Seminar on Vitamin D and Health
November 30, 2011
Jakarta, Indonesia

Meeting Summary

With increasing data on vitamin D deficiency in many populations, in addition to emerging interest in the role of vitamin D beyond skeletal health, the International Life Sciences Institute (ILSI) Southeast Asia (SEA) Region organized a Seminar on Vitamin D and Health on November 30, 2011. The seminar was co-organized by the Southeast Asian Ministers of Education Organization Regional Center for Food and Nutrition (SEAMEO RECFON), and the Southeast Asian Food and Agricultural Science and Technology (SEAFAST) Center. Held in Hotel Borobudur Jakarta, Indonesia, the seminar was attended by about 80 participants, including government officials and key regulators from the SEA Region, as well as representatives from the academia and private sector.

Mrs. Boon Yee Yeong, Executive Director of ILSI SEA Region, and Dr. Siti Muslimatun, Deputy Director for Resource Management & Marketing of SEAMEO RECFON, gave their opening remarks. Mrs. Yeong opened the seminar and outlined the range of topics to be covered: vitamin D status and deficiency in SEA; setting the requirement of vitamin D and implementing strategies to improve adequacy, such as through dietary sources and supplementation; as well as state-of-the-art knowledge on the health benefits of vitamin D, and new findings associated with skeletal and non-skeletal disease risks.

Chaired by Dr. Judhiastuty Februhartanty, Deputy Director for Program of SEAMEO RECFON, the first session of the seminar described Vitamin D Status in the Region. Prof. Geok Lin Khor, Professor of Nutrition & Dietetics in the International Medical University, Malaysia, gave the opening paper on Vitamin D Deficiency and Health Outcomes in Asia. Prof. Khor presented data on the escalating prevalence of sub-optimal vitamin D status in Asian countries, including India, Hong Kong, Indonesia, Malaysia, Vietnam and the Philippines, across different age and ethnic groups and from varying socioeconomic strata. Some of the risk factors for low vitamin D status in these countries are poor dietary intake, skin pigmentation, customary attire, lack of sun exposure, obesity and atmospheric pollution. Prof. Khor also highlighted the increasing level of evidence on the association between vitamin D insufficiency and non-skeletal diseases in the Asian context. Policies such as supplementation, recommendation on increased sun exposure, as well as monitoring of vulnerable population groups may be needed to improve vitamin D status.

Following Prof. Khor’s opening paper, the session covered regional research studies. Dr. Pham Van Thuy, Head of the Nutrition Counseling Department of the National Institute of Nutrition in Vietnam, presented a paper on Micronutrient Survey in Vietnam: Vitamin D
Status of Women and Children. To develop a comprehensive national plan of interventions in controlling micronutrient deficiencies, a micronutrient survey was conducted among reproductive age women and young children 6 to 75 months old in Vietnam, in 2010. It was found that the prevalence of vitamin D deficiency (VDD) in women was 92.4%, while that in children was 89.9% - this was considered a ‘severe public health concern’ under the World Health Organization (WHO) classification. Dr. Thuy recommended that specific interventions be implemented, such as by increasing food diversity and quality, fortification, as well as supplementation, in order to overcome this VDD endemic.

Dr. Laniyati Hamijoyo, medical staff of the Internal Medicine Department in the Faculty of Medicine, University of Padjadjaran, Indonesia, proceeded with a paper on Vitamin D Status and Disease Outcomes in the Philippines, which detailed the findings from a study conducted among patients in rheumatology clinics in Manila by Torralba et al. (2011). Vitamin D inadequacy was documented in 75.6% of patients across different sexes and age groups. It was found that the prevalence of inadequacy was higher in patients with inflammatory and autoimmune diseases compared to those with non-inflammatory and non-autoimmune diseases. Dr. Hamijoyo also presented case studies that showed correlations between vitamin D inadequacy and autoimmune diseases, dermatologic conditions such as psoriasis, as well as tuberculosis, with the immunomodulatory role of vitamin D as a plausible evidence base. Maternal vitamin D status during pregnancy was also reported to play a role in the onset of osteoporosis in the offspring, thus depicting osteoporosis as ‘a pediatric disease with geriatric outcomes’. The correlations conclusively showed that serum vitamin D determination and monitoring are imperative for both sexes and across all ages.

The last presentation of the session was by Dr. Grace Soon, Head and Chief Nutritionist at the Centre of Excellence (Nutrition), Health Promotion Board, Singapore, with the title Serum Vitamin D Levels in Singapore Residents. A National Nutrition Survey was conducted in 2010, and vitamin D levels of participants were assessed to find out the prevalence of vitamin D inadequacy and its associated risk factors among Singaporean adults. The survey found a prevalence of 23%, an increase from findings in 2004 (18%). Prevalence of inadequacy was significantly higher in females than in males, as well as in Indians and Malays than in Chinese. Also, the survey found an increased risk of inadequacy for obese individuals, people with low levels of exercise, diabetics with poor glycemic control, and younger adults under 50 years old. Dr. Soon elaborated that an upcoming analysis of dietary intake data will provide more insight and help to develop targeted interventions to improve vitamin D status in at-risk groups.

The next session of the seminar, Requirements and Sources of Vitamin D: Challenges in Meeting Adequacy, was chaired by Dr. Atmarita from the Ministry of Health, Indonesia. Prof. Kevin Cashman, Professor of Food and Health at University College Cork, Ireland, presented a paper on Requirement and Measurement: Challenges and Strategies in
Meeting Adequacy. The presentation first detailed the measurement of vitamin D status by defining 25-hydroxy-vitamin D (25(OH)D) as a status marker, and describing analytical techniques such as immunoassays and Liquid Chromatography Mass Spectrometry (LCMS)/MS. In light of the rise in epidemiological evidence linking vitamin D with non-skeletal diseases, in addition to its well accepted role in metabolic bone disease, several authorities have begun the process of re-evaluating population reference intakes for vitamin D. Prof. Cashman provided an overview of the evaluation process, such as that undertaken by the North American Institute of Medicine (IOM) and the EUReo micronutrient RECommendations Aligned (EURRECA) network. Different types of vitamin D, circulating 25(OH)D level, and the latitude wherein Randomized Controlled Trials (RCTs) were conducted, are a few of the factors to consider - it is clear that recommendations should be country-specific due to many varying factors. Despite new reference values, sub-optimal vitamin D status will remain a major public health issue as there is a substantial gap between requirements and typical dietary intakes. Despite the relative potency of sunshine exposure in comparison with dietary sources, the risk of skin damage and cancer prohibits using the former as a public health measure. Similarly, supplementation as a preventive strategy has until now little evidence of effectiveness, and it may be more useful for high-risk groups than as a population-targeted strategy. More sustainable solutions, namely fortification or other food-based strategies, are therefore needed.

The next presentation was by Dr. Angelika Friedel, senior scientist in the Department of Human Nutrition and Health at DSM Nutritional Products Ltd, Switzerland. The presentation, titled Vitamin D Sources: Are They All the Same, characterized the two types of vitamin D: cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2). When exposed to UV-B radiation, a photosynthetic reaction on the skin produces vitamin D3, a naturally occurring form in humans and animals. Risk factors such as latitude, time spent outdoors, and use of sunscreens, however, restrict its subcutaneous synthesis. Although limited, dietary sources of vitamin D include fatty fish and irradiated foods, with irradiated plant foods such as mushrooms being the major source of vitamin D2. Dr. Friedel highlighted that while both forms of vitamin D are inert, a number of clinical trials have shown that vitamin D3 is more potent in raising and maintaining serum 25(OH)D levels. This can be attributed to its higher binding affinity to the vitamin D binding protein, as well as higher affinity to the vitamin D receptor (VDR). Vitamin D3 has also shown to be more effective in reducing the risk of falls and fractures as compared to vitamin D2.

Mr. Geoffry Smith, President of ILSI SEA Region as well as Chairman of the Essential Micronutrients Foundation, proceeded with a paper on Vitamin D Supplementation and Fortification: Challenges in Implementation. Mr. Smith explained that the assumption that equatorial nations would receive adequate sunlight exposure to achieve sufficient vitamin D levels may now be defunct, due to modern lifestyles and increasing time spent
indoors. Similarly, good dietary sources such as fatty fish may not provide sufficient amounts of vitamin D to Southeast Asians due to infrequent consumption. Mr. Smith illustrated how fortification of staple or packaged foods or beverages can improve vitamin D status and reduce health care costs and mortality rates in SEA. Wheat flour and edible oil may serve as suitable fortification vehicles that are consumed in sufficient quantities in the region. Supplementation may also be considered for severe VDD and in cases where fortified foods are not consumed in adequate amounts. Nevertheless, these proposed strategies require more substantiation from national data, regional studies on the health effects of vitamin D, as well as improved testing capabilities, so as to better combat the VDD endemic.

Chaired by Mr. Smith, the last session of the seminar, Vitamin D and Health, shared the classical and non-classical health benefits of vitamin D and their scientific basis. The first presentation was Vitamin D and Health Benefits: Skeletal Health and Beyond by Prof. Peter Ebeling from The University of Melbourne, Australia. The presentation first outlined recommendations in Australia, namely vitamin D3 supplementation and sunlight exposure guidelines, backed by solid evidence on the effect of vitamin D treatment in reducing the risk of falls and fracture. Prof. Ebeling presented research findings on VDD and its association with other health outcomes, including type 1 and type 2 diabetes mellitus, and gestational diabetes. It appears that vitamin D treatment also increases insulin sensitivity and reduces the rise of fasting glucose in diabetic patients. Additionally, VDD is associated with a multitude of other non-skeletal conditions, namely autoimmune and infectious diseases, cancer (including breast, ovarian, prostate and colon cancers), as well as overall mortality. In relation to maternal and child health, VDD during pregnancy introduces risks of preeclampsia and hypertension to the mother, as well as risks of schizophrenia and respiratory infections to the child, amongst other diseases. Prof. Ebeling highlighted the importance of observing serum 25(OH)D levels and treating VDD in diabetic patients, as well as in pregnant women from at-risk groups. However, while metabolic benefits are likely to accrue from treating VDD, more RCTs and scientific evidence are still needed.

Dr. Hataikarn Nimitphong from the Ramathibodi Hospital, Mahidol University, Thailand, next presented on the Role of Vitamin D in Human Adipocytes and Human Brain. Dr. Nimitphong showcased studies that suggest vitamin D may favorably influence the remodeling of adipose tissues via regulation of leptin, and may also possess an anti-inflammatory action via regulation of pro-inflammatory adipokines. These properties support its potential role in reducing obesity, insulin resistance and type 2 diabetes. Although the causal relationship between vitamin D status and these disease outcomes are not clear, it is likely connected to the presence of VDR and vitamin D metabolism genes in adipose tissues. Epidemiologic studies have revealed that VDD is linked to a number of neurological disorders as well, such as multiple sclerosis, schizophrenia and Alzheimer’s disease, in addition to neurocognitive and neuropsychiatric diseases. Dr. Nimitphong attributed the association to the potential immunomodulatory function of vitamin D in the
Based on her presentation as well as Prof. Ebeling’s, it could be gathered that the presence of VDR throughout the human body, including Islet cells, adipose tissues and brain tissues, may contribute to the association between VDD and many non-skeletal diseases.

Prof. Koh Woon-Puay from the National University of Singapore provided insight on VDR and its influence on disease outcomes at the cellular and genetic level. Her presentation, *Vitamin D Receptor Gene Polymorphism and Colorectal Cancer Risk*, illustrated VDR as a pivotal mediator for the cellular effects of vitamin D. Polymorphism of VDR gene, which affects its structure and activity level, has been shown to affect colorectal cancer risk. Based on a case-control study nested within the population-based prospective cohort of middle-aged and older Chinese in Singapore, it was demonstrated that individuals carrying the low-activity genotype have an increased risk of colorectal cancer, with dietary calcium and fat intake as modifying factors. Among those with either low calcium or low fat intake, the risk for colorectal cancer increased significantly in a gene-dose-dependent manner. For subjects with higher dietary fat or calcium intake, on the other hand, there was no evidence of a VDR genotype-colorectal cancer association. Prof. Koh concluded that in addition to validating the role of vitamin D in colorectal cancer etiology, the study suggested that vitamin D requirement and effects in individuals may be modified by genetic polymorphisms as well as dietary factors.

The next speaker, Dr. Drupadi Dillon, from University of Indonesia, presented further evidence on the VDR gene and its influence on non-skeletal disease outcomes. With the scientific basis that polymorphism of the VDR gene affects the role of vitamin D in activating the immune process against *tubercle bacillus* (TB), Dr. Dillon’s presentation, *Vitamin D and Immunity: A Case Study on Tuberculosis in Indonesia*, showcased findings from a study that investigated the vitamin D status and VDR genotype of TB patients in Indonesia. Observations included a higher prevalence of VDD among TB patients compared to normal subjects. Additionally, there was a higher risk for vitamin D insufficiency and deficiency for the former group. There was, however, no significant difference in sunlight exposure and vitamin D intake in TB patients and healthy subjects. Due to the potential immune-regulatory function of vitamin D, VDD was deemed a severe problem amongst TB patients in Indonesia. Dr. Dillon added that a study on polymorphism with a larger sample size is needed, and proposed a study on the effect of vitamin D supplementation on TB patients.

The last presentation was given by Dr. Maryantoro Oemardi from the Melania Mother and Children Hospital, Bogor, Indonesia, titled *Vitamin D and Geriatrics: The Indonesian Perspective*. Dr. Oemardi illustrated the decline of vitamin D status with age, which can be attributed to lower dietary intake and diminished sunlight exposure. Research shows that serum vitamin D3 levels after body exposure to sunlight is significantly lower in the elderly than the young. Moreover, biological processes such as intestinal absorption of
vitamin D and conversion of vitamin D to its active form in the liver and kidneys are progressively impaired - hence it is vital to develop strategies to maintain optimal vitamin D status in this at-risk group. Dr. Oemardi outlined a sun-exposure study performed in Jakarta and Bekasi, Indonesia, which found that sun exposure on the face and arms 3 times a week, for 6 weeks, improved serum vitamin D levels of elderly Indonesian women. Sunlight exposure was thus deemed effective in improving vitamin D adequacy and could contribute to the classical role of vitamin D in musculoskeletal health. Dr. Oemardi also presented evidence on the positive correlation of serum 25(OH)D and muscle function in elderly Indonesian women, with the presence of VDR in muscle tissues as a potential scientific explanation.

After the session ended, a panel discussion was done to further discuss and sum up the research gaps and strategies to combat VDD endemic in SEA. Inputs from the academia, industry, as well as government sectors were given. The seminar was closed and all participants were thanked for contributing to the seminar and for sharing their expertise.