The National Seminar on Importance of Zinc in Human Health, organized by International Life Sciences Institute (ILSI)-India and ILSI Human Nutrition Institute, Washington in association with Indian Council of Medical Research and National Institute of Nutrition, was held in New Delhi on 25-26 October 2004. The seminar was addressed by 22 national and international experts, and attended by other representatives from diverse fields including Government, International and National bodies, medicine, pediatrics, public health, nutrition, agriculture, food technology, economics, industry and media (Annexure I).

In five separate sessions the seminar discussed functions and importance of zinc in nutrition, zinc deficiency in human beings and in soil in India, economic implications of zinc deficiency, strategies to eliminate zinc deficiency and the role of partnerships in steps to be undertaken.

**Importance of Zinc**

The Seminar recognized that zinc is an essential micronutrient for healthy functioning of the human body. Though present in tiny amounts, it is critical to life and its deficiency can have a variety of adverse consequences.

**Zinc Deficiency**

Zinc deficiency may occur due to diets inadequate in bioavailable zinc, certain diseases like diarrhea, loss of zinc in processing foods, and poor soil deprived of zinc, which can reduce the zinc content in agricultural products.

The prevalence of zinc deficiency has not been adequately investigated, partly due to lack of suitable biomarkers. Based on the food balance data, it is estimated that a large section of the world population is at risk of developing zinc deficiency. The risk of deficiency is highest in populations, which consume predominantly cereal-based diets with little or no meat consumption. Severe zinc deficiency in India is rare; however, predictions based on dietary patterns indicate that mild or moderate deficiency could be widespread.

There are no Indian RDAs for zinc but suggested intake is 15.5 mg per day for an adult person. This suggested intake was based on information available in late eighties and needs to be updated. It is therefore important that RDAs for different sections of population by age and sex are scientifically estimated by the recent data and techniques.

**Zinc Deficiency in Soil**

Zinc is an important element in soil and can affect nutrient value of crops. Zinc deficiency in soil reduces agricultural productivity as also zinc content in agricultural products. Zinc deficiency is high in soils of several states in India.

**Preventive and therapeutic effects of zinc**

Zinc deficiency in children results in stunting, underweight, and increased risk of infections like diarrhea and pneumonia. Randomized controlled trials indicate that approximately one RDA (10-12 mg) supplementation reduces the number and severity of diarrheal episodes. The cost effectiveness and the therapeutic benefit for diarrhea is now accepted and zinc therapy is recommended by bodies including Indian
Academy of Pediatrics, World Health Organization and United Nations Childrens Fund. Zinc supplementation has been shown to decrease under five mortality, but this remains to be confirmed in larger trials.

Next Steps

The Seminar made the following recommendations:

Programmatic Issues

• It must be recognized that zinc is one of the essential micronutrients, which should not be considered a food contaminant. The Prevention of Food Adulteration rules need to be amended to that effect.

• Therapeutic use of zinc in treating diarrhea is well established and recommended by international bodies. Similar benefits have also been demonstrated for pneumonia. Pharmaceutical industry should take the initiative to manufacture and market suitable isolated pediatric formulations of zinc.

• There is not enough awareness about the importance of zinc in human health. Such awareness should be created among public and medical practitioners.

• Zinc deficiency in soil should be corrected through zinc application.

Research Issues

• It is urgently necessary to develop new biomarker(s) to measure human zinc status so that the extent of zinc deficiency can be directly and easily identified.

• A national survey should be undertaken to assess the prevalence of zinc deficiency in populations in different parts of the country with varied food habits so that focused attention can be given to populations, which are at high risk.

• Relevant data needs to be generated to clarify the interaction between zinc and iron.

• Food technology research should be encouraged to identify and assess the feasibility of zinc fortification of candidate foods including complementary diets. These could be followed up by human efficacy trials.

• Alternative strategies can also be followed like conventional breeding and plant genetic engineering for enhancing zinc content of edible portion of agricultural products.

Ms. Rekha Sinha,
Executive Director,
International Life Sciences Institute-India, Y-40 B, First Floor, Houz Khas, New Delhi 110 016, India.
E-mail: indiailsi@vsnl.net

Annexure - I

1. Dr Arun Kumar Aggarwal, Post Graduate Institute of Medical Education & Research, Chandigarh
2. Dr Kumudha Aruldas, Population Foundation of India, New Delhi.
3. Dr Shally Awasthi, King George Medical University, Lucknow
4. Dr Satinder Bajaj, Lady Irwin College, New Delhi.
5. Dr K C Bansal, Indian Agricultural Research Institute, New Delhi
6. Dr O Massee Bateman, United States Agency for International Development, New Delhi
7. Mr C B Benjwal, Bharat Immunologicals & Biologicals Corp Ltd, Department of Biotechnology, GOI, Bulandshahr
8. Dr Nita Bhandari, All India Institute of Medical Sciences, New Delhi
9. Mr Sanjay Kumar Bhasin, University College of Medical Sciences, Delhi
10. Dr. (Mrs) C M Bhat, Indian Agricultural Research Institute, New Delhi
11. Dr S N Bhat, Nestle India Ltd, Gurgaon
12. Mr K Bhatia, National Seeds Corporation Ltd, GOI, New Delhi
13. Dr. (Mrs) Neelam Bhatia, National Institute of Public Cooperation and Child Development (NIPCD), New Delhi
14. Dr (Mrs) S Bhatnagar, All India Institute of Medical Sciences, New Delhi
15. Dr Robert Black, John Hopkins University, Bloomberg School of Public Health, Maryland
16. Dr Saraswati Bulusu, The Micronutrient Initiative, New Delhi
17. Ms Sheena Chhabra, United States Agency for International Development, New Delhi
18. Mr Bhagirath Choudhary, ISAAA South Asia Office, New Delhi
19. Dr. Panna Choudhury, Lok Nayak Hospital, New Delhi
20. Mr Robert Clay, United States Agency for International Development, New Delhi
21. Dr Vatssla Dadhwal, All India Institute of Medical Sciences, New Delhi
22. Dr Rajib Dasgupta, Jawaharlal Nehru University, New Delhi
23. Prof A P Dubey, Maulana Azad Medical College, New Delhi
24. Dr Hemant K Gautam, Institute of Genomics and Integrative Biology, New Delhi
25. Dr Tarun Gera, S L Jain Hospital, Delhi
26. Prof (Dr) B Gupta, Safdarjung Hospital, New Delhi
27. Mrs Shashi Prabha Gupta, Department of Women and Child Development, GOI, New Delhi
28. Mrs Vipin Gujral, Food Research and Standardization Laboratory, Ghaziabad.
29. Dr R Hemlatha, National Institute of Nutrition, Hyderabad
30. Mrs Surendera Jain, Department of Women and Child Development, GOI, New Delhi
31. Mr C S Jambaladinni, Bharat Immunological and Biological Corporation Ltd., Department of Biotechnology, GOI, Bulandshahr
32. Mrs Anita Jatana, Batra Hospital, New Delhi
33. Mrs Urmila Johri, Central Government Health Services (Retd.), New Delhi
34. Dr Umesh Kapil, All India Institute of Medical Sciences, New Delhi
35. Mrs Renu Kohli, Dumex India Pvt. Ltd,
Gurgaon

36. Mr V G Krishnan, Abt Associates Inc., New Delhi

37. Dr Ashok Kumar, Bharat Immunologicals & Biologicals Corpn. Ltd, Department of Biotechnology, GOI, Bulandshahr

38. Dr Geeta T Kumar, Institute of Home Economics, New Delhi

39. Mr Mahitosh Kumar, Food Research & Standardization Laboratory, GOI, Ghaziabad.

40. Dr Neeta Kumar, Abt Associates Inc., New Delhi

41. Mr. Raj K Malik, Food & Agriculture Organization of United Nations, Rome (Retd.)

42. Ms Manju Mathew, World Vision India, New Delhi

43. Dr Sarmila Mazumder, Researcher, New Delhi

44. Dr B K Misra, Indian Agricultural Research Institute, New Delhi

45. Dr Rakesh Mittal, Indian Council of Medical Research, New Delhi

46. Prof Suneeta Mittal, All India Institute of Medical Sciences, New Delhi

47. Prof. (Dr.) Ajit Mukherjee, Indian Council of Medical Research (ICMR), New Delhi

48. Dr K V Madhavan Nair, National Institute of Nutrition, Hyderabad

49. Mr D H Pai Panandiker, ILSI - India, New Delhi

50. Dr. Chandrakant S Pandav, All India Institute of Medical Sciences, New Delhi

51. Mr S N Pandey, Ministry of Food Processing Industries, GOI, New Delhi

52. Mr Deepak Pandhi, Akzo Nobel Chemicals (I) Ltd, Thane

53. Dr Santosh Jain Passi, Institute of Home Economics, University of Delhi, New Delhi

54. Mr R R Paul, Heinz India Ltd, New Delhi

55. Dr Satya Prakash, Food Research and Standardization Laboratory, Government of India, Ghaziabad

56. Dr K V Radhakrishna, National Institute of Nutrition, Hyderabad.

57. Dr (Mrs) Reeta Rasaily, Indian Council of Medical Research, New Delhi

58. Dr C P Raut, Institute of Genomics and Integrative Biology, Delhi

59. Dr D S Rawat, Food Research and Standardisation Laboratory, GOI, Ghaziabad.

60. Dr H P S Sachdev, Maulana Azad Medical College, New Delhi

61. Dr Sudha Salhan, Safdarjung Hospital, New Delhi

62. Dr Dheeraj Shah, University College of Medical Sciences, Delhi

63. Mr Ravi Shankar, Department of Women and Child Development, GOI, New Delhi

64. Dr. (Mrs) Kanta K Sharma, Punjab Agriculture University (Retd.), Ludhiana
STATEMENT

65. Mrs Rekha Sharma, All India Institute of Medical Sciences, New Delhi
66. Mr Sanjay Kumar Sharma, Wallace Pharmaceuticals, Delhi
67. Dr D H Shete, Batra Hospital, New Delhi
68. Dr Anupa Siddhu, Lady Irwin College, New Delhi
69. Dr Jai Singh, Department of Women and Child Development, Government of India, New Delhi
70. Dr Preeti Singh, All India Institute of Medical Sciences, New Delhi
71. Mr Anand Verdhani Sinha, Abt Associates Inc., New Delhi
72. Dr Anju Sinha, Indian Council of Medical Research, New Delhi
73. Dr B Sivakumar, National Institute of Nutrition, Hyderabad
74. Dr K Srinivasan, Hindustan Lever Ltd, Bangalore
75. Mr T N Swami, Bharat Biotech International Ltd, Hyderabad
76. Dr P N Takkar, Indian National Science Academy (INSA), New Delhi
77. Dr Rajiv Tandon, MOST, New Delhi
78. Dr Sunita Taneja, Society for Applied Studies, New Delhi
79. Dr B K Tewari, Director General of Health Services, Ministry of Health, GOI, New Delhi
80. Dr Salila Thomas, Lady Irwin College, New Delhi
81. Dr N Tripathi, Integrity Nutrient Management, Ministry of Agriculture, GOI, New Delhi
82. Mr Mani Tiwari, Merck Ltd, Mumbai. ILSI-India Secretariat
83. Ms Rekha Sinha, Executive Director
84. Mr Jai Singh, Consultant