of Internal Medicine, Endocrine and Metabolic Sciences and Biochemistry, University of Siena, Siena, Italy

Umberto Di Mario ONLUS Research Foundation, Siena, Italy

Teodora Staeva JDRF, New York, NY, USA

Glyn Stanway Department of Biological Sciences, University of Essex, Colchester, UK

Lars C. Stene Division of Epidemiology, Norwegian Institute of Public Health, Oslo, Norway

Hiroyuki Taniyama Department of Veterinary Pathology, School of Veterinary Medicine, Rakuno Gakuen University, Ebetsu, Hokkaido, Japan

Keith W. Taylor † (Deceased)

Antonio Toniolo Laboratory of Medical Microbiology, University of Insubria & Ospedale di Circolo, Varese, Italy

Malin Flodström Tullberg The Center for Infectious Medicine, Department of Medicine HS, Karolinska Institutet, Stockholm, Sweden

Francesco Vendrame Umberto Di Mario ONLUS Research Foundation, Siena, Italy

Diabetes Research Institute, University of Miami, Miami, FL, USA

Matthias G. von Herrath La Jolla Institute for Allergy and Immunology (LIAI), La Jolla, CA, USA

A. Willcox Peninsula Medical School, University of Exeter, Plymouth, UK

Danny Zipris Barbara Davis Center for Childhood Diabetes, University of Colorado, Aurora, CO, USA

Arie J. Zuckerman Emeritus Professor of Medical Microbiology, University College London Medical School, Royal Free Campus, London, UK

Part I
Background and Pathogenesis

Chapter 1

Historical Background: Earlier Studies on the Connexion Between Viruses and Diabetes

Keith W. Taylor

Although there are references to the possible relationships between mumps and diabetes in the mid-nineteenth century (Stang 1864), it was not until much later that Harris (1899), described in detail a likely association between the two diseases. In the case discussed by Harris, glycosuria in a young American farmer quickly followed the initial mumps attack, but full blown diabetes with ketosis developed over a 3-year period. It was assumed that the mumps produced pancreatitis which involved the islets. In the ensuing 30 years, sporadic cases where there was an association between mumps and diabetes were reported (Patrick 1924), but it was generally assumed that mumps was a rare cause of diabetes. Gundersen (1927), however, published a paper with the intriguing title “Is Diabetes of Infectious Origin?”, in which it was suggested that what he termed infectious parotitis or mumps produced pancreatic disease leading to diabetes in the young some 3 years after the initial infection. His figures were based on death rates due to diabetes in Norway in the pre-insulin period. At that time diabetes in the young with ketosis was usually fatal, and death rates from the disease bore a relationship to its incidence.

It is now known that several other viruses can produce a parotitis, as well as pancreatic disease, including enteroviruses. Since methods for the accurate identification of viruses did not then exist, viruses other than the mumps virus could well have been involved on occasions.

The association of mumps with subsequent diabetes has been reported in isolated cases ever since.

K.W. Taylor, M.B.B.S., Ph.D., F.R.C.P.

† (Deceased)