

## COMMENTARY

# Introduction to the special issue of *BoneKEy Reports* on 'vitamin D and bone'

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The dual origin of vitamin D (by photosynthesis or by dietary intake) was discovered nearly a century ago. Its widespread use in infants and young children efficiently eliminated endemic rickets. It took a long time to decipher its metabolism, its spectrum of activities and its mode of action. During the last decade the interest in vitamin D among scientists and the general public increased substantially and the use of vitamin D supplements has increased nearly exponentially in many countries. Although vitamin D was discovered as an anti-rachitic agent, for a long time there remained insufficient evidence to support the concept that vitamin D directly stimulates osteoblastic bone formation and mineralization. Paradoxically, it is much easier to demonstrate that the vitamin D endocrine system stimulates the process of osteoclastic bone resorption. One of the aims of the present special issue is to clarify the mechanisms of action of vitamin D compounds on bone formation and resorption in terms of the calcium and vitamin D endocrine systems.

The Editors decided to publish a state-of-the-art summary of our present understanding on the effects of vitamin D and its metabolites and analogs on calcium and bone homeostasis, while deliberately excluding an in-depth analysis of its potential extra-skeletal effects.

The co-editors were pleased that the best experts around the world were immediately enthusiastic in writing a dedicated review chapter for *BoneKEy Reports*, a recently introduced joint enterprise of the International Bone and Mineral Society and the Nature Publishing group. A total of 18 chapters will be published between January and March 2014 as a special issue entitled 'vitamin D and bone'.

First we start with several historical aspects of vitamin D. Hector F DeLuca describes the story of the discovery of vitamin D in the beginning of the 20th century and the milestones made till today in understanding its metabolism and spectrum of activities. Jeffrey O'Riordan and Olav Bijvoet even go one step back in history and review what is known from the first description of endemic rickets until the discovery of vitamin D itself. Roger Bouillon and Tatsuo Suda try to summarize the evolutionary aspects of vitamin D from unicellular organisms into a full endocrine system during the evolution of vertebrates.

Several chapters deal with basic aspects of vitamin D. First Wes Pike, Seong Min Lee and Mark B Meyer describe its complex effects on gene regulation. Then several chapters deal with the

actions of the vitamin D endocrine system on different bone cells: osteoblasts (Marjolein van Driel and Johannes PTM van Leeuwen), osteocytes (Beate Lanske, Michael J Densmore and Reinhold G Erben) and osteoclasts (Naoyuki Takahashi, Nobuyuki Udagawa and Tatsuo Suda), followed by a description of the complex interaction between osteoblasts and osteoclasts (Natalie A Sims and T John Martin). A review on vitamin D's actions on the intestine is presented by Sylvia Christakos, Liesbet Lieben, Ritsuko Masuyama and Geert Carmeliet, whereas Seiji Fukumoto reviews the role of vitamin D metabolites on phosphate homeostasis. John Eisman and Roger Bouillon then summarize the lessons learned from genetically engineered mice to understand the direct actions of vitamin D on bone at the tissue level.

Clinical aspects of vitamin D and bone are described by David Feldman and Peter Malloy (vitamin D-resistant rickets), Francis Glorieux and John Pettifor (vitamin D-deficient or -dependent rickets), whereas Sagar U Nigwekar, Hector Tamez and Ravi I Thadhani review the involvement of vitamin D in bone diseases due to chronic renal failure. Epidemiologic human studies concerning 'vitamin D and bone health' are discussed by P Ebeling whereas Paul Lips, Evelien Gielen and Natasja M van Schoor undertake a meta analyses of vitamin D supplementation and fractures. Finally the question of 'can nature be improved?' is addressed by two groups (Toshio Matsumoto, Toshiyuki Takano, Hitoshi Saito and Fumiaki Takahashi, and a second chapter by Hector F DeLuca) in their reviews on preclinical and clinical studies dealing with the use of vitamin D analogs for bone diseases.

The co-editors want to thank all authors for their timely submissions and superb contributions. We also greatly appreciate the editorial support from the Editor of *BoneKEy Reports*, Serge Ferrari, and the Nature Publishing staff (especially Chantal Botha and Joe Bennett) for their very constructive and pleasant collaboration.

We hope the readers will enjoy this comprehensive overview on so many aspects of vitamin D and bone and that this special issue may inspire basic and clinical scientists to plan their future research. We also hope it will help clinicians to use vitamin D wisely and widely to prevent or cure vitamin D-related bone diseases.

### Conflict of Interest

The authors declare no conflict of interest.