



Preface

Fourteenth Workshop on Vitamin D[☆]

The Fourteenth Workshop on Vitamin D was held at the **Concertgebouw** in Brugge, Belgium, from Sunday evening October 4 through October 8, 2009. A total of 420 registered delegates from 35 countries were in attendance.

The primary function of the Vitamin D Workshop is to organize and present scientific meetings on any aspect related to vitamin D. The first Vitamin D workshop meeting was held in Frankfurt, Germany in 1973 and they have been held at approximately 3-year intervals ever since, alternating between venues in the USA and Europe.

This special volume of the *Journal of Steroid Biochemistry and Molecular Biology* represents the official published Proceedings of the Fourteenth Workshop on Vitamin D. The table of contents identifies the major topical sections of the Proceedings; the 1077 Chapters are listed under their appropriate topic heading. Within each topic, the first series of chapters are written by Plenary or Invited Speakers followed by the Free Communications. This Proceedings publication is the fourteenth in our Vitamin D Workshop series. The first eleven were published as independent stand alone

Workshop number	Date	Number of delegates	Number of countries represented	Number of presentations		Presentations per delegate
				Talks	Posters	
I	October 1973 Frankfurt, West Germany	56	3	5	0	0.09
II	October 1974 Wiesbaden, West Germany	221	22	84	0	0.39
III	January 1977 Asilomar, California, USA	332	20	45	124	0.51
IV	February 1979 Berlin, West Germany	402	26	80	205	0.76
V	February 1982 Williamsburg, Virginia, USA	455	25	95	298	0.86
VI	March 1985 Merano, Italy	474	27	77	380	0.96
VII	April 1988 Rancho Mirage, California, USA	381	24	82	292	0.98
VIII	July 1991 Paris, France	595	32	76	415	0.82
IX	May 1994 Orlando, Florida, USA	502	31	91	348	0.89
X	May 1997 Strasbourg, France	571	37	87	358	0.78
XI	May 2000 Nashville, Tennessee, USA	376	30	83	239	0.86
XII	July 2003 Maastricht, The Netherlands	323	30	75	255	1.03
XIII	April 2006 Victoria, BC, Canada	332	24	76	220	0.89
XIV	October 2009 Brugge, Belgium	420	35	61	252	0.74

The substantial attendance at the Brugge Workshop reflected the continuing world-wide interest in research developments related to vitamin D. Presented in a table above are the dates, attendance, and the number of talks given at the fourteen Vitamin D Workshops that have now been held.

[☆] Special issue selected article from the 14th Vitamin D Workshop held at Brugge, Belgium on October 4–8, 2009.

books, each of approximately 1000 pages. For the Proceedings of the Twelfth Workshop on Vitamin D, the Workshop Advisory Committee decided to publish the Proceedings in a peer reviewed journal, the *Journal of Steroid Biochemistry and Molecular Biology*. We are delighted that the current editor, Dr. Jerzy Adamski, and Elsevier Press have extended to the Vitamin D Workshop the opportunity to again publish the Proceedings of the 14th Workshop in JSBMB.

The Scientific Program for the Fourteenth Workshop on Vitamin D was proposed by the Program Committee and implemented

by the Workshop Advisory Committee; membership of these two groups is listed on subsequent pages. The Program Committee members nominated scientists for consideration by the Advisory Committee as Invited Speakers. The objective here was to allow presentation of all viewpoints on all scientific topics related to vitamin D. Further, the Program Committee members collectively reviewed and scored the 252 submitted Free Communication abstracts, which were candidates for presentations. The scores were rank-ordered to allow selection of the top 20 abstracts for 10 min oral presentations at the Workshop.

The quality and diversity of the science presented at the Fourteenth Workshop on Vitamin D was again at a very high level. Remarkable progress continues to be made in the many research areas related to vitamin D. Over the first 11 Workshops (1973–2000) there were two primary foci of research presentations. (a) The traditional biological functions of vitamin D and $1\alpha,25(\text{OH})_2\text{-vitamin D}_3$ in the general area of calcium homeostasis with important biological effects in the intestine, kidney and its related disease of renal osteodystrophy and bone and its disease state of osteoporosis. (b) The chemical synthesis by highly talented chemists of many hundreds of analogs of vitamin D's steroid hormone, $1\alpha,25(\text{OH})_2\text{D}_3$. The availability of these analogs permitted the elucidation of their specific biological properties and, at the molecular level of how $1\alpha,25(\text{OH})_2\text{D}_3$ or its analogs bind to the vitamin D receptor, VDR, to produce both genomic responses as well as rapid responses (e.g. opening of calcium or chloride channels). The capstone of this era was the publication by Professor Dino Moras¹ and his colleagues in 2000 of the X-ray structure of the VDR with a $1\alpha,25(\text{OH})_2\text{D}_3$ ligand.

Since 2000, the research world of vitamin D has been transformed by two events. The first is the significant expansion of the vitamin D endocrine system as evidenced by the number of annual publications of peer-reviewed papers with the term 'vitamin D' in either the title or abstract that has increased from 600 to 700 (1990–1999) to 2200 papers in 2009. Secondly, the recognition of the presence of the VDR in at least 37 tissues and cell types and convincing data from a number of laboratories demonstrating the existence of the paracrine enzymatic production of $1\alpha,25(\text{OH})_2\text{D}_3$ by the $25(\text{OH})_2\text{-D}_3$ hydroxylase in many new locations, including the pancreas, ovary, prostate, mammary gland and colon. Thus, as collectively summarized by the 41 invited speakers and amplified by the 252 poster presentations and 20 short oral communications at the 14th Brugge Vitamin D Workshop, it was clear to the attendees that the vitamin D endocrine system includes, besides calcium homeostasis, both the adaptive and innate immune systems, pancreatic beta cells, heart and cardiovascular systems and muscle. It is likely that the future will bring the addition of many $1\alpha,25(\text{OH})_2\text{D}_3$ driven functions in the brain. Thus the potential contributions of vitamin D to good health have greatly increased.

The topic of vitamin D nutrition was another major presence at the Fourteenth Workshop. Two oral sessions were dedicated to vitamin D nutrition. The first session addressed the key topics of understanding the current world-wide status of vitamin D nutrition (reviewed by Professor Paul Lips) and included a presentation "Falls and fractures: Update and how to design an evidence-based study that will identify vitamin D intake recommendations" (reviewed by Professor Bess Dawson-Hughes). This was immediately followed by a vitamin D Roundtable that lasted for over 2 h. It opened with four 15 min presentations, two advocating that optimal health requires that the blood levels of $25(\text{OH})\text{D}_3$ be greater than 30–40 ng/ml and two presentations advocating that the blood

levels of $25(\text{OH})\text{D}_3$ be greater than 20 ng/ml. This was followed by an expanded 1 h roundtable discussion that included one additional expert each from the US, South Africa, Australia and Finland who commented from their geographical perspectives. Also all members of the ~250 person audience were welcome to make comments. There emerged three important issues: (a) concern about the increasing prevalence of vitamin D deficiency world-wide as defined by a serum $25(\text{OH})\text{D}$ below 30 nM or 12 ng/ml. (b) Concern that the US Vitamin D Dietary Reference Intake (DRI) of 200 (infants, children and adults), 400 (adults age 51–69) or 600 IU (adults greater than age 69) per day should be significantly increased, perhaps to 1000–2000 IU/day (25–50 $\mu\text{g}/\text{day}$). Related to this issue was the topic of defining the optimal safe level of daily vitamin D intake. The present Upper Level of vitamin D intake is currently set at 2000 IU (50 μg) and arguments were presented that it should be increased. (c) Concern as to whether increased sun exposure or ultraviolet exposure (tanning salons) could be an appropriate mechanism to increase the daily intake/production of vitamin D_3 . Counter arguments were presented that it is not appropriate to increase sun exposure significantly due to concern for increased risk for skin melanomas and other skin cancers. An official summary of the vitamin D Workshop Nutrition Roundtable appears in these Proceedings as the first chapter.

The Fourteenth Workshop on Vitamin D continued its tradition of presenting Young Investigator Awards. Eight \$1000 travel awards were provided to Young Investigators under the age of 35 who had submitted a meritorious abstract to the Workshop. The recipients are listed on the following pages.

Twelve Vitamin D Workshop Career Recognition Awards were given to distinguished scientists to honor their significant and continuing contributions to the field of vitamin D research during their careers. They are summarized on a following page.

The Advisory Committee as well as the Program Committee acknowledges the financial support of the many sponsors of the Fourteenth Workshop on Vitamin D. A tabulation of these appears on subsequent pages. Without the generous multi-corporate financial support, it would have been impossible to have had a Vitamin D Workshop with such a comprehensive program and world-wide attendance.

The presentation of the Fourteenth Workshop on Vitamin D in Brugge would not have been possible without the dedicated and highly professional contributions of Dagmar DeGraef, Workshop Secretary from LEGENDO, Belgium and Nancy Day from Riverside.

Vitamin D Workshop Advisory Committee
Anthony W. Norman, Riverside, California, USA
Roger Bouillon, Leuven, Belgium
April 2010

FOURTEENTH WORKSHOP ON VITAMIN D AWARDS

Young Investigator Award Recipients

Femke Baeke, K.U.Leuven, Belgium
Katie M. Dixon, University of Sydney, Australia
Maria J. Larriba, Universidad Autónoma de Madrid, Spain
Danusa Menegaz, University of California, Riverside, USA
Mark B. Meyer, University of Wisconsin-Madison, USA
Pamela von Hurst, Massey University, New Zealand
Yun Wang, Georgia Tech, USA
Kari Wong, University of Chicago, USA

Career Award Recipients

Daniel D. Bikle, VAMC, University of California, San Francisco, USA
Roger Bouillon^(a), KU-Leuven, Leuven, Belgium
Martin J. Calverley, Leo Pharma Co, Denmark
Sylvia S. Christakos, New Jersey Medical School, USA
Pierre J. De Clercq, Ghent University, Belgium
David D. Feldman, Stanford University School of Medicine, USA
Mark R. Haussler, University of Arizona, USA
Helen L. Henry, University of California, Riverside, USA
Michael F. Holick, University of Tennessee Health Science Center, USA

¹ The crystal structure of the nuclear receptor for vitamin D bound to its natural ligand. Rochel, N, Wurtz, JM, Mitschler, A., Klahlholz, B., and Moras, D. *Molecular Cell* 5: 173–129 (2000).

Noboru Kubodera, Chugai Pharmaceutical Co. Ltd., Japan
 Rebecca S. Mason, University of Sydney, Australia
 Dino Moras, Institut de Génétique et de Biologie Moléculaire et Cellulaire, France
 Antonio Mouriño, Universidad de Santiago, Spain
 Anthony W. Norman^(b), University of California, Riverside, USA
 (a) Co-organizer of 7 Vitamin D Workshops from 1981 to 2009.
 (b) Co-organizer of 14 Vitamin D Workshops from 1973 to 2009.

Organizers

Fourteenth Workshop on Vitamin D

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 Anthony W. Norman (Riverside, CA, USA)

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