THE MICRONUTRIENT INITIATIVE
INFORMATION PAPER NO. 1

VITAMIN A DEFICIENCY:

KEY RESOURCES *in its* PREVENTION AND ELIMINATION

Compiled by
Jenny Cervinskas and Mahshid Lotfi

The Micronutrient Initiative
PO Box 8500
250 Albert Street
Ottawa Ontario
Canada
K1G 3H9

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"The persistence of vitamin A deficiency anywhere in the world is cruel, because it exposes mothers and children to great risks; it is immoral, because it ignores basic human values; and it is unacceptable, because it is preventable."

— **Abraham Horwitz**
Chairman,
1993 International Vitamin A Consultative Group Conference.

FOREWORD TO THE SECOND EDITION

Vitamin A deficiency is a public health problem in more than 75 countries and affects as many as 228 million children subclinically at a severe or moderate level. Some 3.1 million preschool age children have eye damage due to vitamin A deficiency and an estimated 250,000–500,000 preschool children go blind every year. Vitamin A deficiency is the most preventable cause of blindness worldwide. The impact of vitamin A deficiency, however, is more extensive than the ocular effects. Xerophthalmia and low vitamin A levels are associated with increased mortality and severity of morbidity from respiratory and gastrointestinal disease. Recent findings have indicated that vitamin A is a key modulator of the immune system and may play a role in preventing the development of cancer. Sufficient vitamin A stores could significantly reduce the risk of transmission of HIV from infected mothers to their babies. The virtual elimination of vitamin A deficiency and its consequences is one of the goals of the World Summit for Children for the year 2000.

There has been a dynamic evolution of the global effort to address vitamin A deficiency accelerated by the mid-decade goal set by the Joint Committee on Health Policy of the World Health Organization (WHO) and UNICEF to "ensure that at least 80% of all children under 24 months of age living in areas with inadequate vitamin A intake receive adequate vitamin A."

Ending the hidden hunger caused by deficiencies in the three micronutrients — iodine, iron, and vitamin A — is potentially the most important achievable international health goal of the decade. Although a lot of information is available about different components of vitamin A deficiency prevention and control, all of it is not in one place and cannot be easily accessed especially by those working in the field. In general, there is a need to reduce the gap between what is known and what is done.

This document has been compiled by the Micronutrient Initiative to cater to this need. It is hoped that the document will assist in endeavours to achieve and sustain the mid- and end-decade goals to eliminate the problem of vitamin A deficiency.

M.G.Venkatesh Mannar
Executive Director
The Micronutrient Initiative

PREFACE AND ACKNOWLEDGEMENTS

This document aims to provide those working to eliminate vitamin A deficiency with a listing of the latest significant publications and resources and where they can be obtained. Although those working directly in the planning or implementation of vitamin A interventions are the main audience for this document, it is expected that it would also be of value to researchers or indeed to anyone who needs to consult only the key available resources (e.g., teachers of medical, public health and nutrition students, consultants, technical officers in development assistance agencies). The scope of coverage of the resources is wide, touching on the variety of aspects related to programs dealing with the elimination and control of vitamin A deficiency. In deciding which resources to include, we tried to chose ones that are: technically sound and up-to-date, available (i.e., still in print), recent, and low-cost. Resources listed are available only in English unless otherwise indicated.

A number of people generously gave their time and lent their technical expertise to enable the preparation of this annotated resource listing. We would like to thank Don de Savigny and Janice Johnson of the Health Sciences Division of the International Development Research Centre (IDRC) for their contributions, respectively, to the sections on "Measles and vitamin A" and "Safety and vitamin A: Important emerging issues," and Kevin Sullivan of Program Against Micronutrient Malnutrition for his assistance in the preparation of the section "Assessment, monitoring and evaluation." The Manoff Group contributed to preparing the sections on "Breastfeeding," "Nutrition education and communications," "Increasing the availability of vitamin A-rich foods" and "The vitamin A content of foods." Special thanks are due to Barbara Macdonald of McGill University and to Sian FitzGerald for the preparation of numerous annotations, to Lilah Moore for her support, and to Tanya Guay of the Micronutrient Initiative for her help on an assortment of tasks. Keith West of Johns Hopkins University, Stephen Simon (formerly of the Micronutrient Initiative) and Mr Flavin of the Manoff Group also provided many useful suggestions for the structure of the overall document, for which we are thankful.

We are deeply grateful to those who provided suggestions regarding key resources to include, or else reviewed certain sections. In particular, Mr James Akre and Dr Barbara Underwood of World Health Organization, and Keith West of Johns Hopkins University could always be counted on for help and practical ideas. Others to whom we are grateful include Ms Laurie Aomari of International Vitamin A Consultative Group, staff at Helen Keller International (New York) and the Food Policy and Nutrition Division of the Food and Agricultural Organization, David Alnwick of UNICEF, Nevin Scrimshaw of the United Nations University, David Ross of the London School of Hygiene and Tropical Medicine, and Venkatesh Mannar of the Micronutrient Initiative. All were most helpful, readily offering guidance based on their extensive experience in programs and research to overcome vitamin A deficiency. Our appreciation is also extended to Alison Ball of IDRC who helped undertake literature searches on the topics covered in this document.

The efforts of Gary Bellamy in design and layout are also highly appreciated.

Jenny Cervinskas

Mahshid Lotfi

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PART ONE THE PROBLEM

1. OVERVIEW

Vitamin A deficiency is widely prevalent, particularly in the developing world. The World Health Organization (WHO) estimates that as many as 228 million children are affected subclinically at a severe or moderate level by vitamin A deficiency, and that deficiency of this micronutrient is a problem in more than 75 countries. Adequate vitamin A status is important for maintenance of good health and disease prevention. This bibliography represents a small fraction of the hundreds of articles and publications available on vitamin A that were selected to give an overview of the importance of this essential nutrient. All papers, books, and reports listed have extensive bibliographies for those wishing further information. Although some of the textbooks included in this section are relatively expensive, they have nonetheless been included because of their comprehensive coverage of many topics related to vitamin A. Information on the global distribution of vitamin A deficiency is available from the first two publications listed below.

Vitamin A is needed for vision and eye health and is now also recognized as a critical factor in child health and survival.

UN Administrative Committe on Coordination/Sub-Committee on Nutrition, 1992. **Second report on the world nutrition situation.** Volume 1, Global and regional results. Chapter 3: Micronutrients. ACC/SCN, October 1992. Available free of charge on request from developing countries from the ACC/SCN, c/o WHO, Avenue Appia, Geneva, Switzerland.

WHO, 1995. **Global prevalence of vitamin A deficiency**. MDIS Working Paper # 2. WHO/NUT/95.3. WHO, Geneva. ❑ This is the latest WHO report on the global prevalence of vitamin A deficiency as part of the Micronutrient Deficiency Information System (MDIS) Working Papers (number one was devoted to global prevalence of iodine deficiency). This 118-page report contains tables summarizing vitamin A deficiency prevalence by country in each WHO region, plus regional maps showing the severity of vitamin A deficiency in countries of that region. Also included are disaggregated tables giving prevalence of ocular signs and symptoms, sample size, age group, and date of surveys, by country. A world map shows, as of April 1995, countries categorized by the degree of public health importance of vitamin A deficiency. For information contact Barbara Underwood, Nutrition Unit, WHO (see "Organizations" for contact information).

Bauernfeind, J.C. 1983. **Vitamin A: Technology and applications.** *In* Bourne, G.H., ed., World Review of Nutrition and Dietetics (volume 41). Karger, Basel, Switzerland. pp.110-199. ❑ A comprehensive review of various topics related to vitamin A including physicochemical properties, metabolism, function, and prophylactic and therapeutic control of deficiency. Factors affecting vitamin A absorption and utilization are addressed including data from numerous animal studies. Human supplementation is also described

including a review of field study experience. A large section of the article (37 pp.) is devoted to fortification including the potential use of various carriers and industrial manufacture (see annotation in section "Food fortification").

Bauernfeind, J.C., ed. 1986. **Vitamin A deficiency and its control.** Academic Press, London. 530 pp. ❑ This text is a multifaceted collection of 19 papers by many authors addressing various aspects of vitamin A deficiency. The etiology and pathogenesis of the deficiency are described including clinical and biochemical effects and interactions with other nutrient deficiencies and diseases. Control strategies described consist of public health education, agricultural and dietary modification, and supplementation and fortification. Experiences with, and constraints to, implementation of the different interventions are reviewed. Evaluation of efficacy of intervention programs is also considered with illustrative examples from Asia and Central America. (Abstracted from annotation in Mamdani and Ross, 1988, see section on "Supplementation.")

Blonhoff Rhune, ed. 1994. **Vitamin A in health and disease.** Marcel Dekker, Inc., New York. ❑ This is a compendium that updates the vitamin A scientist on current knowledge about the absorption, metabolism, biochemistry, cellular mechanisms, functions and consequences of vitamin A deficiency, and therapeutic uses of retinoids. Contains over 2300 references.

Feachem, R.G. 1987. **Vitamin A deficiency and diarrhoea: A review of interrelationships and their implications for the control of xerophthalmia and diarrhoea.** Tropical Diseases Bulletin, 84(3), R1-R16. ❑ This insightful review explores the nature of the links between vitamin A deficiency and diarrhea. Drawing mainly on epidemiologic research, the author presents evidence of the complex interrelations between these two conditions. The literature is critically assessed and issues of confounding and causality are addressed. Policy implications for the prevention and control of both diarrhea and vitamin A deficiency are presented.

Fifteenth Marabou Symposium. 1994. **Vitamin A: From molecular biology to public health.** Nutrition Reviews, 52(2, Part II), S1-S94. ❑ Eleven papers that cover the breadth of modern advances related to the roles of vitamin A in embryonic development, transport and metabolism, receptors, epithelial differentiation, cancer, child mortality, and vision from a June 1993 symposium in Sweden.

Humphrey, J.H. and West, K.P. 1991. **Vitamin A deficiency: Role in childhood infection and mortality.** *In* Bendich, A. and Butterworth, Jr., C.E., ed., Micronutrients in health and in disease prevention. Marcel Dekker, Inc., New York. pp. 307-329. ❑ An in-depth treatment of the relation between vitamin A deficiency and infection is found in this document. Manifestations of the deficiency are described in detail including ocular effects, biochemical alterations, and epithelial changes. Cell-mediated, humoral, and nonspecific immune system effects are reviewed. Links between vitamin A deficiency and respiratory infection, diarrhea, and mortality are explored including the impacts of supplementation.

Prevention and control of vitamin A deficiency. 1989. Food and Nutrition Bulletin, 11(3), 1-42. ❑ Seven papers from a 1988 workshop that addressed research methods and priorities related to vitamin A deficiency and interventions in developing countries are provided. The consequences of deficiency in terms of cellular mechanisms, immunocompetence, and host resistance to infection are discussed.

Sommer, A. 1982. **Nutritional blindness: xerophthalmia and keratomalacia.** Oxford University Press, New York. ❑ A classic, authoritative clinical, and epidemiologic treatise on xerophthalmia, integrating research and historical studies up to the early 1980s. Contains 521 references.

Sommer, A. and West, Jr., K.P. 1995. **Vitamin A deficiency: Health, survival and vision.** Oxford University Press, New York. (In press.) ❑ Provides a timely, critical update and analysis of the extent and severity of vitamin A deficiency, its epidemiology and public health importance in terms of blindness, mortality, morbidity and growth consequences, and basic strategies for prevention.

Tomkins, A. and Watson, F. 1989. **Malnutrition and infection: A review.** UN Administrative Committee on Coordination/Sub-Committee on Nutrition (ACC/SCN) State-of-the-Art Series. Nutrition Policy Discussion Paper No. 5. Food Policy and Nutrition Division, Food and Agriculture Organization, Rome. 136 pp. ❑ This paper provides a review of the interactions between various nutrient deficiencies and infection. Effects of vitamin A deficiency on morbidity and mortality are discussed including impacts on cellular immunity and lysozyme activity. An excellent, annotated bibliography is provided including 28 citations directly related to vitamin A.

West, K.P. 1991. **Dietary vitamin A deficiency: Effects on growth, infection, and mortality.** Food and Nutrition Bulletin, 13(2), 119-131. ❑ An extensive review of both animal and human studies that details the effects of vitamin A deficiency on growth, morbidity and mortality. Aberrations in attained growth and growth velocity are addressed. A significant portion of the article is devoted to the role of breastfeeding, weaning, and food preparation practices in supplying an adequate dietary intake of vitamin A.

2. SPECIAL CONCERNS

2.1 VITAMIN A DEFICIENCY AND RISK OF CHILDHOOD MORTALITY AND MORBIDITY

Evidence that has accumulated over the last years shows that improving vitamin A status of children in communities with vitamin A deficiency as a public health problem exerts a measurable positive impact on child mortality, morbidity and chances for survival. This effect has also been demonstrated in infants in the second 6 months of their lives. Considering the variations in the severity of vitamin A deficiency in individuals and populations, and other physiological, and environmental factors to which they are exposed, it is only natural to see variations in the extent of response in different studies reported. The following citations are some of the most recent reports on vitamin A and mortality and morbidity.

Any intervention that proves effective in improving vitamin A status in deficient populations will on average reduce mortality by 23% in infants and children between the ages of 6 months and 5 years.
— Beaton et al. 1993.

ACC/SCN. 1994. **Controlling vitamin A deficiency.** ACC/SCN State-of-the-Art Series, Nutrition Policy Discussion Paper No. 14. A report based on the ACC/SCN Consultative Group Meeting of Strategies for the Control of Vitamin A Deficiency, 28-30 July 1993. The meeting was held at the Micronutrient Initiative, Ottawa, Canada (See section 4 "Strategies for the prevention and elimination of VAD" for a full annotation of the report.) ❑ In Annex 2 the age-specific benefits of vitamin A deficiency control are discussed and a table is presented that estimates the absolute mortality-reducing effect for two age groups, 6-11 months and 12-59 months. The conclusion is that a maximum of 1.2 million preschool lives could have been saved in 1989 if vitamin A interventions had been in place in the 23 countries defined by WHO as of October 1988 as harbouring the greatest risk of vitamin A deficiency in the world.

Beaton, G.H., Martorell, R., Aronson, K.J., Edmonston, B., McCabe, G. Ross, A.C. and Harvey, B. 1993. **Effectiveness of vitamin A supplementation in the control of young child morbidity and mortality in developing countries.** ACC/SCN State-of-the-Art Series. Nutrition Policy Discussion Paper No. 13. c/o World Health Organization, Geneva. 120 pp. ❑ This excellent, clearly written, detailed technical document, which captures almost total experience in major controlled studies, marks a milestone in the understanding of the effect of vitamin A on mortality and morbidity. The document has already stimulated much attention to the implications for policy- and population-level control programs when improving vitamin A status in a population.

This report presents the findings of a review commissioned by the Canadian International Development Agency of the major controlled studies of the effect of vitamin A supplementation on young child morbidity and mortality in developing countries (10 mortality trials and 17 morbidity trials). The report provides conclusive evidence that any intervention that proves effective in improving vitamin A status in deficient populations will on average reduce mortality by 23% in infants and children between the ages of 6 months and 5 years. The mortality effect is pronounced for diarrheal disease, is demonstrable for deaths attributed to measles, and may be absent or very small for deaths attributed to respiratory disease. This conclusion is based on a meta-analysis of 10 controlled mortality trials in populations where xerophthalmia is present that were identified and reviewed by an eight-member team led by Dr Beaton and Dr Martorell as co-chairs of the project (only eight of the trials could be examined in full detail and be incorporated in the overall summary of effects). The review of the 17 studies providing information about morbidity outcomes (including morbidity results from the 10 mortality trials) concludes

that there is very little evidence to suggest that vitamin A status affects the prevalence of general morbidity in young children. There is a suggestion that improvement in vitamin A status can be expected to reduce the chance of infectious diseases progressing to their severe forms.

This document contains chapters on epidemiology of vitamin A deficiency, vitamin A and biological functions, controlled trials relating vitamin A and young child morbidity, controlled trials relating vitamin A and young child mortality, discussions and conclusions. A 42-page technical annex presents the theoretical basis of the strategy for analysis of the mortality data, all computer programs used, and the input data sets. Extensive set of references.

Beaton, G.H.. 1993. **Effectiveness of vitamin A supplementation in the control of young child morbidity and mortality in developing countries.** ACC/SCN News - Focus On Micronutrients, 9, 17-23. ❑ This paper presents the main findings, and their interpretations, of the review of controlled studies on the effect of vitamin A supplementation on young child morbidity and mortality conducted by Beaton and colleagues (reported in full in the previous entry). This paper is fitting for those readers who want just the summary and do not wish to delve into the details of the studies and the technical aspects of the meta-analysis.

Bellagio Brief. 1992. **Vitamin A deficiency and childhood mortality.** ❑ This is a concise summary of the conclusions and underlying scientific rationale of the Bellagio meeting on vitamin A deficiency. 8 pages with references. English, French and Spanish. Available free from Helen Keller International (HKI), 90 Washington St, New York, NY, USA 10006.

Helen Keller International. 1993. **Bellagio meeting on vitamin A deficiency and childhood mortality.** Proceedings of "Public health significance of vitamin A deficiency and its control," 3-7 February 1992, Bellagio Study and Conference Centre of the Rockefeller Foundation. Sponsored by the Charles A. Dana Foundation. Helen Keller International, New York. 73 pp. ❑ This document comprises of a number of brief papers covering a wide spectrum of topics related to the role of vitamin A status in child morbidity and mortality. These papers resulted from a meeting of international scientists, health officials, and policymakers convened by Helen Keller International and is a highly readable source of key information on vitamin A and the consequences of its deficiency. The report includes a meta-analysis from the then-published Asian mortality trials that indicated that improved vitamin A nutriture may result in a 34% reduction in child mortality. Recommendations for a plan of action against vitamin A deficiency are presented. Available from Helen Keller International, 90 Washington St, New York, NY, USA 10006 for US $14.50.

Humphrey, J.H., West, Jr., K.P., and Sommer, A. 1992. **Vitamin A deficiency and attributable mortality among under-5-year-olds.** Bulletin of the World Health Organization, 70(2), 225-232. ❑ Estimates have been calculated of the potential impact of improved vitamin A status in reducing mortality among children under five. Reference data used to produce estimates were the WHO country classification of vitamin A deficiency, UNICEF estimates of mortality rates, and results of vitamin A supplementation trials in reducing mortality. Global estimates indicate that between 1.3 and 2.5 million deaths could be averted each year by improving vitamin A status.

Those interested in reading some of the original articles describing the studies examined in the meta-analyses are referred to the following articles:

Daulaire, N.M.P., et. al. 1992. **Childhood mortality after a high dose of vitamin A in a high risk population.** British Medical Journal, 304, 207-210.

Fawzi, W.W., et. al. 1993. **Vitamin A supplementation and child mortality: A meta-analysis.** JJournal of the American Medical Association, 269, 898-903.

Fawzi, W.W., et. al. 1994. **Dietary vitamin A intake and the risk of mortality among children.** American Journal of Clinical Nutrition, 59, 401-408.

Ghana, VAST Study Team. 1993. **Vitamin A supplementation in northern Ghana: Effects on clinic attendances, hospital admissions, and child mortality.** Lancet, 342, 7-12.

Herrera, M.G., et. al. 1992. **Vitamin A supplementation and child survival.** Lancet, 340, 267-271.

Humphrey, J.H., et. al. 1992. **Vitamin A deficiency and attributable mortality among under 5 year olds.** Bulletin WHO, 70, 225-232.

Muhilal, et. al. 1988. **Vitamin A fortified monosodium glutamate and vitamin A status: A controlled field trial.** American Journal of Clinical Nutrition, 48, 1265-1270.

Muhilal, et al. 1988. **Vitamin A fortified monosodium glutamate and health, growth and survival of children: A controlled field trial.** American Journal of Clinical Nutrition, 48, 1271-1276.

Rahmathullah, L., et. al. 1990. **Reduced mortality among children in Southern India receiving a small weekly dose of vitamin A.** New England Journal of Medicine, 323, 929-935.

Sommer, A., et. al. 1983 **Increased mortality in children with mild vitamin A deficiency.** Lancet, 2, 585-588.

Sommer, A., et. al. 1986. **Aceh Study Group. Impact of vitamin A supplementation on childhood mortality: A randomized controlled community trial.** Lancet, 1, 1169-1173.

Vijayaraghavan, K., et. al.1990. **Effect of massive dose vitamin A on morbidity and mortality in Indian children**. Lancet, 2, 1342-1345.

West, K.P. Jr., et. al. 1991. **Efficacy of vitamin A in reducing preschool child mortality in Nepal.** Lancet, 338, 67-71.

2.2 VITAMIN A DEFICIENCY AND MEASLES: A SPECIAL CONCERN

Measles rapidly reduces blood levels of vitamin A (hyporetinemia) and frequently precipitates xerophthalmia. Vitamin A therapy in the case management of measles improves outcome in terms of reduced measles mortality and reduced incidence and severity of measles morbidity, even in situations where prior vitamin A status is adequate. WHO and UNICEF recommend routine high-dose vitamin A therapy for children with measles in areas where vitamin A deficiency has been designated a public health problem.

To date, there are no published studies investigating whether administration of live attenuated measles vaccine also induces transient hyporetinemia, and there are no published studies to determine the optimal dose and schedule for vitamin A therapy in case management of measles. In areas where vitamin A deficiency exists, UNICEF and WHO recommend 100,000 IU of vitamin A at the time of measles vaccination. No side effects have been reported in any of the above clinical trials suggesting that the currently recommended dose of vitamin A is safe. Moreover, the currently recommended vitamin A therapy has important implications for financially constrained health services in developing countries. At approximately US $0.20 per dose to achieve significant reductions in hospitalization and costs in terms of mortality and long-term morbidity, vitamin A therapy for the management of measles is highly cost-effective .

The following resources include selected key works that have elucidated the role of vitamin A therapy in the case management of measles presented in the order of their publication. A review of the policy and implementation implications of this role is also given. The likely audience for this annotated bibliography would include front-line clinical practitioners who manage measles cases, district health management teams, immunization program managers, nutrition specialists, infectious disease specialists, ophthalmologists, clinical and primary health care policymakers, and researchers interested in further optimization of measles case management. Most of these resources will be found in medical libraries.

Measles, one of the six major childhood diseases, is a striking example of how damaging effects of VAD can lead to both blindness and increased mortality.
— Ending Hidden Hunger Conference, 1991

Ellison, J.B. 1932. **Intensive vitamin A therapy in measles.** British Medical Journal, 2, 708-711. ❑ This classic work was the first clinical trial to evaluate the effect of high- dose vitamin A therapy on measles morbidity and mortality. In the UK, in addition to routine case management, 300 measles cases received a total dose of 140,000 to 40,000 IU (20,000 IU of vitamin A orally, daily, for 1-3 weeks) and were compared with a further 300 measles cases who received no vitamin A therapy. The relative risk of measles death in the vitamin A supplemented group compared with the unsupplemented group was 0.46 (95% CI of RR 0.26-0.81; $P = 0.018$). Mortality reduction was more apparent with regard to deaths from pneumonia. Even though measles immunization was not introduced in the North until the early 1970s, no further trials of vitamin A for measles case management were conducted in either North or South until 55 years after this important study.

Barclay, A.J.G., Foster, A., and Sommer, A. 1987. **Vitamin A supplements and mortality related to measles: A randomized clinical trial.** British Medical Journal, 294, 294-296. ❑ This hospital-based trial in rural Tanzania was a randomized, controlled, open trial of high-dose vitamin A in a population where malnutrition and vitamin A deficiency were common. One-hundred and eighty children with a mean age of 30 months admitted with measles were randomly allocated to receive routine treatment alone or routine treatment with additional vitamin A in a total dose of 400,000 IU (200,000 IU orally immediately and again the next day). Baseline characteristics of the two groups were virtually identical for age, severity of measles, and vitamin A and nutritional status. Some 91% had serum vitamin A concentrations less than 0.56 µmol/L. Six (7%) of the 88

supplemented children died, whereas 12 (13%) of the 92 unsupplemented controls died (RR 0.52; 95% CI 0.21-1.33; $P = 0.25$). Although this difference was not statistically significant, the difference in mortality was significant for children aged less than 2 years (one death of 46 supplemented children versus seven deaths out of 42 controls; RR 0.15; $P = 0.03$) and for the cases complicated by croup or laryngotracheobronchitis.

This important work drew attention to the effect of measles in further compromising vitamin A status in populations with marginal vitamin A stores and the importance of vitamin A therapy in reducing measles mortality in such populations. Acting on this evidence, WHO recommended routine vitamin A therapy for all children with measles in regions where vitamin A deficiency was a recognized problem (200,000 IU vitamin A orally to children over 12 months of age on day 1, and if eye signs of vitamin A deficiency are present, the initial dose repeated on day 2, and again 1-4 weeks later; 100,000 IU for children under 12 months). WHO further suggested that vitamin A supplements be given to all children diagnosed with measles in countries where the case fatality rate of measles is 1% or higher.

Hussey, G.D. and Klein, M. 1990. **A randomized controlled trial of vitamin A in children with severe measles.** New England Journal of Medicine, 323, 160-164. This trial was the first double-blind, randomized, controlled trial of high- dose vitamin A therapy for case management of severe measles. The study involved 189 children of a median age of 10 months, hospitalized in South Africa because of measles complicated by pneumonia, diarrhea, or croup. Children were assigned to receive routine therapy plus either 400,000 IU vitamin A or a placebo given orally within 5 days of the onset of rash. Unlike Tanzania, clinical vitamin A deficiency was rare in the source population. Nevertheless, 92% of children had serum retinol levels less than 0.7 µmol/L at admission. Compared with the placebo group, children supplemented with vitamin A recovered more rapidly from pneumonia (mean 6.3 vs 12.4 days; $P < 0.001$) and diarrhea (mean 5.6 vs 8.5 days; $P < 0.001$); had less croup (13 vs 27 cases; $P = 0.03$), and spent fewer days in hospital (mean, 10.6 vs 14.8 days; $P = 0.01$). Twelve children died, of these 10 were in the placebo group (RR 0.21; 95% CI 0.05-0.94). The overall risk for an adverse outcome in children treated with vitamin A was half that in the control group (RR 0.51; 95% CI 0.35-0.74).

This work confirmed that treatment with vitamin A reduces measles morbidity and mortality regardless of whether children had prior nutritional deficiency.

Coutsoudis, A., Broughton, M. and Coovadia, H.M. 1991. **Vitamin A supplementation reduces measles morbidity in young African children: A randomized, placebo-controlled, double-blind trial.** American Journal of Clinical Nutrition, 54, 890-895. ❑ In this hospital-based, randomized, placebo-controlled, double-blind trial, 60 children under 2 years of age (mean age 11 months) with complicated measles were randomly assigned to vitamin A therapy (WHO recommended dose) or placebo groups on admission. Again, hyporetinemia was prevalent on admission with 90% of cases having serum retinol <0.70 µmol/L. There was a significant reduction in the duration of pneumonia in the treated group ($P < 0.05$) and complete clinical recovery within 8 days in 96% of the treatment group versus 65% of the control group ($P = 0.002$). There was one death in the placebo group, none in the treatment group. This study supported the WHO recommendations for vitamin A supplementation during measles.

Kavishe, F.P. 1994. **Vitamin A in the management of measles: Policy, implementation and monitoring for impact.** Research and program experience in the control of vitamin A deficiency in the west African subregion: Toward development of policy and strategies. Report of a meeting held in Accra, Ghana, 9-11 August 1993. USAID and Micronutrient Initiative, Washington DC. ❑ This recent, thoughtful review of vitamin A in the management of measles concludes that there is no longer any debate on whether to improve vitamin A status of children with measles or who are at risk of developing measles. "What is now needed are national policies and programs which offer the best possibility for such children to be protected against vitamin A deficiency and measles, and

receive therapeutic vitamin A when they get measles. Breast-feeding, supplementation, dietary diversification, measles immunization accompanied by information, education and communications, should be part of national policies and programmes. Monitoring for performance and impact should be integrated into existing health and nutrition information systems. Above all, vitamin A policies and programmes should not be formulated in isolation. They should be linked to policies for overall health and nutrition improvement. The constant association between vitamin A deficiency and poverty means that the elimination of vitamin A deficiency should be integral to poverty alleviation policies and programs".

2.3 VITAMIN A DEFICIENCY AND HIV/AIDS INFECTION

Vitamin A is an essential micronutrient for normal immune function, and may be of clinical importance in patients with AIDS. Vitamin A deficiency is common among HIV infected adults, and is associated with more rapid progression of HIV to AIDS and with decreased survival during HIV infection. It is estimated that 38-108 million people will be infected with HIV by the year 2000, among them 13 million women. Children generally acquire HIV infection through vertical mother-to-child transmission; when HIV-infected women become pregnant, their children have a 10–40% chance of acquiring the infection. To date one million children have already been infected. Although further studies are required to test whether vitamin A supplementation has the potential to alter clinical outcome of HIV infection or mother-to-child transmission of HIV, recent findings suggest that vitamin A supplementation may be an economic and relatively simple intervention in the treatment and prevention of AIDS. Further investigations are still necessary to formulate a relevant international public health policy.

Vitamin A deficiency independent of protein energy malnutrition, increases the risk of dying from HIV infection by almost 4 times. — Semba et al. 1995

Baum, M., Cassetti, L., Bonvehi, P., Shor-Posner, G., Lu, Y., and Sauberlich, H. 1994. **Inadequate dietary intake and altered nutrition status in early HIV-1 infection.** Nutrition, 10(1), 16–20. ❑ Recent studies have indicated that multiple nutritional abnormalities occur relatively early in the course of HIV infection. The authors wished to determine the level of intake of micronutrients consistent with normal plasma nutrient levels in HIV-1 seropositive and seronegative homosexual men. To do this, they measured nutrition status in relation to food consumption and nutrient supplementation. The mean level of total intake for all nutrients was significantly higher in HIV+ men. To achieve normal plasma nutrient values, the HIV+ men appeared to require intake in multiples of the recommended dietary allowances for vitamins A, E, B6, and B12 and zinc. For these men, a relatively high proportion of biochemical deficiency was associated with consumption of vitamin B6 and zinc at the recommended dietary allowance level. Because there was little evidence of deficiency with elevated intake, the authors concluded that an effective program of nutritional supplementation may be beneficial in maintaining adequate plasma nutrient levels.

Beach, R.S., Mantero-Atienza, E., Shor-Posner, G., Javier, J.J., Szapocznid, J., Morgan, R., Sauberlich, H.E., Cornwell, P.E., Eisdorfer, C., and Baum, M.K. 1992. **Specific nutrient abnormalities in asymptomatic HIV-1 infection.** AIDS, 6, 701–108. ❑ The objective of this study was to determine whether specific nutrient abnormalities occur in early stages of HIV-1 infection, thereby preceding the marked wasting and malnutrition that accompany later stages of the infection. The nutritional status of 100 homosexual HIV-infected asymptomatic men was assessed using biochemical measurement, dietary history, anthropometry, and clinical examination; results were compared with a control group of HIV-negative homosexual men. Despite few differences in mean blood levels of specific nutrients, prevalence of specific nutrient abnormalities was widespread among HIV-infected subjects, compared with noninfected controls. Overtly and marginally low blood levels of vitamins A, E, riboflavin, B6, and B12, together with copper and zinc, were documented in HIV+ subjects. With the exception of riboflavin, zinc, and copper, a similar prevalence of abnormalities among controls was not observed. The results provide evidence that specific nutrient abnormalities occur with relative frequency in asymptomatic HIV -infection, and suggest that these abnormalities may contribute to HIV disease progression.

Semba, R.D., Caiaffa, W.T., Graham, N.M.H., Cohn, S., and Vlahov, D. 1995. **Vitamin A deficiency and wasting as predictors of mortality in human immunodeficiency virus-infected injection drug users.** Journal of Infectious Diseases, 171, 1196–

1202. ❑ Although studies have shown that HIV and AIDS are accompanied by a large number of specific nutritional abnormalities, little is known about nutritional factors that may contribute to an increased risk of mortality during HIV infection. The purpose of this study was to assess vitamin A deficiency and wasting as predictors of mortality from infectious diseases in HIV-infected adults. Subjects were from a large prospective cohort of HIV-infected injection drug users. Fifty adult subjects who died from AIDS and infections were matched with 235 controls who survived. Vitamin A deficiency occurred in 50% and wasting occurred in 38% of patients in the last visit before death, marking this population group as high risk for vitamin A deficiency and wasting. HIV-infected subjects with vitamin A deficiency had a four-fold increase in risk of death; those with wasting had an eight-fold greater chance of dying. The study corroborates the observation that vitamin A deficiency, independent of protein–energy malnutrition, increases the risk of dying. Although it is not known whether correcting vitamin A deficiency by supplementation during HIV infection will increase survival, this study suggests that nutritional supplementation and treatment of wasting are strategies that may increase survival of HIV-infected persons.

Controlling vitamin A deficiency may significantly reduce the number of HIV infected children born to infected mothers.

Semba, R.D., Miotti, P.G., Chiphangwi, J.D., Saah, A.J., Canner, J.K., Dallabetta, G.A., and Hoover, D.R. 1994. **Maternal vitamin A deficiency and mother-to-child transmission of HIV-1**. Lancet, 343, 1593–1597. ❑ This important study was the first to show that vitamin A deficiency is associated with increased mother-to-child transmission of HIV. The researchers conducted a study of vitamin A status in pregnant women as a risk factor for mother-to-child transmission of HIV in Malawi. Mother-to-child transmission of HIV was estimated at about 35%, taking into account excess perinatal and infant mortality. Nearly 60% of women had serum vitamin A levels indicative of deficiency (<1.05 μmol/L). Serum vitamin A levels were significantly lower in women with HIV-infected infants (0.86 μmol/L) than in those whose infants were uninfected (1.07 μmol/L). When women were stratified by their vitamin A status, women with the lowest serum vitamin A values were nearly four and a half times more likely to transmit HIV infection to their infants than were women with the highest levels of vitamin A. There was also an observed temporal relationship between low vitamin A in the second and third trimesters of pregnancy and increased mother-to-child transmission; this is important because it suggests that improving vitamin A status during pregnancy may lower vertical transmission rates of HIV. Although further studies are required to test whether vitamin A supplementation has the potential to alter clinical outcome of mother-to-child transmission of HIV, the results of this study are highly significant because they suggest that nutritional intervention, a simple and low-cost preventive strategy, may have the potential to significantly reduce the risk of HIV transmission to children worldwide.

Semba, R.D. 1994. **Vitamin A, immunity, and infection.** Clinical Infectious Diseases, 19, 489–499. ❑ This recent review summarizes major advances that have been made in the last decade regarding the biological mechanism of vitamin A and of its role in enhancing immunity and resistance to infection. The focus is primarily on data from studies of humans, and includes recent findings related to the importance of vitamin A in HIV infection. Recent findings have shown that vitamin A deficiency is relatively common during infection with HIV and AIDS, and those with vitamin A deficiency are at four- to six-fold greater risk of dying than those not deficient. In addition, there is a temporal relationship between survival time for HIV-infected adults and vitamin A deficiency. However, although vitamin A deficiency is common during HIV infection and is associated with an increased risk of death, it is not yet known whether vitamin A supplementation will alter clinical outcome. The author leaves open the question of whether vitamin A holds promise for the treatment of HIV infection as well as other major diseases characterized by immunosuppression.

Semba, R.D., Graham, N.M.H., Caiaffa, W.T., Margolick, J.B., Clement, L., and Vlahov, D. 1993. **Increased mortality associated with vitamin A deficiency during human immunodeficiency virus type 1 infection**. Archives of Internal Medicine, 153,

2149–2154. ❑ The purpose of this investigation was to determine whether vitamin A levels are relevant to clinical outcome during HIV infection in adults. Vitamin A levels, complete blood cell counts, and serologic markers for liver disease were measured. 179 individuals with and without HIV-1 infection were randomly chosen from a cohort of more than 2000 intravenous drug users participating in a study with longitudinal follow-up to determine survival. Mean follow-up time was 22.8 months; 15 subjects died during follow-up. The results demonstrated a high prevalence (>15%) of vitamin A deficiency among HIV+ individuals, and that vitamin A deficiency is associated with increased mortality during HIV infection. However, the author suggests that further research is required to establish the direction of the association before considering the use of vitamin A supplementation during HIV infection.

Tang, A.M., Graham, N.M.H., Kirby, A.J., McCall, L.D., Willett, W.C., and Saah, A.J. 1993. **Dietary micronutrient intake and risk of progression to acquired immunodeficiency syndrome (AIDS) in human immunodeficiency virus type 1 (HIV-1)-infected homosexual men**. American Journal of Epidemiology, 138(11), 937–951. ❑ This was the first reported epidemiologic study to examine the relation between nutrient intake and the progression of HIV infection to AIDS. A total of 281 HIV-1 seropositive homosexual or bisexual men were seen semiannually since 1984. Nutrient intake was measured using a food frequency questionnaire. Levels of daily micronutrient intake at baseline were examined in relation to subsequent progression to AIDS during a median follow-up period of 6.8 years. The highest levels of total intake of vitamins C and B1 and niacin were associated with a significantly decreased progression rate to AIDS. The relation between total vitamin A intake and progression to AIDS appeared to be U-shaped; the lowest and highest quartiles of intake had the least effect, whereas the middle two quartiles were associated with significantly slower progression to AIDS. Increased intake of zinc was monotonically and significantly associated with an increased risk of progression to AIDS. In a final multinutrient model, vitamin A, niacin, and zinc remained significantly associated with progression to AIDS, whereas vitamin C was only marginally significant. The results suggest a rationale for dietary interventions in the early stages of HIV infection.

PART TWO THE SOLUTION

3. NATIONAL AND INTERNATIONAL COMMITMENT AND ACTION

Governments around the world and other concerned parties have pledged their commitment to the elimination of vitamin A deficiency by the end of the century. At national levels, governments have prepared plans of action for nutrition. For those countries where vitamin A deficiency is a public health problem, appropriate actions and programs need to be implemented and sustained.

Three major international forums that have set goals for health, nutrition, and development in the 1990s have been held over the past 5 years. These forums — the World Summit for Children, the Conference on Ending Hidden Hunger, and the International Conference on Nutrition (ICN)— as well as the World Health Assembly and the UNICEF Executive Board have all adopted the following goal related to vitamin A deficiency to be achieved by the year 2000:

> ***"...the virtual elimination of vitamin A deficiency and its consequences, including blindness."***

A description of each of the three international forums is described below.

Ending Hidden Hunger: A Policy Conference on Micronutrient Malnutrition, October 1991. WHO, UNICEF, et al. 1991. Proceedings of "Ending hidden hunger." A policy conference on micronutrient malnutrition. 10-12 October 1991, Montreal, Canada. Sponsored by WHO, UNICEF, World Bank, CIDA, USAID, FAO, UNDP. 250 pp. ❑ Proceedings are reported of an international conference designed to review national programs addressing micronutrient malnutrition. Over 300 participants from 60 countries attended the meeting. The proceedings form an excellent review of key issues associated with the elimination of micronutrient deficiencies with a special focus on supplementation, fortification, and dietary diversification. Strategies pursued in various countries including Indonesia, Tanzania, and Ecuador are detailed. The global situation with respect to vitamin A, iron, and iodine deficiencies is analyzed in three papers. Several authors have included copies of visual aids that may be useful for teaching and communication purposes. Limited copies available from the MI Secretariat. (For address, see "Organizations.")

FAO. 1993. **Developing national plans of action for nutrition: guidelines.** FAO, Rome, Italy. 31 pp. ❑ A useful companion to the World Declaration and Plan of Action for Nutrition, the main objective of this document is to provide guidelines to assist countries to prepare national plans of action based on ICN goals and objectives using a broad-

Vitamin A policies and programs should not be formulated in isolation. They should be linked to policies for overall health and nutrition improvement. — Festo Kavishe 1993

based and intersectoral approach. Section II addresses briefly how to set objectives and define policies, factors to consider in determining preliminary priorities and strategies, and presents a sample outline of a national plan. Section III outlines some of the main issues that should be considered in connection with each of the nine themes identified as action/ strategy areas by the ICN. Overall, this document can be a useful tool to encourage a thorough assessment of the national context and issues raised when developing a national plan of action for nutrition and should be read by all involved in preparing a plan. Order from Food Policy and Nutrition Division, FAO, Rome. (For address, see "Organizations.")

International Conference on Nutrition, December 1992 ❑ At the International Conference on Nutrition (ICN) held in December 1992 in Rome, 159 countries unanimously adopted a World Declaration and Plan of Action for Nutrition that emphasizes the determination to eliminate hunger and reduce all forms of malnutrition. The ICN Plan of Action provides useful guidelines for governments, acting in collaboration with interested parties, to achieve the objectives of the World Declaration on Nutrition. It provides a technical framework for developing national plans of action and contains recommendations on policies, programs, and activities to improve nutrition. Strategy and action areas described in the Plan of Action include these nine themes: incorporating nutrition objectives into development programs and policies; improving household food security; protecting consumers through improved food quality and safety; preventing and managing infectious diseases; caring for the socioeconomically deprived and nutritionally vulnerable; promoting breastfeeding; preventing specific micronutrient deficiencies; promoting appropriate diets and healthy lifestyles; and assessing, analyzing, and monitoring nutrition situations. The strategies chosen may vary from country to country, and the responsibilities for action rest with a variety of agents at the national and international levels.

Every program manager and person working actively in programs to alleviate vitamin A deficiency should be thoroughly familiar with this document. For a copy of the World Declaration and Plan of Action for Nutrition contact FAO or WHO. The document is available in Arabic, Chinese, English, French, Russian, and Spanish.

The World Summit for Children, September 1990 ❑ Seventy-one heads of state and government and 88 other senior officials, mostly at the ministerial level, met at the United Nations in New York on 29-30 September 1990 to undertake a joint commitment to protect the rights of the child and give every child a better future. A Declaration on the Survival, Protection and Development of Children and a Plan of Action for implementing the declaration in the 1990s was adopted at the World Summit for Children (WSC). Major goals for the survival, development, and protection of children in the 1990s were formulated, as well as more detailed goals related to nutrition, child health, women's health and education, water and sanitation, basic education, and children in difficult circumstances.

First Call for Children, a 75-page booklet that contains the text of the Declaration and Plan of Action and the Convention on the Rights of the Child, is available in English, French, and Spanish for US $1.00 per copy. The booklet includes an appendix that lists the goals for children and development in the 1990s and a list of the countries that were represented at the WSC. For further information contact UNICEF, UNICEF House, H-9F, 3 United Nations Plaza, New York New York, 10017 USA. Tel: (212) 326-7072, fax:(212) 326-7768.

4. STRATEGIES FOR THE PREVENTION AND ELIMINATION OF VITAMIN A DEFICIENCY

A combination of interventions is usually needed to prevent and eliminate vitamin A deficiency. Measures to combat vitamin A deficiency are generally grouped into the following: dietary modification (e.g., improving food availability through the production and preservation of vitamin A-rich foods, and increasing food consumption), breastfeeding protection and promotion, food fortification, supplementation, and pertinent public health measures such as primary health care and safe drinking water. The following selections provide an overview of these strategies. For key resources related to each of them (public health measures have received relatively less attention), see the next sections of this document.

To prevent and eliminate vitamin A deficiency a combination of interventions is usually needed.

ACC/SCN. January 1994. **Controlling vitamin A deficiency.** A report based on the ACC/SCN Consultative Group Meeting on "Strategies for the control of vitamin A deficiency" held 28-30 July 1993, Ottawa, Canada. ACC/SCN State-of-the-Art Series. ACC/SCN Nutrition Policy Discussion Paper No. 14. The Lavenham Press: Lavenham, Suffolk, England. 81 pp. ❑ What are the lessons learned from past experience in different types of vitamin A interventions and what guidance can be given to policymakers and program planners? These questions are central to the intensive efforts made by the ACC/SCN throughout 1993 that resulted in this publication. The publication is an expanded and modified version of a widely circulated background paper prepared by the ACC/SCN that reviewed 46 evaluations of trials and large-scale vitamin A deficiency programs (including both published and unpublished studies). Although five major intervention types were reviewed (vitamin A supplementation, dietary modification, food fortification, public health services, and breastfeeding promotion), 25 of the 46 evaluations were supplementation projects. The paper served as background to the Consultative Group meeting, and the output of the Consultative Group meeting (i.e., discussion summaries, reports of working groups, and recommendations on strategies for the control of vitamin A deficiency) was then incorporated into the background paper to result in this publication.

Structure of the document: summary; five chapters (introduction, problem identification, comparative evaluation of different interventions, some considerations in the choice of strategy, concluding statement on strategies for the control of vitamin A deficiency); five annexes. In Chapter 3 the roles of each intervention type (including how it is used and when) and its pros and cons are evaluated. In Chapter 4, 11 factors to consider in the choice of strategy and for deciding on the mix and sequencing of vitamin A control interventions and a table summarizing examples of approaches in 11 nations to control vitamin A deficiency are presented. Chapter 5 provides the 12-point concluding statement on strategies for the control of vitamin A deficiency that was agreed upon by participants at the Consultative Group meeting. (Reproduced in full in the Annex of this document.) Annex 3 presents the references for the 46 vitamin A interventions that were reviewed. Annex 4 lists 187 references that are additional to the references given for the 46 vitamin A interventions noted in Annex 3. Annex 5 is a 10-page table that presents summary information on the interventions reviewed by type of strategy. This publication should be read (and probably, reread, as it is densely written) by all those involved in planning vitamin A interventions. It should also be of value to academics and others interested in vitamin A research and interventions. Available from the ACC/SCN Secretariat. (For address, see "Organizations.")

Eastman, S.J. 1988. **Vitamin A deficiency and xerophthalmia.** Recent findings and some program implications. Assignment Children, UNICEF, New York. 84 pp. ❑ A booklet that succinctly describes the main issues related to vitamin A deficiency and its control. Key pieces of information regarding the physiological role of vitamin A, precipi-

tating factors resulting in deficiency, and effects on child morbidity and mortality are conveyed. Numerous strategies for the control of vitamin A deficiency are reviewed including supplementation, food production, fortification, and nutrition education, with the author calling for an integrated approach within existing health and nutrition programs. Available from UNICEF, New York. (For address, see "Organizations".)

Food and Agriculture Organization (FAO). 1992. **The vitamin A programme.** Fourth summary progress report 1991-92. ❑ FAO's contribution to the 10-year UN action program to control and prevent vitamin A deficiency, xerophthalmia, and nutritional blindness. For more information contact: The Director, Food Policy and Nutrition Division, FAO, Viale Terme di Caracalla, 00100 Rome, Italy.

International Conference on Nutrition (ICN). 1992. **Preventing specific micronutrient deficiencies.** Major Issues for Nutrition Strategies, ICN Theme paper No.6. Food and Agriculture Organization and World Health Organization, Rome. 33 pp. ❑ This theme paper was prepared as a background document for the International Conference on Nutrition. The magnitude, causes, and consequences of iodine, iron, and vitamin A deficiencies are concisely reported. The bulk of the document is dedicated to the advantages, disadvantages and implementation of various interventions for prevention and control. Action strategies at local, national, and international levels are outlined.

International Vitamin A Consultative Group. 1993. **Toward comprehensive programs to reduce vitamin A deficiency.** A report of the XV International Vitamin A Consultative Group meeting held 8-12 March 1993, Arusha, Tanzania. 161 pp. ❑ This well-edited and attractive report will be of interest to policymakers, scientists, and program implementers who want current information about vitamin A-related research and program experiences. The report summarizes the latest, and largest, IVACG meeting in which representatives from 51 countries were among the 294 participants assembled to address the theme "Toward Comprehensive Programs to Reduce Vitamin A Deficiency." A 29-page summary coherently summarizes the wealth of information that was presented during the 5-day program that included 132 oral, poster, and video presentations. Lists 145 references, generally relating to papers prepared for the meeting, abstracts of which make up 72 pages of the report, and an 18-page participants list. Available from IVACG. (For address, see "Organizations.")

Johns, T., et al. 1992. **Factors influencing vitamin A intake and programs to improve vitamin A status.** Food and Nutrition Bulletin, 14(1), 20-33. ❑ Drawing on literature from a variety of disciplines, factors influencing the dietary intake of vitamin A are described. Sources of vitamin A are placed into seven broad categories including green vegetables, plant oils, fish, and milk products. Determinants of intake of the different food groups are detailed for various cultural groups and include dietary beliefs, seasonal availability, and economic factors. Programs to increase dietary intake of vitamin A include promotion of home gardening, nutrition education, and social marketing.

Levin, H.M., et al. 1993. **Micronutrient deficiency disorders.** In Jamison, D.T., et al., Disease control priorities in developing countries. Oxford University Press, New York, NY, USA. pp. 421-451. ❑ This chapter provides a concise review of vitamin A, iron, and iodine deficiencies in terms of their magnitude, distribution, and prevention with almost 200 references. The severity of vitamin A deficiency and vitamin A intervention activities (fortification and supplementation) are provided by country. A review of studies on the cost-effectiveness and cost–benefit of interventions is provided.

Phillips, M. 1994. **The costs and effectiveness of three vitamin A interventions in Guatemala**. Working Paper No. 2, Nutrition Cost Effectiveness Studies. USAID, LAC Health and Nutrition Sustainability, University Research Corporation/International Science and Technology Institute. Washington, DC, May 1994. 62 pp. including tables and annexes. ❑ This report presents the results of an analysis of the cost-effectiveness of three

approaches to providing vitamin A in Guatemala: fortification of sugar for domestic consumption; oral supplementation in young children and women of reproductive age in high prevalence areas; and, promotion of home gardens and vegetable production and consumption targeted at a region with widespread chronic dietary vitamin A deficiency. The results of this analysis showed cost per high-risk person achieving adequate vitamin A to be US $0.98 for fortification; US $1.86 for capsule distribution; and US $2.71 to US $4.16 for vegetable gardens. It is concluded that fortification can be an economically attractive option for meeting vitamin A requirements of much of the Guatemalan population if vitamin A levels in sugar are reasonably maintained. Measures to design a more efficient monitoring system to ensure stability of vitamin A in sugar are recommended. (For contact address, see USAID under the "Organizations" section.)

Research and programme experience in the control of vitamin A deficiency in the West African subregion: Toward development of policies and strategies. Report of a meeting held 9-11 August 1993, Accra, Ghana. 112 pp. ❑ This report summarizes the plenary presentations and discussions as well as the conclusions presented by the working groups on policy and programmatic issues. These proceedings from the first West African conference on vitamin A deficiency should be of value to those involved with policy formulation and program planning and implementation in West Africa. Issues related to program development and implementation for the prevention and control of vitamin A deficiency in the subregion and issues related to policy formulation for micronutrient deficiency control were the major focus of the meeting's presentations and working groups. Selected key presentations have been reproduced in full text in an appendix. Some 76 participants representing 13 countries in the region, over 20 observers from Ghana, and 24 other international participants attended the meeting. Report available in French and English. Limited copies may be available from the Office of Health and Nutrition, USAID. (For address, see "Organizations.")

Storms, D. and Quinley, J. 1989. **A field guide for adding vitamin A interventions to PVO child survival projects.** Recommendations for child survival project managers. Johns Hopkins University, Baltimore. 39 pp. ❑ This guide book was produced by a special task force on the vitamin A components of private voluntary organizations' (PVO) child survival projects. Practical, field-based recommendations are provided to aid in the assessment of need, design, operation, and evaluation of vitamin A interventions. Interventions described include nutrition education, agricultural projects, supplementation strategies, and fortification. Available from Johns Hopkins University, Institute for International Programs, 103 East Mt Royal Ave, Baltimore, MD, USA, 21202.

Wasantwisut, E. and Attig, G. 1995. **Empowering vitamin A foods: A food-based process for Asia and the Pacific region**. Institute of Nutrition, Mahidol University, Salaya, Thailand. 125 pp. ❑ The focus of this publication is on improving the effectiveness of dietary diversification strategies by recognizing the need not only to increase the production and consumption of vitamin A rich foods by vulnerable groups, but also by addressing the need for quality. Increasing the production and consumption of vitamin A rich foods will not always translate into improved vitamin A status if the foods that are eaten are prepared in such a way that the vitamin A-carotene content is destroyed. The work now being pursued by the South and East Asia Nutrition-cum-Action Network and FAO (the co-publishers of this publication) is to develop a process for "empowering" vitamin A rich foods to release the fullest potential when they are consumed. This entails a series of stages beginning with the selection and identification of good vitamin A food sources; determining what storage, cooking, and preservation practices should be promoted to maintain vitamin A activity; and devising ways to help community members learn to remember what foods should be used, and how, throughout the year. The chapters that comprise this book demonstrate the food empowerment process. The experiences of countries in the Asia and Pacific region in developing food-based programs in line with the above process are documented. Overall, the book is divided into nine key issues (e.g., attention to availability and production, identification of vitamin A-rich foods and recom-

mended preparation and preservation methods, the promotion of vitamin A-rich foods), each of which is illustrated by one or two country cases.

This publication is a valuable and practical source of information and ideas for people who are interested in developing and improving food-based programs to eliminate vitamin A deficiency. The information is presented in an attractive, easy-to-read format, with colour plates and many lists of references. The book also contains information on the vitamin A content of foods found in the region, which can be incorporated into databases, and provides recipes using both plant and animal sources of vitamin A. For ordering information contact Dr Emorn Wasantwisut, Associate Director for International Affairs, Institute of Nutrition, Mahidol University, Salaya, Phutthamonthon, Nakhon Pathom 73170, Thailand. Tel: (662) 441-9035-9, 441-9740, Fax: (662) 441-9344.

World Bank 1994. **Enriching lives: Overcoming vitamin and mineral malnutrition in developing countries.** A World Bank Publication — Development in Practice. 73 pp., also available in French. Available from the World Bank Bookstore, PO Box 7247-8619, Philadelphia, Pennylvania, USA, 19170-8619; Tel: (202) 473-1155, Fax: (202)522-2627. More information from the Population, Health and Nutrition Department of the World Bank, 1818 H Street, Washington, DC, 20433 USA . Tel: (202) 473-3452, Fax: (202) 522-3234. ❑ This document deals with programs to combat vitamin A, iron, and iodine deficiencies.

5. SPECIFIC INTERVENTIONS TO COMBAT VITAMIN A DEFICIENCY

5.1 PROMOTION OF BREASTFEEDING

Breast milk is virtually the only source of vitamin A the first few months for many infants and often continues to be one of the most important sources through age 2. Without breast milk, newborns can maintain optimal vitamin A nutriture for no more than a few weeks. Although vitamin A concentrations in human milk are dependent on the mother's vitamin A status, vitamin A deficiency is rare among breastfed infants, even in parts of the world where vitamin A deficiency is endemic. Promotion of exclusive breastfeeding for 4-6 months and continued breastfeeding with complementary foods thereafter should form part of any dietary intervention to improve vitamin A status (partially adapted from Newman, 1993).

In all circumstances the promotion and protection of breastfeeding is a fundamental aspect of preventing vitamin A deficiency.

Chetley, A. and Amin, S. 1993. **Investigating breastfeeding: Questions, ideas and issues to explore.** ❑ This 27-page document is arranged in 14 chapters and includes sample questionnaires. This is part of a global program by the World Alliance for Breastfeeding Action to document the state of breastfeeding in as many countries as possible. The aim is to help those investigating and promoting breastfeeding to ask the right questions, find the key answers, develop appropriate policies, and advocatenecessary change in practices. Copies at US $6.00 including airmail from: World Alliance for Breastfeeding Action, PO Box 1200, 10850 Penang, Malaysia. Tel: (60 4) 658-4816, Fax: (60 4) 657-2655. Special rates for bulk orders.

Cunningham, A.S. et al., 1992. **Breastfeeding, growth and illness: An annotated bibliography.** 157 pp. ❑ This book lists the details of where to find over 500 articles related to breastfeeding, growth, and illness. The purpose of the bibliography is to provide information on recent research work and to give health workers an overview of the subject of breastfeeding. Further information available from UNICEF, Programme Publications, 3 UN Plaza, New York, NY 10017, USA.

Green, C.P 1989. **Media promotion of breastfeeding: A decade of experience.** AED/USAID. ❑ This publication reviews breastfeeding promotion efforts undertaken in over 25 countries. The document is aimed at planners who wish to learn from past successes. It explores the conceptual issues underlying how breastfeeding is promoted, reviews the role of the popular media, provides guidelines on how to apply communication design principles to breastfeeding, and makes practical recommendations for future programs. Free copies are available to the individuals from developing countries, and at US $10 per copy to those from developed countries. Available through the Academy for Educational Development, 1255 23rd Street, NW, Washington, DC 20005. Tel: (202) 862-1900, Fax: (202) 862-1947.

Griffiths, M. and Anderson, M.A. 1993. **Guide for country assessment of breastfeeding practices and promotion.** 59 pp. ❑ Field-tested in seven countries, this guide for national breastfeeding assessments is designed to help a team of three to four people learn the current breastfeeding situation, factors supportive of, or obstacles to, breastfeeding, and the gaps requiring further investigation or immediate, direct actions. Each of the eight major subdivisions is introduced by an objectives statement, assessment topics, and suggested sources of information and methods. A score sheet is included to generate an overall score for the country and may permit a rough comparison of breastfeeding situations among countries. Annexes include detailed checklists on marketing of infant formula, knowledge, attitudes, and practices of health and nutrition staff, and

training content, as well as other supportive technical information. Suitable for health and nutrition planners/evaluators and assessment team members. Available from the MotherCare Project, John Snow Inc., 1616 N Fort Myer Drive, 11th floor, Arlington, VA 22209, USA. Tel: (703) 528-7474, Fax: (703) 528-7480. English only. Cost: US $15.64 for the guide alone; US $33.00 for the guide plus assessment summaries for Bolivia, the Dominican Republic, Uganda, and Ghana.

Huffman, S.L. and Martin, L.H. 1994. **First feeding: Optimal feeding of infants and toddlers.** Nutrition Research, 14, 127-159. 85 references. ❑ The authors argue that under 2 years of age morbidity levels will remain high unless child survival and development programs address the existing constraints and target at-risk populations through programs that emphasize exclusive breastfeeding during the first 6 months of life, improved complementary foods, and better feeding practices.

Koniz-Booher, P., et al., ed. 1992. **Q/A on infant feeding: A panel of experts takes a new look.** 44 pp. ❑ This document reports the opinions and consensus of a multidisciplinary expert panel on issues related to breastfeeding. It discusses four breastfeeding-related issues including the relationship between breastfeeding and maternal nutritional status, growth of exclusively breastfed infants, breastfeeding supplementation, and the timing of introducing complementary foods. Questions and answers follow the introduction of each issue along with recommendations for additional research. Intended primarily for policymakers and program planners. Available from the Nutrition Communications Project, Academy for Educational Development, 1255 23rd St, NW, Washington, DC 20037, USA. Tel: (202) 884-8000, Fax: (202) 884-8400. English, French, and Spanish. Cost: US $8.00 for individuals in industrialized countries, free for individuals in developing countries.

Newman, V. 1993. **Vitamin A and breastfeeding: A comparison of data from developed and developing countries.** 119 pp., summary, 30 pp. ❑ This book presents findings from a review of literature on vitamin A and breastfeeding published during the last 40 years indicating that colostrum and breast milk are important sources of vitamin A for infants, particularly in the first weeks of life. It discusses the vitamin A status of lactating women, the effect of her vitamin A status on breast milk content, and the adequacy of breast milk as a vitamin A source for an infant. Concludes that breast milk is a major source of vitamin A, even for mothers in developing countries with lower levels of vitamin A in their milk. A 30-page summary of the report is available. Available from Wellstart International, 4062 First Avenue, San Diego, CA 92103, USA. Tel: (619) 295-5192, Fax: (619) 294-7787. English only. Cost: Limited copies of the report and/or a summary are available free to health care professionals from developing countries from: Clearinghouse in Infant Feeding and Maternal Health, American Public Health Association, 1015 15th Street, NW, Washington, DC 20005, USA. Tel: (202) 789-5600, Fax: (202) 789-5661. US $10.00 for individuals from industrialized countries (prepaid with check made out to Wellstart).

Newman, V. 1994. **Vitamin A and breastfeeding: A comparison of data from developed and developing countries.** In: Food and Nutrition Bulletin, 15(2). 161-176. ❑ This report assesses the vitamin A status of lactating women, its effect on the vitamin A content of human milk, and the adequacy of human milk as a source of vitamin A comparing data from developing and developed countries. This paper is a summary of a report published in 1993 for Wellstart International, San Diego, California, USA (see above). A limited number of copies of the full text with all appendices are available in English without charge to interested health care professionals. Abbreviated summaries are also available in Spanish and Russian. Requests from developing countries should be sent to the American Public Health Association, Clearinghouse on Infant Feeding and Maternal Nutrition (see above). Requests from developed countries should be addressed to Wellstart International, 4062 First Avenue, San Diego, CA, 92103 USA. Tel: (619) 295-5192, Fax: (619) 294-7787.

Palmer, G. 1993. **Who helps health professionals with breastfeeding?** Midwives Chronicle and Nursing Notes, 106, 147-156. ❑ Copies from American Public Health Association, Clearinghouse on Infant Feeding and Nutrition, 1015 15th Street NW, Washington, DC 20005, USA.

Perez-Escamilla, R. et al. January 1994. **Infant feeding policies in maternity wards and their effects on breastfeeding success: An analytical overview.** American Journal of Public Health, 84(1), 89-97. ❑ The review is restricted to articles on the relationship between maternity ward practices and lactation success published in English or Spanish between 1951 and 1991. With the purpose of examining the plausibility of a causal relationship between maternity ward practices and lactation success, studies included in this review involved randomized trials or quasi-experimental designs. 80 references.

Saadeh, R.J., ed., with Labbok, M.H., et. al. 1993. **Breast-feeding. The technical basis for recommendations for action.** WHO/NUT/MCH/93.1. 119 pp. ❑ This book provides up-to-date technical information for strategic planning. Primarily intended for policymakers and program planners, it provides the technical background and recommendations on breastfeeding-related topics including health care practices, lactation management training, information, education and communications, and global prevalence and trends. Available from the World Health Organization, Distribution and Sales, 1211 Geneva, 27, Switzerland. Tel: (4122) 791-2111. English only. Currently available on request from the Nutrition Unit (Ext. 3315); will be sold by WHO Distribution and Sales.

WHO. 1991. **Indicators for assessing breastfeeding practices.** Report of an informal meeting 11-12 June 1991. WHO/CDD/SER/91.14. WHO, Geneva, Switzerland. 14 pp. and 3 annexes. ❑ This report summarizes the discussion and consensus reached on breastfeeding indicators derived from household survey data. The main purpose was to produce a common set of easy-to-measure and interpret, and operationally useful indicators to assess the breastfeeding practices and evaluate the progress of promotional programs. Annexes include sample questions on breastfeeding indicators for use in surveys, a summary list of key breastfeeding indicators, and a list of participants at the meeting. Available from the Division of Diarrhoeal and Acute Respiratory Disease Control, World Health Organization, 20 Avenue Appia, CH-1211 Geneva 27, Switzerland.

WHO/UNICEF. 1990. **Innocenti declaration on the protection, promotion and support of breastfeeding.** Adopted by the participants at the WHO/UNICEF policymakers' meeting on "Breastfeeding in the 1990s: A global initiative," held at the Spedale degli Innocenti, Florence, Italy, on 30 July -1 August 1990. Available from UNICEF. (For address, see "Organizations.")

5.2 NUTRITION EDUCATION AND COMMUNICATIONS

Nutrition education is an essential element in any strategy to reduce vitamin A deficiency: this includes promoting increased consumption of vitamin A-rich foods, suggesting new preparation techniques or food combinations, motivating and teaching people ways of growing or preserving nutritious foods locally, motivating acceptance of vitamin A capsules, and promoting purchase and use of vitamin A-fortified foods. Effective nutrition education is based on a clear understanding of the learner's perspective and tailored to the local situation, combining mass media and effective interpersonal communications as appropriate; it encompasses both centrally planned activities and local, community initiatives. The communications component of vitamin A or other development programs encompasses nutrition education aimed at behaviour-change among mothers and families, advocacy with policymakers and program support communications to strengthen services and counselling.

Information, education, and communications are key components in any program to reduce vitamin A deficiency.

Achterberg, C. 1992. **Effective nutrition communication for behaviour change programs.** 24 pp. ❑ This book, intended primarily for individuals and groups who are designing and implementing nutrition communication projects in developing countries, summarizes eight country case studies in nutrition communication for behaviour change. It highlights program success and lessons learned. It synthesizes findings, theories, methods, and conclusions from the Sixth International Conference of the International Nutrition Planners Forum at Unesco Headquarters in 1991. Available in English, French, and Spanish from the ILSI Research Foundation, 1126 Sixteenth Street, NW, Washington, DC, 20036, USA. Tel: (202) 659-0074, Fax: (202) 659-3617. Cost: US $3.50 for professionals in industrialized countries; single copies are free to professionals in developing countries.

Favin, M. and Griffiths, M. n.d. **Social marketing of micronutrients in developing countries.** ❑ This book sensitizes program planners to the potential contributions of social marketing in any approach (food-based, supplementation, or fortification) to controlling micronutrient deficiency and summarizes program experiences and lessons learned to date. Suitable for planners of micronutrient programs and communications and marketing specialists, this book discusses how a social marketing (consumer) perspective can help planners make more effective decisions concerning products or behaviours promoted, the market, the delivery strategy, and the communications strategy. Describes lessons learned from iodine, iron, and vitamin A interventions concerning the role of communications in advocacy, program support, and supporting health-promoting behaviours. Summarizes lessons for micronutrient programs from social marketing experiences in weaning, oral rehydration therapy, immunization, family planning, and water supply and sanitation. Available in English only from The Manoff Group, 2001 S Street, NW, Suite 501, Washington, DC 20009, USA.

Hurtado, E., Senez de Tejada, E., and de Valverde, C. 1994. **El diseño de actividades contra la deficiencia de la vitamina A en Guatemala** *(The design of activities to combat vitamin A deficiency in Guatemala).* 57 pp. ❑ This book teaches the social marketing process for developing a communications strategy and materials to promote increased consumption of vitamin A-rich foods by describing the experience of Helen Keller International, the International Eye Foundation, and other NGOs in Guatemala. It is suitable for qualitative researchers and planners and managers of vitamin A and other nutrition education programs in Spanish-speaking countries. It describes the methods (in-depth interviews, observations, food recalls, household trials) employed to study beliefs and practices regarding consumption of vitamin A-rich foods among children under three and pregnant and lactating mothers, the research findings, and the resulting strategy and materials. Includes research instruments and photographs of materials. Descriptive,

instructional. Available in Spanish only from Helen Keller International, 90 Washington Street, New York, NY 10006, USA. Tel: (212) 943-0890, Fax: (212) 943-1220. Cost: US $10.00.

International Vitamin A Consultative Group Communications Task Force. 1992. **Nutrition communications in vitamin A programs: A resource book.** 124 pp. ❑ This book presents field experience from communications activities in support of reducing vitamin A deficiency. It summarizes basic issues in planning, developing, and implementing nutrition communication activities; a selection of creative materials, including radio scripts; and thorough descriptions of eight projects. Numerous colour photos, charts, boxes, etc. Suitable for program planners and program managers and communications/ social marketing specialists. Available in English only from IVACG Secretariat, ILSI Research Foundation, 1126 16th Street, NW, Washington, DC, 20036, USA . Tel: (202) 659-9024, Fax: (202) 659-3617. Cost: Free to representatives in developing countries; US $3.50 (check to ILSI Research Foundation) for others.

Smitasiri, S. et. al., 1993. **Social marketing of vitamin A rich foods in Thailand: A model nutrition communication for behavior change process.** Institute of Nutrition, Mahidol University. ❑ This book highlights valuable lessons learned over the course of a project on social marketing of vitamin A rich foods from 1988 to 1991. It presents a case study on how nutrition communication and its principles can be applied within a participatory action project aimed at alleviating vitamin A deficiency. It is written simply and presented in a user-friendly way for a wide variety of users. Includes 27 references. This publication is available free of charge (except for postage and handling cost of US $8 per copy) from Paiwan Tantivatanasathain, Division of Communication and Behavioral Science, Institute of Nutrition, Mahidol University, Salaya, Phutthammmonthon, Nakhon Pathom 73170, Thailand. Tel: (662) 441 9035-9, Fax: (662) 441 9344.

Vella, J. and Uccellani, V. 1993. **Learning to listen to mothers: A trainer's manual to strengthen communication skills for nutrition and growth promotion.** Academy for Educational Development, Nutrition Communication Project, Washington, DC ❑ This manual —field tested in Bolivia, Honduras, India, Indonesia, and Mali— emphasizes that growth monitoring programs should strengthen two-way communication skills based on participatory principles for training community health workers. Single copies of this document are provided free of charge to people from Africa, Asia, and Latin America. For others the charge is US $4.00 per copy. Write to Academy for Educational Development, Nutrition Communication Project, 1255, 23rd Street, Washington, DC 20037, USA.

5.3 PRODUCTION, PRESERVATION, AND PROCESSING OF VITAMIN A-RICH FOODS

Sufficient vitamin A-rich foods are simply not available in some communities, particularly at certain times of the year. In these situations, programs must either rely on supplementation or fortification or they can help people increase the availability of these foods, most commonly through home gardening and/or food preservation, as well as teach and promote appropriate consumption.

In other situations, vitamin A-rich foods may be available in the community but not be consumed in sufficient quantities by some families for economic or cultural reasons, or they may be available in the family but not be consumed by young children or pregnant or lactating women. In such circumstances, program planners must decide, ideally based on qualitative research, including trials, how feasible it is to overcome the barriers to appropriate consumption. They then must decide whether the intervention program should increase availability of vitamin A-rich foods or increase consumption of currently available foods.

We recognize that this section is not well-rounded, as it does not provide many references that deal with topics that may affect food production and availability, such as agricultural policy, and pricing and marketing strategies.

Food production, availability and access, and food preparation and conservation practices — factors that can all affect what is actually eaten.

African Training and Research Centre for Women (ATRCW). 1983. **Traditional palm oil processing: Women's role and the application of appropriate technology.** ❑ This book provides an excellent overview of the problems faced by women not only in traditional palm oil processing, but also with the introduction of any new technology. The study examines the role of women in the traditional palm oil industry and the introduction of new technologies in three countries (Sierra Leone, Côte d'Ivoire, and Cameroon) concluding that any serious approach to the development of the food industry in Africa would have to take account of the crucial role of women. The discussion provides guidelines related to traditional palm oil processes as well as the introduction of improved technologies for women at the household level and at the level of small-scale industry. Available free of charge from ATRCW, UN Economic Commission for Africa, PO Box 3001, Addis Ababa, Ethiopia.

Brownrigg, L. 1985. **Home gardening in international development: What the literature shows.** The League for International Food Education, Washington, DC 330 pp. ❑ Addresses horticultural production systems in diverse ecologies throughout the world, including economic and nutritional considerations. Detailed case studies of gardening projects in Nigeria, Chile, and Mauritania, plus descriptions of other international gardening projects, are provided. Includes an extensive annotated bibliography of reports on gardening projects and horticultural resources, up to 1984. Although not a recent book, this publication remains a valuable resource for program planners and researchers interested in the theory and practice of home and community gardening. The publication is out-of-print however, and might only be found in a well-stocked library.

Choo Yeung 1994. **Palm oil carotenoids.** Food and Nutrition Bulletin, 15 (2), 130-137. ❑ Current refining processes to deodorize red palm oil retain no carotenoids in the final product. This paper reports on methods developed to prepare carotenoids-rich palm oil and remove odoriferous materials as well as free fatty acids. In this way, more than 80% of the carotenoids originally present in the crude palm oil are retained. The deodorized and deacidified red palm oil produced in this way is a more widely acceptable source of vitamin A. Reprints of this and other articles related to red palm oil in this edition of Food and Nutrition Bulletin are available without charge from the Malaysian

Palm Oil Promotion Council, 1st floor, Bangunan Getah Asli, 148 Jalan Ampang, 50450 Kuala Lumpur, Malaysia. Tel: (603) 248-1075, Fax: (603) 242-2935.

Cleveland, D. and Soleri, D. 1991. **Food and dryland gardens. An ecological, nutritional and social approach to small-scale household food production.** Centre for People, Food and Environment, Tucson. 387 pp. ❑ This document is a guide to the development and management of a garden. Aimed at fieldworkers, extension agents, students, project workers, and program planners, details on garden management are discussed ranging from water supply to plant propagation. Related topics are covered such as how to make appropriate weaning foods for young children. The user is prompted to consider social and environmental impacts of gardens. The guide is highly practical with clear illustrations accompanied by concise instructions. Available from the Centre for People, Food and Environment, 344 South Third Ave, Tucson, AZ 85701, USA. Tel: (602) 624-5379, Fax: same. US $27.50 for industrialized countries, $19.20 for developing countries.

FAO. 1991. **Nutrient rich foods as a solution to micronutrient deficiency: An FAO policy statement.** 11 pp. Annexed to the FAO Vitamin A program report 1991-92 See section 4, "Strategies for prevention and elimination of VAD."

FAO and ILSI. 1995. **Food-based approaches for solving micronutrient deficiencies. A manual for policy makers and programme planners.** International Life Sciences Institute (ILSI) and Food and Agriculture Organization (FAO) of the United Nations. 152 pages. (In press) ❑ This manual outlines all food based approaches including increasing the production and consumption of micronutrient-rich foods, increasing micronutrient levels in commonly eaten foods through plant breeding, food fortification, marketing, promotion, and designing micronutrient strategies, as well as monitoring, surveillance, and evalution of such programmes. Contact: ILSI, 1126 16th Street, NW Suite 100, Washington, DC 20036, USA. Tel: (202) 659-0789, Fax: (202) 659-8654.

Linehan, M., et. al. 1993. **Solar drying for vitamin A.** A publication of the VITAL Project, Office of Nutrition, USAID. 48 pp. ❑ This clear, easy-to-read manual serves as a reference guide or a training tool on solar drying of fruits and vegetables, including detailed instructions on the construction and use of a solar dryer. Construction of a simple, appropriate box is taught to dry foods speedily and safely while maintaining maximum vitamin content. Summary pages for easy duplication and distribution at community presentations are provided. This document would be particularly useful for community members, extension agents, health care workers, and nutritionists, especially in areas where vitamin A-rich foods are seasonal. Available from the OMNI Project, John Snow, Inc., 11th Floor, 1616 N Ft. Meyer Drive, Arlington, VA 22209. Tel: (703) 528-7474, Fax: (703) 528-7480. Cost to be determined.

Peduzzi, C.S. 1990. **Home and community gardens assessment program implementation experience: The tip of the iceberg.** VITAL Report No. TA-2. VITAL, Arlington. 45 pp. ❑ Geared to planners of vitamin A projects, this report summarizes lessons learned in home garden projects, highlighting potential pitfalls and how to avoid them. One appendix describes several individual projects. Available from the OMNI Project, John Snow, Inc., 11th Floor, 1616 N Fort Meyer Drive, Arlington, VA 22209, USA . Tel: (703) 528-7474, Fax: (703) 528-7480. Cost to be determined.

Rukmini, C. 1994. **Red palm oil to combat vitamin A deficiency in developing countries.** Food and Nutrition Bulletin, 15(2), 126-129. ❑ Red palm oil is the richest natural source of beta-carotene, a precursor of vitamin A, in addition to providing energy density to the diet. This report summarizes some aspects of health and nutritional effects of red palm oil and the results of a comprehensive safety evaluation which was carried out by the Indian Council of Medical Research at the National Institute of Nutrition. The purpose

of this work was to recommend the use of the oil in supplementary feeding programs. Based on the results obtained, it was recommended that "developing countries should have no hesitation in creating strategies to increase the use of red palm oil in combatting vitamin A deficiency." Free copies of this paper are available from the Malyasian Palm Oil Promotion Council at the address given above (see Choo Yeung 1994).

Soleri, D., et. al. 1991. **Vitamin A nutrition and gardens bibliography.** Prepared by the University of Arizona under a subcontract agreement with VITAL (Task No. 702). VITAL Report No. IN-1. VITAL, Arlington, USA. 65 pp. ❑ This document provides detailed annotations and comments on the literature on gardens and nutrition published since 1984 and includes several indexes. Available from the OMNI Project, John Snow, Inc., 1616 N Fort Myer Drive, 11th Floor, Arlington, VA 22209, USA Tel: (703) 528-7474, Fax: (703) 528-7480. Cost to be determined.

Soleri, D., et. al. 1991. **Gardens and vitamin A: A review of recent literature.** Prepared by the University of Arizona under a subcontract agreement with VITAL (Task No. 702). VITAL Report No. IN-2. VITAL, Arlington, USA. 32 pp. ❑ This review summarizes findings of literature on "development approaches to gardens, issues related to targeting and evaluation, indigenous sources of provitamin A, food processing and nutritional value, food intake and nutritional status, garden nutrient yields, the impact of gardens on consumption and income, and factors that affect garden impact" (p. 3). Available from the OMNI Project, John Snow, Inc., 1616 N Fort Myer Drive, 11th Floor, Arlington, VA 22209, USA . Tel: (703) 528-7474, Fax: (703) 528-7480. Cost to be determined.

Talukder, A., Islam, N., Klemm, R., and Bloem, M. 1993. **Home gardening in South Asia: The complete handbook.** Helen Keller International, Dhaka, Bangladesh. 12 references. 109 pp. ❑ This book details project experiences and lessons learned while highlighting the issues involved in making a home gardening and social marketing/ nutrition communication program successful. Detailed illustrations and step-by-step instructions are presented on garden management, including such topics as fertilizer management, pests and diseases, and seed production. Much of this book is applicable globally. The book would be of interest to fieldworkers and program managers. Available from Helen Keller International/Bangladesh, PO Box 6066 Gulshan, Dhaka - 1212, Bangladesh, Tel: 880-2-816156, Fax: 813310. US $12.00 for industrialized countries, US $8.00 for developing countries, plus US $10.00 postage or US $7.50 book rate.

Wasantwisut, E. and Attig, G. 1995. **Empowering vitamin A foods: A food-based process for Asia and the Pacific region.** Institute of Nutrition, Mahidol University, Salaya, Thailand. See section 4, "Strategies for the prevention and elimination of vitamin A deficiency" for a full description of this informative publication.

5.4 SUPPLEMENTATION

Supplementation can be an effective intervention for the improvement of vitamin A status in deficient populations. However, supplementation should be progressively phased out as soon as micronutrient-rich food-based strategies enable adequate consumption of vitamin A. Key papers that provide guidelines for the use of supplements, and major reviews of this strategy, are provided below. The first entries are related to specific guidelines for supplementation, while the last three are comprehensive reviews of the literature up to the late 1980s.

Supplementation can be an effective intervention for the improvement of vitamin A status among deficient populations.

IVACG (International Vitamin A Consultative Group) and DeMaeyer, E.M. 1988. **Guidelines for the use of vitamin A in emergency and relief operations.** IVACG Secretariat, Washington. 5 pp. ❑ A summary of IVACG guidelines for the use of vitamin A in relief situations is presented in this short pamphlet. The recommendations are broad and meant to be adapted given local constraints. The focus of the guidelines is on supplementation, and schedules are given for both prevention and treatment of vitamin A deficiency among infants, children, and pregnant or lactating women. Available from the IVACG Secretariat. (For address, see "Organizations".)

Nieburg, P., et. al. 1988. **Vitamin A supplementation for refugees and famine victims.** Bulletin of the World Health Organization, 66(6), 689-697. ❑ This article was one of the main sources for IVACG's guidelines cited earlier and provides additional technical background. Information is provided on specific risk factors for vitamin A deficiency under famine and refugee conditions, mechanisms for reaching target groups, procurement and administration of supplements, and possible adverse effects. This review shows that relief rations are frequently inadequate in vitamin A content, and measures to remedy this are proposed.

WHO, Expanded Programme on Immunization. 1993. **How to give vitamin A supplements.** WHO/EPI/TRAM/93.6. ❑ A practical guidebook on how to give vitamin A supplements. Contains schedules for giving vitamin A supplements for treatment and prevention, as recommended by WHO in 1993. A task force is currently being formed to revise the guidelines. It is expected that the dosages will remain unchanged, but some of the ancillary information will be made more explicit. Available from the Nutrition Unit or the Global Vaccine Program (formerly called EPI Program), WHO, Geneva. (For address, see "Organizations.")

WHO, Nutrition Unit. 1993. **Using immunization contacts to combat vitamin A deficiency.** Report of an informal consultation, 30 June - 1 July 1992. WHO, Nutrition Unit, Expanded Program on Immunization and the International Vitamin A Consultative Group (IVACG), Geneva. 17 pp. ❑ This report reflects the consensus reached during an informal consultation of experts regarding the use of immunization contacts in the combat of vitamin A deficiency. These contacts may be very effective as each year 80% of the world's children are reached. WHO is awaiting research results before formulating official policy on the issue of vitamin A supplementation for infants below 6 months of age. (At present, WHO does not recommend vitamin A supplementation for infants under the age of 6 months unless there is clinical evidence of deficiency.) Current supplementation recommendations, however, starting at over 6 months and to mothers within 4 weeks of delivery are confirmed (e.g., in areas where vitamin A deficiency exists UNICEF and WHO recommend supplementing with vitamin A at the time of measles vaccination, and routine high-dose therapy for children with measles in areas where vitamin A deficiency has been designated a public health problem).

WHO/UNICEF/IVACG Task Force. 1988. **Vitamin A supplements: A guide to their use in the treatment and prevention of vitamin A deficiency and xerophthalmia.**

World Health Organization, Geneva. 24 pp. ❑ Prepared by a WHO/UNICEF/IVACG task force, this small booklet provides practical guidelines for the administration of vitamin A supplements. These guidelines could be used by health policymakers, health administrators and program managers in the development of programs for the prevention and control of vitamin A deficiency, with adaptations as judged appropriate to local conditions. Schedules have been devised for both the treatment and the prevention of vitamin A deficiency in children and women. Information on dosage and frequency of dose are provided. Special notes are included regarding the effects of infection on absorption of supplements in children and the safety of supplementation during pregnancy. Operational issues are covered comprehensively, including procurement and storage of supplies, costs, channels of distribution, and evaluation. A WHO/UNICEF/IVACG task force is currently being established to revise this booklet. Available in English and French from IVACG, or from WHO for CHF 5.60. (For address, see "Organizations.")

Mamdani, M. and Ross, D.A. 1988. **Vitamin A supplementation and child survival: Magic bullet or false hope? A review and selected annotated bibliography.** Evaluation and Planning Centre for Health Care (EPC), Publication No. 19. London School of Hygiene and Tropical Medicine, London. 131 pp. ❑ This extensive review of literature provides a significant amount of background information on vitamin A deficiency including its epidemiology and consequences. Strategies discussed for prevention and control include periodic, high-dose supplementation, fortification, and dietary modification. Advantages and disadvantages of the various strategies are discussed in terms of potential costs, feasibility, and effectiveness. The section devoted to supplementation is relatively short (7 pages) and reviews recommended doses and demonstrated effectiveness of national programs in India, Bangladesh, and Indonesia. This document provides a comprehensive list of references (185) including 42 annotations. Available from EPC, London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, UK US $15.00.

Mamdani, M. and Ross, D.A. 1989. **Vitamin A supplementation and child survival: Magic bullet or false hope?** Health Policy and Planning, 4(4), 273-294. ❑ This journal article provides the same review as described above, excluding the annotated bibliography. Reference list includes 122 citations.

West, K. and Sommer, A. 1987. **Delivery of oral doses of vitamin A to prevent vitamin A deficiency and nutritional blindness: A state-of-the-art review.** UN Administrative Committee on Coordination/Sub-Committee on Nutrition (ACC/SCN) State-of-the-Art Series. Nutrition Policy Discussion Paper No. 2. Food Policy and Nutrition Division, Food and Agriculture Organization, Rome. 113 pp. ❑ This document contains a thorough review of large-scale administration of oral doses of vitamin A. The breadth of information covered is wide and includes technical rationale for the use of oil-based preparations, description of various delivery systems (medical, targeted, and universal), and administrative difficulties associated with delivery. Specific methods for evaluation of program effectiveness are also described. The main article which describes fortification and dietary modification as alternative strategies is followed by five discussion paper which further explore management issues associated with oral dosing. Available from the ACC/SCN Secretariat. (For address, see "Organizations.")

5.5 FOOD FORTIFICATION

One of the main strategies to prevent and eliminate vitamin A deficiency is the addition of nutrients to foods and accessory food items. Provided that reasonable evidence of need for the added nutrients exists in a population, fortification is described as an effective, economical, flexible, and socially acceptable method of increasing the nutrient intake, contributing to improved nutrition status and health. Food fortification is used for three main purposes: (a) to restore nutrients lost during food processing by enriching a food with these nutrients (hence the terms restoration and enrichment), (b) to correct a demonstrated deficiency by increasing the level(s) of specified nutrient(s) in a food, and (c) to ensure nutritional quality and equivalency of new foods developed by food industry. Some key general references and country experiences on the fortification of foods with vitamin A are given below.

Food fortification — selected as one of the top ten innovations of the past 50 years. — Expert Panel, Food Safety and Nutrition, 1989

Arroyave, G. 1979. **Evaluation of sugar fortification with vitamin A at the national level.** Pan American Health Organization, Scientific Publication No. 384. Washington, DC, USA. ❑ Describes in detail the original country program for fortifying sugar with vitamin A in Guatemala and the evaluation of its impact on vitamin A status and health.

Arroyave, G. 1982. **The program of fortification of sugar with vitamin A in Guatemala: Some factors bearing on its implementation and maintenance.** *In*: Nutrition policy implementation: Issues and experience. Scrimshaw, N.S. and Wallerstein, M.B., eds. Plenum, New York . pp. 75-88. Includes 8 references. ❑ A retrospective report describing and discussing the historical development, policy and developmental issues, economics, and practicality of a program developed in Guatemala for combating the high prevalence of vitamin A deficiency through fortifying sugar with retinyl palmitate. The report pays particular attention to conflicts concerning the requirement that fortification costs must be absorbed by the sugar manufacturers.

Bauernfeind, J.C. 1983. **Vitamin A: Technology and applications** *In*: World review of nutrition and dietetics. Volume 41, Food Nutrification, pp. 147-183. Includes 65 references. ❑ The issue of food fortification (or nutrification as it is called here) in general, and vitamin A fortification in particular is discussed in some length in this valuable publication. The author covers comprehensively the foods suitable for vitamin A addition, giving details such as level of fortification practised in various countries, the fortificant stability under various environmental, storage, and packaging conditions, as well as discussing some operational aspects of fortification technology.

Bauernfeind, J.C. and Lachance, P.A. 1991. eds. **Nutrient additions to foods, nutritional, technological and regulatory aspects.** Food and Nutrition Press, Inc. Trumbull, CT 06611, USA. 622 pp. US $138. Inquire for special textbook prices. ❑ This book provides the first comprehensive overview of the science and technology of food and delivery of nutrients through formulated and fabricated food systems. It covers all aspects of fortification of staple and processed foods, to make them more nutritious and of higher quality. Information is provided in 21 chapters on bioavailability considerations, engineering, labelling and regulations aspects of food fortification, with references given at the end of each chapter.

Bauernfeind, J.C. 1994. **Nutrification of foods.** *In*: Modern nutrition in health and disease. Shils, M.E., Olson, J.A. and Shike, M. eds. 8th edition. Lea & Febiger. Baltimore, Volume 2, Chapter 91, pp. 1579-1592. US $ 99.50 ❑ This chapter outlines the definition and objectives of food fortification programs, and their potential benefits. Also

included are a discussion of successful fortification programs and future trends in food fortification programs and technology.

Cox, J.P. 1990. **Vitamin A and micronutrient deficiency crisis: A strategic and tactical solution.** 27 pp. with 8 annexes and 49 references. For a free copy write to: Johnathan Green, Bon Dente Nutrition, 2111 26 Avenue West, Seattle, Washington, USA. Tel: (206) 285-2727, Fax: (206) 283-3442. ❑ This report presents a unique process developed for the fortification of rice with vitamin A and other micronutrients.

FAO and ILSI 1994. **Food-based approaches to prevent micronutrient malnutrition.** International Life Sciences Institute (ILSI) and Food and Agriculture Organization (FAO) of the United Nations. pp 63-113. ❑ A manual for policymakers and program planners. This manual, referred to under section 5.3 on increasing production and availability of vitamin A-rich foods, has a detailed section on food fortification, marketing, promotion and designing micronutrient strategies, as well as monitoring, surveillance, and evaluation of such programs. Will become available late 1995. Contact: ILSI, 1126 16th Street, NW Suite 100, Washington, DC 20036, USA. Tel: (202) 659-0789, Fax: (202) 659-8654. Available free of charge to people in developing countries from ILSI and FAO.

Lotfi, M., Venkatesh Manner, M.G., Merx, R.J.H.M. and Naber-van den Heuvel, P. 1995. **Micronutrient fortification of foods: Current practices, research and opportunities.** Micronutrient Initiative and the International Agricultural Centre, Ottawa. 190 pp. ❑ This document reviews the main issues in relation to the fortification of foods with vitamin A, iodine, and iron describes some programs and projects on food fortification with special reference to technological feasibility, effectiveness, cost, consumer acceptability and other programmatic issues. It will be accompanied by a comprehensive bibliography on food fortification, with many of the citations annotated. Available late 1995 from the Micronutrient Initiative or from Richard Merx, Food Technologist, International Agriculture Centre, Wageningen, Netherlands. Tel: (31) 8370 90355, Fax: (31) 8370 18552.

Mckigney, J.I. 1983. **Interventions for the prevention of vitamin A deficiency: A summary of experiences.** *In*: Nutrition intervention strategies in national development. Underwood, B.A., ed., Academic Press, New York. Chapter 30, pp. 363-384. Includes 38 references. ❑ In describing various interventions for prevention and control of vitamin A deficiency, the author discusses some of the characteristics and conditions for strategy selection. In addition to explaining the importance of meeting certain criteria for any effective fortification program, the paper gives another set of criteria related to practical aspects for such programs to be successful in a developing country. Some examples of vitamin A fortification efforts undertaken in developing countries are briefly given in which these specific criteria are applied to their unique conditions.

Micronutrient Initiative (MI), 1993. **Vitamin A fortification: A bibliography.** Compiled by M. Lotfi (MI) with assistance from A. Ball (IDRC Library). ❑ Over 25 pages of references on various aspects of vitamin A fortification. Available free of charge from the Micronutrient Initiative, PO Box 8500, Ottawa, ON, K1G 3H9 Canada . Tel: (613) 236-6163, Fax: (613) 236-9579.

Micronutrient Initiative (MI), 1995. **Canadian experience with food fortification: Experiences and issues.** ❑ This document prepared with assistance from Health Canada summarizes the extensive Canadian experience with food fortification to deal with deficiency diseases, processing losses, and ensuring nutritional quality and equivalency of newly produced foods in Canada. Available from the Micronutrient Initiative from the above address.

Micronutrient Initiative (MI), 1995. **Vitamin A fortification of edible oils and fats.** ❑ This manuscript describes the technology of vitamin A fortification, dosages, stability and

toxicity considerations, and analytical procedures. It also discusses opportunities for oil fortification in select countries. Available free of charge from the Micronutrient Initiative at the above address.

Muhilal, P.D. et. al., 1988. **Vitamin A-fortified monosodium glutamate and health, growth, and survival of children: A controlled trial.** American Journal of Clinical Nutrition, 46, 1271-1276. Includes 22 references ❑ In a controlled trial in Indonesia, fortification of commercially-marketed MSG with vitamin A improved vitamin A status of young children and lactating women. This paper reports the impact of this improved vitamin A status on xerophthalmia rates, growth, hemoglobin levels, and child survival.

Muhilal, P.D. et. al. 1988. **Vitamin A-fortified monosodium glutamate and vitamin A status: A controlled field trial.** American Journal of Clinical Nutrition, 48, 1265-1270. Includes 23 references. ❑ This paper reports a pilot MSG-fortification project in Indonesia that utilized a novel method for overcoming technical and organoleptic obstacles to the fortification process and that had a demonstrable and significant impact on vitamin A status of children and lactating mothers residing in program villages. Based on the experiences gained, the paper argues that a national program for vitamin A fortification of MSG is feasible and will have significant effects on the health of the community.

Nathan, R. 1995. **Food fortification: Legislation and regulation manual.** Second edition, March 1995. Program Against Micronutrient Malnutrition Emory University, 1518 Clifton Road NE, Atlanta, GA, 30322, USA . 51 pp. ❑ This comprehensive manual is designed to serve as a guide for governments wishing to ensure that their food control laws and regulations contain adequate and meaningful provisions for fortification and related (e.g., enforcement) activities. Various issues on laws and regulations relevant to fortification are covered in some detail in four chapters.

Nestel, P. 1993. **Food fortification in developing countries.** A report prepared for USAID. Includes 44 references. ❑ A very useful document bringing together concisely various main issues related to food fortification in developing countries. Topics range from types of fortificants and how to determine the level of fortification to more general issues such as quality assurance and control, monitoring and evaluation, economic aspects and sustainability, and political and legal dimensions of food fortification. Available from OMNI in English and Spanish. (For address, see "Organizations.")

UNICEF, 1994/1995. **Sugar fortification in Guatemala**. 31 pp. including Appendix. Available in English and Spanish. ❑ Sugar was initially fortified during a 2-year period after the law requiring mandatory fortification of all sugar produced for domestic market with vitamin A was enacted by the Guatemalan congress in 1974. Although epidemiological surveys among preschool children revealed a significant positive impact, when fortification efforts lagged, vitamin A deficiency rose to its former level. Since the mid-1980s, UNICEF, the Nutrition Institute for Central America and Panama, and other agencies have participated in a broad-based effort to ensure that the population consumes adequate vitamin A through a combination of sugar fortification, vitamin A supplementation, and nutrition education. Working with the National Association of Sugar Producers of Guatemala and the Ministry of Health, these organizations revitalized the practice of sugar fortification with vitamin A that occurred during the 1987–88 harvest. Impact studies carried out during the past 5 years indicated that vitamin A deficiency levels among preschool children have dropped markedly. This document provides information on the evolution of sugar fortification in Guatemala. It covers technical information relating both to the fortification process and to impact studies, as well as institutional aspects of programs to fortify sugar with vitamin A. Contact UNICEF, Guatemala for Spanish version (at Apartado Postal 525, Guatemala City, Guatemala, C.A. Tel: (502 2) 33 63 15, Fax: (502 2) 33 63 17), or UNICEF, New York (at 3 UN Plaza, New York, NY 10017, USA. Tel: (212) 326 7057, Fax (212) 326 7336) for English version.

World Bank, 1994. **Enriching lives: Overcoming vitamin and mineral malnutrition in developing countries.** A World Bank Publication — Development in Practice. 73 pp., also available in French. ❑ This document deals with programs to combat vitamin A, iron, and iodine deficiencies. It examines various aspects of food fortification programs including improving industry compliance, cost, and sustainability. Available for US $6.95 from the World Bank Bookstore, PO Box 7247-8619, Philadelphia, PN, 19170-8619 USA. Tel: (202) 473-1155; Fax: (202) 522-2627. More information from the Population, Health and Nutrition Department of the World Bank, 1818 H Street, Washington, DC, 20433, USA . Tel: (202) 473-3452, Fax: (202) 522-3234.

6. GENERAL INFORMATION FOR PLANNING AND IMPLEMENTATION OF VITAMIN A DEFICIENCY CONTROL PROGRAMS

6.1 VITAMIN A CONTENT OF FOODS

The UNICEF/WHO Joint Committee on Health Policy recently provided guidelines on adequate consumption of vitamin A by children 6-24 months old: "Approximately two tablespoons of cooked carrots or dark yellow squash, or 5 tablespoons green vegetable daily, or the equivalent consumed in multiples less frequently in a week, would meet or exceed (for those still receiving breast milk) the basic need for children 6 months to 24 months of age."

Specific programs, however, must devise specific, locally appropriate messages that recommend particular foods, amounts, and frequency of consumption for particular types or ages of people. Such specificity can only be achieved by combining the technical input of nutritionists regarding food consumption tables, with local knowledge about food consumption behaviour and the feasibility of certain recommendations. Food composition tables are an important resource for planning food-based interventions, but nonspecialist planners should also consult with nutritionists if possible. There is also a fair amount of information in the literature on the effects of food storage, preparation, preservation, and consumption of other foods on vitamin A availability and bioavailability. The following references are valuable resources for those looking for information about the carotenoid and preformed vitamin A or the retinol content of foods.

Planning food-based interventions requires technical input regarding food composition tables and local knowledge about food consumption behaviour and the feasibility of recommendations.

Bowes & Church's food values of portions commonly used. 1994. 16th edition. Revised by A.T. Pennington, J.B. Lippincott, Philadelphia. 483 pp. ❑ The purpose of this book is to supply authoritative data on the nutritional values of foods in a form for quick and easy reference. Data on about 8500 foods, organized into 35 food categories, are presented in this edition. Although this book is written with a Northern audience in mind, it could prove useful for dietitians, nutritionists, and nutrition researchers who would like to have one of the "classic" works on nutrient values of foods on their reference shelf.

Journal of Food Composition and Analysis. A publication of the United Nations University, International Network of Food Data Systems.

Paul, A.A. and Southgate, D.A.T. 1988. **McCance and Widdowson's the composition of foods.** 4th edition. Elsevier, Amsterdam.

The following three food composition tables focus on foods in developing countries and are available from distributors of FAO publications or from the Distribution and Sales Section, FAO-C182, Via delle Terme di Caracalla, 00100 Rome, Italy.

Food composition tables for the Near East. 1982. A Food and Nutrition Paper of the FAO. ISBN 5-101277; Accession number 84-36825. Food and Agricultural Organization, Rome. 275 pp.

Food composition tables for use in Africa. 1970. FAO Nutrition Information Documents Series No. 3. ISBN number 95788; Accession number 71-16139. Available in English and French. 313 pp.

Food composition table for use in East Asia. 1972. ISBN number 5-200159; Accession number 79-42265. Food and Agricultural Organization, Rome. 347 pp.

Agoade, R.B. 1993. **Improved vitamin A consumption through agricultural products: A reference manual for agricultural extension workers.** 32 pp. ❑ This is a

practical and simple manual produced for Malawi, listing Chichewa, English, and Latin names for foods rich in vitamin A that are available in the country. Malawi Government, Ministry of Agriculture. Available for US $3.00 from Dzuka Publishing Company Ltd, Private Bag 39, Blantyre, Malawi.

Booth, S.L., Johns, T., and Kuhnlein, H. 1992. **Natural food sources of vitamin A and provitamin A.** Food and Nutrition Bulletin, 14(1), 6-19. ❑ This technical article reviews published values of vitamin A activity in the current food composition literature. It not only provides published values for vitamin A content of foods from several sources but also discusses the technical issues behind these values: units of expression, analytical techniques, natural sources of variation, effects of processing, and bioavailabil-ity and metabolism. Reprints of this article are available in English only from H. Kuhnlein, Centre for Nutrition and the Environment of Indigenous People, 21111 Lakeshore Road, Ste Anne de Bellevue, Montreal, Québec, H9X 3V9 Canada. Tel: (514) 398-7544.

Feldon, K. 1992. **A guide to the vitamin A content of indigenous plants used for medicine and food.** 73 pp. ❑ This guide book is intended to raise awareness of and describe the nutritional value and potential role of traditional plants in combatting vitamin A deficiency. The guide lists over 160 plants commonly consumed as food or medicine throughout the world. The listing for each plant includes the botanical and common English names, the regions where it grows, the vitamin A level of its edible parts, and its medicinal uses. Reference sources, a bibliography, and common names index are included. Although clear, the guide contains many medical and nutritional terms. Available in English only from Helen Keller International, 90 Washington Street, New York, NY 10006, USA. Tel: (212)943-0890, Fax: (212) 943-1220. Cost US $5.00.

Helen Keller International/Niger.1988. **Aliments riches en vitamine A/Foods rich in vitamin A: Niger.** 9 pp. ❑ This document assists program planners to determine technically appropriate recommendations for consumption of vitamin A-rich foods. Some 65 foods available in Niger are listed in seven languages (English, French, Hausa, Djamra, Peul, Tamacheq, and Beriberi) with their vitamin A content in international units per 100 grams. Foods are categorized as dark green leafy vegetables, other vegetables, yellow fruits, animal sources, and miscellaneous. Suitable for nutritionists, NGO staff, and others planning vitamin A projects in Africa. To order, contact Helen Keller International, 90 Washington Street, New York, NY 10006, USA. Tel: (212) 943-0890, Fax: (212) 943-1220. Cost: US $5.00.

Oomen, H.A. and Grubben, G.J.H. 1977. **Tropical leaf vegetables in human nutrition.** Royal Tropical Institute, Amsterdam.

OMNI (Opportunities for Micronutrient Interventions) and the Micronutrient Initiative. 1995. **Bioavailability and bioconversion of carotenoids.** A summary report of a workshop organized by the Micronutrient Initiative, OMNI, and USAID, and held in Washington, DC, April 4-5, 1995. OMNI Brief 1. OMNI, Arlington, VA. 12 pp. ❑ Increasing the consumption of carotenoid-rich plant foods has generally been accepted as an important long-term solution to improve vitamin A status. To date however, the link between increased dietary intake of carotenoid-rich foods and vitamin A status is not clear. Among other issues, this has raised questions about the bioavailability and bioconversion of provitamin A carotenoids in humans and their contribution to vitamin A status, particularly in at-risk populations in developing countries. In this workshop, 45 scientists, nutrition program managers, and representatives of development assistance agencies met to address the question: Can foods rich in provitamin A carotenoids provide adequate vitamin A for human needs? The consensus of the participants was that carotenoid-rich fruits and vegetables provide a substantial and necessary contribution to the requirements of vitamin A and other nutrients of populations at-risk of nutrient deficiencies in developing countries, and that consumption of these foods should be encouraged. Available from OMNI. (For address, see "Organizations.")

Reed Mangels, A. and Holden, J. 1993. **Carotenoid content of fruits and vegetables: an evaluation of analytical data;** and Chug-Ahuja, J. and Holden, J. 1993. **The development and application of a carotenoid database for fruits, vegetables, and selected multi component foods.** Journal of American Dietetic Association, 93(3), 284-296; 318-323. English only. ❑ These two articles provide reference data on the carotenoid content of fruits and vegetables. Intended for nutritionists, dietitians, health scientists, food industry, and labelling specialists, they provide accurate and current food composition data for individual carotenoids. Discusses appropriate application of the database that is particularly pertinent for developing countries with high rates of vitamin A deficiency. Diskette containing the database is also available in an ASCI file. Both articles are available free of charge from Joanne Holden, Beltsville Human Nutrition Research Centre, US Department of Agriculture, Beltsville, MD 20705, USA. Tel: (301) 504-8186.

USDA-NCI carotenoid food composition database, version 1. 1993. Department of Health and Human Services. ❑ The USDA Food Composition Laboratory has critically reviewed 180 papers and internal reports and developed this database of analytical carotenoid values for fruits and vegetables consumed in the United States. The data is available on diskette. For further information or to obtain a copy of the database, contact: Michele Forman or Joanne Holden at the National Cancer Institute, National Institutes of Health, Bethesda, MD 20892 USA. Tel: (301) 496-8559 or 504-8356.

West, C.E. and Poortvliet, E.J. 1993. **The carotenoid content of foods with special reference to developing countries.** A report prepared for the Office of Nutrition, Bureau for Research and Development, US Agency for International Development. ❑ This report presents a database on carotenoid values for foods, but with information not included in the USDA publication cited above. A useful reference for those interested in carotenoid values for foods found within developing countries. About 160 pp. Available from OMNI project. (For address, see "Organizations.")

6.2 ASSESSMENT, MONITORING, AND EVALUATION OF VITAMIN A STATUS

Three reasons for determining the vitamin A status in populations are: to assess the magnitude of vitamin A deficiency, to identify populations at high risk for developing vitamin A deficiency, and to monitor and evaluate the effectiveness of vitamin A elimination programs and track progress toward elimination goals. References in this section focus on one or more of the following aspects of vitamin A: first, what to measure and the advantages and disadvantages of each indicator; second, who to measure in terms of age and sex; and third, how to conduct a survey and analyze the data generated from it.

Three reasons to determine the vitamin A status in populations are to assess the magnitude of deficiency; to identify populations at high risk; and to monitor and evaluate the effectiveness of programs to eliminate vitamin A deficiency.

Arroyave, G., et al. 1989. **Methodologies for monitoring and evaluating vitamin A deficiency intervention programs.** A report of the International Vitamin A Consultative Group (IVACG). The Nutrition Foundation, Inc., Washington, DC. 66 pp. ❑ This monograph has been described by IVACG as being "useful to those involved in intervention programs who are not experts in monitoring and evaluation. It presents and promotes evaluation as an integral component of all interventions and highlights the use of evaluation results for increasing the effectiveness of vitamin A deficiency intervention programs. Use of the methodologies described in the manual will help determine whether a particular intervention has produced the results for which it was planned. It will also assist program managers to estimate the extent to which changes accompanying the intervention can be attributed to the program." Compared with other documents listed in this section, this monograph is of interest because it provides more information on survey methods and designs for evaluation of interventions than the other publications. The use of proportionate to population size (PPS) cluster surveys and issues concerning the correct analysis of data collected using complex survey designs are discussed, and sample size tables are provided. 19 recommended readings are listed. Order from IVACG. (For address, see "Organizations.")

Arroyave, G., et al. 1982. **Biochemical methodology for the assessment of vitamin A status.** A report of the International Vitamin A Consultative Group (IVACG). The Nutrition Foundation, Washington, DC, USA. 92 pp. ❑ This is a practical manual describing commonly used biochemical methods for measuring vitamin A and provitamin A carotenoids in human populations. Methods for the analysis of carotenoids in foods are not included. Recommendations are provided for collection of samples, use of reference standards, chromatographic and spectrophotometric methods, laboratory quality control, and data analysis. Under each method, information is included on the principle of the method, apparatus and reagents required, and the procedure to be followed. Available from IVACG. (For address, see "Organizations.")

FAO. 1988. **Requirements of vitamin A, iron, folate and vitamin B12.** Report of a Joint FAO/WHO Expert Consultation. FAO Food and Nutrition Series #23, FAO, Rome, Italy. (For address, see "Organizations.")

Gibson, R.S. 1990. **Principles of nutritional assessment.** Oxford University Press, New York, USA. 691 pp. ❑ An excellent reference book covering all aspects of nutritional assessment of individuals and populations. Dietary, anthropometric, and biochemical assessment of nutritional status are all covered in detail. Various methods used in the assessment of vitamin A are explained including measurement of serum retinol, retinyl ester, and carotenoid concentrations; the relative dose-response test; the rapid dark adaptation test; and conjunctival impression cytology. Special emphasis is placed on the validity and reliability of various assessment techniques.

Helen Keller International. 1994. **How to use the HKI food frequency method to assess community risk of vitamin A deficiency.** 72 pp. ❑ This manual is based on the

HKI Food Frequency Method, which aims to: determine whether populations are at risk of vitamin A deficiency, provide baseline data to evaluate changes in the intake of vitamin A-rich foods, and provide information on whether mass distribution of vitamin A supplementation should be discontinued if the consumption of vitamin A-rich foods is adequate. Data collected by this method can easily be analyzed by hand. A highly readable and practical presentation, with an attractive layout. Should be on the bookshelf of every vitamin A program manager. (This is the second of a two-part series, the first being "Conducting a qualitative assessment of vitamin A deficiency: a field guide for program managers" described below.) Order from Helen Keller International at US $10.00 (For address, see "Organizations.")

Helen Keller International. 1992. **Conducting a qualitative assessment of vitamin A deficiency: A field guide for program managers.** 55 pp. ❑ This field guide explains how to use secondary data sources, qualitative information, and small-scale consumption surveys to develop a community profile of vitamin A deficiency in a program area. Examples of survey questionnaires, discussion guidelines, and a case study are included. Provides an alternative to the IVACG guidelines for a simplified dietary assessment for the identification of groups at risk of inadequate vitamin A intake. (See the second of this two-part series "How to use the HKI food frequency method to assess community risk of vitamin A deficiency," above.) Order from Helen Keller International at US $10.00.

Horner, M.R. 1991. **The IVACG guidelines for the development of a simplified dietary assessment to identify groups at risk for inadequate intake of vitamin A: A review of field experience.** VITAL Report No. IN-4. Available from the OMNI Project. (See "Organizations.")

Micronutrient Initiative, Program Against Micronutrient Malnutrition and UNICEF. In preparation. **Monitoring vitamin A programs: A manual.** ❑ This manual is designed for program managers who require guidelines and reference materials to aid in the design and implementation of monitoring systems for vitamin A programs. The document includes chapters on monitoring of dietary improvement programs, supplementation programs, and food fortification efforts, with the focus being on process monitoring. In addition there are sections on monitoring program impact, cluster survey methods, lot quality assurance survey methods and laboratory methods to measure vitamin A in foods and equipment needs for a vitamin A laboratory.

Scrimshaw, N. and Gleason, G. 1993. **Rapid assessment methodologies for planning and evaluation of health related programs.** 528 pp ❑ This book elucidates the core concepts on which rapid assessment procedures and rapid rural appraisal rest. It would be useful for development workers and students of public health, anthropology, and sociology. It describes approaches for investigating household and individual health-related attitudes, behaviours, and motivations of both clients and service providers. Most of the book is based on presentations from the 1990 International Conference on Rapid Assessment Methodologies at the Pan American Health Organization. Available from: INFDC, Charles Street Station, PO Box 500, Boston, MA, 02114-0500 USA. Tel: (617) 227-8747, Fax: (617) 227-9405. Cost: US $29.00 for industrialized countries, US $20.00 for developing countries. (Make cheques payable to INFDC.)

Scrimshaw, S. and Hurtado, E., 1987. **Rapid assessment procedures for nutrition and primary health care: Anthropological approaches to improving programme effectiveness.** 70 pp. ❑ This book instructs readers in the use of anthropological methods for rapid assessments of health and health-seeking behaviours at the household level and interactions with traditional and modern health care providers. A "how to" book for social scientists, health workers, researchers, students of anthropology, and experienced anthropologists. It includes sample data collection instruments, examples of field techniques and a discussion of data management and analysis. Features a 17-minute instructional video on

the application of techniques. Available in French, English, and Spanish from the UCLA Latin American Centre, University of California, Los Angeles, CA, 90024-1447 USA. Tel: (310) 825-6634, Fax: (310) 206-6959. Cost: US $10.95 for English and Spanish, US $12.95 for French, and US $19.40 for video. (Make cheques payable to Regents-U.C.).

Sommer, A. 1995 **Vitamin A deficiency and its consequences: Field guide to their detection and control**, 3rd edition. WHO, Geneva. ❑ This is a concise, updated, authoritative treatise to guide the field assessment, treatment, and prevention of vitamin A deficiency. The publication offers guidance based on internationally-accepted practice. To be available in English, French, and Spanish from WHO. (For address, see "Organizations.")

Underwood, B. and Olson, J. ed. 1993. **A brief guide to current methods of assessing vitamin A status.** International Vitamin A Consultative Group, Washington, DC, USA. 37 pp. ❑ This well-organized book is an invaluable introduction to various assessment methods currently used for the assessment of vitamin A deficiency. Dietary, physiological, biochemical, histological, and clinical procedures are described, as well as promising developments (vision restoration time, rapid dark adaptation time, isotope dilution analysis and tear fluid retinol analysis). Investigators and program planners will find the text helpful in selecting assessment methods best suited to their specific situations and available resources. Each chapter is written by an expert on the method being described, and includes information on the physiological basis of the method, a brief description of the procedure, a discussion of its advantages and limitations, information about interpretation of the results, and an example of its application. Key recent references for each procedure aid the reader in gathering more detailed information. Order from IVACG. (For address, see "Organizations.")

Underwood, B., et al. 1989. **Guidelines for the development of a simplified dietary assessment to identify groups at risk for inadequate intake of vitamin A.** International Vitamin A Consultative Group, Washington, DC, USA, 61 pp. ❑ As described by IVACG: "This manual assists those who wish to identify groups at risk for inadequate intake of vitamin A and to help them decide on appropriate follow-up. It also assists community workers developing programs for better health and nutrition to give mothers in the vulnerable groups appropriate advice about feeding practices and use of locally available foods. The manual focuses on the problems of nonindustrialized countries." The IVACG simplified dietary assessment method (SDA) is a semi-quantitative technique for evaluating the risk of inadequate intake of vitamin A by children aged 1-4 years. Besides describing the actual technique, the manual contains useful information on a number of topics (e.g., limitations in the use of food composition tables, the selection of an appropriate dietary intervention strategy in various situations). This manual would interest program managers looking for a method to identify communities at risk of vitamin A deficiency, personnel involved in dietary assessment and intervention planning and monitoring, and those involved in planning nutrition education and behavioural change programs (the method can provide relevant baseline information from which to develop nutrition education materials and sustainable programs to change feeding behaviours and improve the diet of children). The method has been field-tested in a number of countries and recommendations have emerged regarding specific ways to improve it. Revision of the method is likely as experience and data from field-testing continue to be collected. An IVACG task force is currently being formed to review the present state of dietary approaches to improve vitamin A status. Published in looseleaf format. Contains sample questionnaires and numerous boxes of text illustrating sample calculations, and applications of the method. Order from IVACG. (For address, see "Organizations.")

WHO and UNICEF. 1994 **Indicators for assessing vitamin A deficiency and their application in monitoring and evaluating intervention programs.** Report of a joint WHO/UNICEF consultation. Review version May 1994. WHO/NUT/94.1. Nutrition Unit, World Health Organization, Geneva. 56 pp. Includes 65 references. ❑ This document is

based on a meeting held in November 1992 that addressed issues related to assessing vitamin A deficiency. Information is provided on different potential indicators to measure the vitamin A status within a population and how to interpret the results and the costs. The biologic indicators discussed include clinical indicators (xerophthalmia) and subclinical indicators (night blindness, biochemical tests, and impression cytology). An interesting aspect of this document is the use of "ecologic and related indicators associated with risk of vitamin A deficiency," such as breastfeeding patterns, anthropometric indicators of malnutrition, low birth weight, disease prevalence, socioeconomic indicators, and other factors. These indicators can be used to locate where vitamin A deficiency areas or populations are likely to be found. The use of approaches to assess the availability and consumption of vitamin A-containing foods is briefly discussed. Annex 1 is a listing of countries categorized by degree of health importance of vitamin A deficiency by WHO region. Essential reading for program planners and managers, and nutrition researchers. Publication available from the Nutrition Unit, WHO. (For address, see "Organizations.")

6.3 SAFETY OF VITAMIN A: IMPORTANT EMERGING ISSUES

There is currently some controversy about the value and safety of routinely supplementing infants in the first 6 months of life with high doses of vitamin A. Recent studies report findings that show that the strategy is not without risk of adverse side effects. The references below (DeFrancisco et al. and West et al.) present the evidence to date that acute toxicity can occur within hours after a sufficiently high dose of vitamin A, and the effects can last for up to 96 hours. The interpretation of the findings is still under discussion, and other studies have been completed and have yet to be fully analyzed and published. In women, high dose supplementation during the first half of pregnancy carries some risk of birth defects, although the dose of vitamin A needed to produce the effects is uncertain.

Several factors influence the toxicity of vitamin A.

Bauerfeind, J. C. 1980. **The safe use of vitamin A: A report of the International Vitamin A Consultative Group** IVACG, Washington, DC. 127 references. ❑ A review of the literature to 1980 on safety of vitamin A, with case studies on toxicity to that time.

Bendich, A. and Langseth, L. 1989. **Safety of vitamin A**. American Journal of Clinical Nutrition, 49, 358-371. 105 references. ❑ A comprehensive review including factors influencing chronic hypervitaminosis A, such as dosing regimen, physical form of the vitamin, health status, dietary factors - intakes of protein and alcohol, interactions with vitamins E,C,D,K. The paper contends that no cause-and-effect relationship has been established between vitamin A intake and birth defects, and that reported incidences of vitamin A toxicity are rare (fewer than 10 cases per year between 1976 and 1987).

De Francisco, A. et. al. 1993. **Acute toxicity of vitamin A given with vaccines in infancy.** Lancet, 342, 526-527. Includes 10 references. ❑ A double-blind, randomized, placebo-controlled trial to test safety of vitamin A supplementation with the Expanded Program on Immunization (EPI) in rural Bangladesh: 191 infants received 3 doses of either 50,000 IU of vitamin A or placebo at about 6, 10, and 14 weeks and were examined on days 1, 2, 3, and 8 after supplementation. 11.5% of vitamin A supplemented infants had bulging fontanelles, as opposed to 1.1% in the placebo group. The bulging episodes lasted between 24 and 72 hours and subsided without treatment.

Hathcock, J. N., et. al. 1990. **Evaluation of vitamin A toxicity.** American Journal of Clinical Nutrition, 52, 183-202. Includes 224 references. ❑ Adverse effects may occur in children with intakes as low as 1,500 IU per kilogram per day, and in pregnant women, with birth defects being associated with maternal intakes as low as 25,000 IU\per day. The maternal dose threshold for birth defects cannot be identified from present data. Lowest reported intakes causing toxicity have occurred in those with compromised liver function or protein-energy malnutrition. Animal studies on toxicity are also reviewed. Beta-carotene appears to be nontoxic.

International Vitamin A Consultative Group. 1986. **The safe use of vitamin A during the reproductive years.** IVACG, Washington, DC. 12 references. ❑ This brochure contains the 1986 IVACG recommendations for safely improving vitamin A status of pregnant and lactating women and nursing infants. These recommendations include a maximum of 10,000 IU daily for pregnant women in areas where there is little opportunity for dietary improvement of dietary vitamin A intake. The recommendations for the nursing infant include one dose (a single dose of 100,000 IU shortly after birth) that has a now-known risk of bulging fontanelles and other side effects.

West, K. P., Jr., et. al. 1992. **Tolerance of young infants to a single, large dose of vitamin A: Randomized community trial in Nepal.** Bulletin WHO, 70, 733- 739. ❑ A randomized, double-blind community trial to evaluate the incidence of bulging fontanelle and other side effects 24 hours after intake of 50,000 IU in neonates or 100,000 IU in infants 1-6 months of age. Excess rate of bulging fontanelles was 0.5% and of projectile vomiting, 2%. Bulging fontanelles subsided within 96 hours of dosing.

7. USEFUL SUPPORT MATERIALS AND ORGANIZATIONS

7.1 NEWSLETTERS

Bon Dente Nutrition, Inc. **Ultra Rice.** An occasional newsletter from Bon Dente Nutrition to keep interested individuals informed on developments related to the ultra rice technology. Write to John E. McLean, Bon Dente Nutrition, 1127 Crested View Dr, St Louis, MO 63146, USA. Tel:(314) 567-6842, Fax: (314) 567- 6547.

Community Eye Health is produced by Institute of Ophthalmology, International Centre for Eye Health, 27-29 Cayton Street, London, UK, EC1V 9EJ. Tel: (71) 387 9621, Fax: (71) 250 3207.

Garden to Kitchen Newsletter is a quarterly publication of the UNICEF Pacific Regional Family Food Production and Nutrition Project. The aim is to suggest simple, practical, and low-cost solutions to many farm problems and to encourage consumption of locally grown foods. Write to Family Food Production and Nutrition Project/UNICEF Pacific Operation, c/o UNDP, Private Mail Bag, Suva, Fiji. Tel: 300 439, Telex: FJ 2227.

IAPB News, the newsletter of the International Agency for the Prevention of Blindness (IAPB), is published twice a year and has a wide circulation. Contact Terrence Gillen, c/o National Eye Institute, National Institutes of Health, Building 31, Room 6A03, Bethesda, MD 20892, USA.

Nutriview is a quarterly update on micronutrients, nutrition, and health. It is published by Human Nutrition Communications/F. Hoffmann- La Roche Ltd as a service to health care professionals and science communicators. Contact: Peter A. Brugger, Project Manager, F. Hoffmann-La Roche Ltd., Postfach, CH-4002 Basel, Switzerland. Building 241/1014.

Sight and Life newsletter is available from the Sight and Life Task Force (See "Organizations" for address.)

SCN News This biannual newsletter is produced by the ACC/SCN. A special issue "Focus on Micronutrients" was published in mid-1993 (No. 9). Contains feature articles on the global situation regarding micronutrient deficiency, addressing micronutrient malnutrition, zinc deficiency, and the SCN-organized Micronutrient Symposium held in Geneva, February 1993. Also covered is agencies' activities in micronutrient control. Available free from the ACC/SCN. (See "Organizations" for address.)

PAMM Newsletter, produced periodically by the Program Against Micronutrient Malnutrition (PAMM), updates readers about global efforts to overcome micronutrient malnutrition. Articles focus on reports of progress, problems, and plans in countries that have received support from PAMM, updates on PAMM laboratory's research and development efforts, and information about PAMM's planned activities. To submit items of interest to the PAMM newsletter or to be placed on the mailing list, contact: Frits van der Haar, Director of Operations, PAMM. (Address given under "Organizations.")

The Vitamin A+ Sieve is produced semiannually by Prevention magazine and the Rodale Institute. Subscription is free of charge. Write to Janet Glassman, Rodale Free Information Services, 33 E Minor Street, Emmaus, PA 18098, USA.

Vitamin A News Notes is a publication of the Vitamin A Technical Assistance Program, of the US nongovernmental organization Helen Keller International (HKI). The newsletter is published twice a year, in English, French, and Spanish. Available free of charge from HKI.

Xerophthalmia Club Bulletin is a publication of Sight Savers and International Vitamin Consultative Group. Available free of charge from: D.S. McLaren, International Centre for Eye Health, 27-29 Cayton Street, London, UK, EC1V 9EJ. Fax: (903) 206770

MATA is the semiannual publication of Project MATA, Mobilizing Action through Technical Assistance, a joint project of the Department of Health, NGOs, and Helen Keller International. Subscriptions are available to the Philippine NGO community.

Nepal Vitamin A News is the biannual newsletter of the National Vitamin A Program. Produced twice a year by the Program's Technical Assistance Group (TAG). TAG provides training and other services to integrate the vitamin A program into the existing government and NGO health network.

The Unidad Pro-Vita-A produces **Hablemos de Vitamina A** in Spanish. Founded by the International Eye Foundation in 1992, Unidad Pro-Vita-A is a resource centre for vitamin A and nutrition education. Copies of the newsletter are available to those with an interest in health issues in Guatemala.

In Guatemala, the Philippines, and Nepal, country-specific newsletters help spread the word about the importance of vitamin A in child survival and health programs. Typically, their audience is the staff of many organizations who have a shared interest and a unique contribution toward eliminating vitamin A deficiency. These newsletters are one tool to foster interagency coordination. [As excerpted from HKI newsletter.]

7.2 TRAINING OPPORTUNITES, TRAINING MATERIALS, AND VIDEOS

The development of sustainable institutional capacities and human resources is critical to achieving the goal of elimination of vitamin A deficiency. Training is needed in all sectors to support vitamin A-related activities. The section below provides some information about training materials and opportunities for human resource development in the areas of elimination and control of micronutrient deficiencies.

Program Against Micronutrient Malnutrition (PAMM). PAMM training is designed to assist national teams working on micronutrient elimination programs to acquire skills required in their work. ❑ Training is an important component of PAMM's program, and each year select teams participate in training courses of varying durations (from 1 week to 3 months). Training is offered in advocacy, laboratory management, information management, communications, and interventions, with a focus on food fortification. The food fortification training module is held at the International Agricultural Centre in the Netherlands. The International Agriculture Centre organizes courses, training programs and conferences, seminars, and workshops on a wide range of subjects. Contact addresses: For PAMM: Centre for International Health, Emory University, School of Public Health, 1518 Clifton Road NE, Atlanta, GA 30322, USA. Tel: (404) 727 5417 or 727-5416, Fax: (404) 727-4590. (For more information on PAMM see "Organizations" section.) For International Agriculture Centre: 6700 AB Wageningen, The Netherlands. Tel: (31) 8370 90355, Fax: (31) 8370 18552.

Department of Health of the Philippines, Nutrition Service and Helen Keller International. n.d. **Ending hidden hunger: training manual.** 144 pp., with a 77-page appendix. ❑ This training manual, designed for primary level health workers, provides learning activities aimed at developing skills that community and health workers need to implement interventions to prevent, treat, and manage vitamin A deficiency, iron deficiency anemia, and iodine deficiency disorders. The manual consists of 8 modules aimed at providing learning activities related to the following tasks: detect and treat individuals at risk for micronutrient deficiencies, record and report individuals receiving treatment, plan and evaluate micronutrient interventions at the community level, and conduct individual and group counselling and learning activities. Although written for health workers in the Philippines and tested with over 1000 Department of Health personnel, this manual would be valuable in any country where micronutrient deficiencies are a problem and where training activities are being planned and conducted. Many useful, practical ideas for training activities are provided, based on principles of adult learning, with experience-based learning and learner participation stressed.The appendix contains handouts for the trainees, many articles on group process and team building, and short articles on micronutrient malnutrition in the Philippines. A welcome and stimulating addition to the limited training resources on micronutrient deficiencies. Order from HKI International Inc., 2139 Fidel A. Reyes Street, Malate, Manila, Philippines. Tel: 59-24-21 (ext. 213-215), 50-15-26, Fax: (63-2) 501-526 or 521-2378.

Helen Keller International (HKI). 1993. **El deseño de actividades de la vitamin A en Guatemala.** Available in Spanish for US $10.00. ❑ This document will interest those who are involved in developing culturally-relevant nutrition education materials for the control of vitamin A deficiency. The document describes how to plan and conduct formative research, develop an education strategy based on the findings and then develop materials to implement the education strategy. Order from HKI. (For address, see "Organizations.")

Helen Keller International (HKI), 1993. **Vitamin A training activities for community health and development.** 70 pp., with an appendix that provides information on the vitamin A content of common foods. Available in English and French. ❑ This is a manual of 18 interactive, experiential training activities that can be used by NGOs and trainers of community health workers. Field tested in six countries in Africa, Asia, and Latin America, the manual represents a highly collaborative effort. Each of the structured training activities has a clearly defined objective and a set of step-by-step instructions, with handouts ready for photocopying. Slides are included for two of the activities. These activities can be used separately or in combination, depending on specific training objectives. Topics covered include general information about vitamin A and vitamin A deficiency, nutrition education that addresses feeding practices and capsule distribution for prevention and treatment. Order from HKI. (For address, see "Organizations.")

VITAL training module. A slide set (18 slides and accompanying script) on "Vitamin A Deficiency: An Update" has been produced by VITAL ❑ Provides a brief overview of the significance of vitamin A for child health and survival, risk factors for vitamin A deficiency, and possible interventions. A useful resource for introductory presentations on the problem of vitamin A deficiency and possible solutions available in English, French, and Spanish. Order from VITAL. (For address, see "Organizations.")

VITAL Vitamin A Field Support Project. 1992. Measles case management and vitamin A. An annotated slide presentation series produced for the Office of Nutrition, Bureau for Research and Development, US Agency for International Development, implemented by the International Science and Technology Institute (ISTI). ❑ These training materials include 20 high-quality diapositive slides, including 4 graphics, 4 photographic, and 12 text slides, with handouts, and annotated text matched to the slides. This series contains practical information needed by health workers and their supervisors on how to implement the guidelines for vitamin A supplementation in the context of a comprehensive measles control program. It focuses on measles case management and deals with measles outcomes, impact of vitamin A, measles diagnosis, vitamin A dosing schedules, vitamin A supplies, nutrition messages, measles complications, immunization, coverage, and targets. Contents of the presentation are based on WHO publications. Available from the Office of Nutrition, USAID. (See USAID under "Organizations.")

VITAL training module (slide presentation), 1993. Fortification of foods with vitamin A. A set of 20 slides available in English, French, and Spanish, prepared by the Vitamin A Field Support Project (VITAL) of the USAID Office of Nutrition. ❑ The purpose of this slide presentation is to review recent developments in the area of vitamin A fortification programs. It provides an overview of fortification definitions, rationale, food vehicles, estimating fortification level, as well as highlighting the components of a fortification program, how to get a program started, and model legislation and required quality control/monitoring systems. Also covered are costs and fortification limitations. Some of the experiences from Guatemala and Indonesia are summarized. Available from the OMNI Project. (See OMNI under "Organizations.")

All We Expect: Nutrition—a Basic Human Right is a 24-minute video produced by the Micronutrient Initiative/World Wide TV Associates/Gainsborough Communications Group Ltd. Available in English, French, and Spanish, for NTSC, PAL, and SECAM systems and close captioned for the hearing impaired. A companion Facilitator's Guide accompanies the video. ❑ The video illustrates the significance and adverse consequences of micronutrient malnutrition in women and provides information on the three most common deficiencies: iron, iodine, and vitamin A. Examples of the solutions that are being used around the world are given. The video is aimed at policy advisors, and program managers and planners in government and NGOs. It will also be of interest to trainers and the general public. Available from World Wide TV Associates, 411 Echo Drive, #3, Ottawa K1S 1N5, Canada. Tel: (613) 238-2410, Fax: (613) 238-7977, e-mail: LSHIELDS@IDRC.CA.

Ending Hidden Hunger 1992. This 20-minute video is produced by the United Nations Children's Fund (UNICEF)/World Health Organization (WHO). Bedford Productions. Available in English, French, and Spanish, for PAL, NTSC, and SECAM systems. To obtain a copy at US $10.00 (exclusive of postage and handling) contact: Bedford Productions Ltd, 6th floor, 6 Vigo Street, London W1X 1AH, UK. Tel: (71) 287 9928, Fax: (71) 287 9870.

From Darkness into Light. Available from Worldview (Bangladesh), House 76A, Road 12A, Dhanmondi, Dhaka, Bangladesh. Tel: (880 2) 813138.

The Battle against Nutritional Blindness is a video produced by the Sight and Life Task Force. Available in English, French, Spanish, or German, in PAL, NTSC, or SECAM format.

7.3 ORGANIZATIONS

Many developing countries will need substantial international cooperation and assistance to enable the achievement of the elimination of vitamin A deficiency. Worldwide, there are dozens of organizations whose activities help to create an enabling international environment for the implementation of plans of action, for nutrition. Some of these are described below.

Support from international organizations can foster political commitment, and help provide financial support in line with local priorities.
— ACC/SCN Consultative Group meeting, July 1993

AFRICA REGIONAL VITAMIN A INFORMATION AND COLLECTION CENTRES

L'Institut du Sahel (INSAH)—Francophone Africa Vitamin A Information Collection and Dissemination Centre. This regional vitamin A information collection and dissemination centre serves francophone African countries, including Benin, Burkina Faso, Chad, Côte d'Ivoire, Gabon, Mali, Niger, and Senegal. Activities are similar to those listed for the Information Centre at TDRC. For information contact: Mr Zoumana Bamba, Project Documentalist, Institut du Sahel, Boulevard de l'Independance, BP 15, Bamako, Mali. Tel: (223) 22.51.11, Fax: (223) 22.23.37.

Organisme de recherches sur l'alimentation et la nutrition africaines (ORANA). ORANA houses the ORANA Information Centre on Child Survival, a regional information centre which responds to the information needs of francophone African countries in three subject categories: diarrheal disease, nutrition, and vitamin A. Participating countries are Benin, Burkina Faso, Mali, Mauritania, Niger, Senegal, and Togo. ORANA's staff gather, catalogue, and disseminate documents from a variety of sources; by mid 1992, 632 documents on vitamin A were in their collection, and six acquisition lists had been prepared and distributed to those on their mailing list. A bibliography was prepared in 1991 which focused on vitamin A documents written by Africans or about vitamin A in Africa, an African supplement to the newsletter "Dialogue on Diarrhoea" is produced, and information requests have been handled. The Information Centre has a mailing list of over 800 readers, and readers are encouraged to request copies of articles or documents which interest them. Contact: A.M. Ndiaye, ORANA, 39, Avenue Pasteur, BP 2089, Dakar, Senegal. Tel: 22-58-92.

Tropical Disease Research Centre (TDRC). A Vitamin A Information Collection and Dissemination Centre has been established at TFNC to serve anglophone Africa, including Botswana, The Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Namibia, Nigeria, Sierra Leone, Somalia, Swaziland, Tanzania, Uganda, Zambia, and Zimbabwe. Major information activities undertaken include the dissemination of key articles to all participants, press releases on the problem of vitamin A deficiency, developing and maintaining a list of all vitamin A projects in the region, and the compilation of relevant workshops and conferences. For information contact: Mr Justin Chisanga, Project Coordinator, Tropical Diseases Research Centre (TFNC), PO Box 71769, Ndola, Zambia. Tel: (260 2) 610961, Fax: (260 2) 612837.

AFRICAN-BASED REGIONAL CENTRES/ASSOCIATIONS

African Training and Research Centre for Women. Contact: UN Economic Commission for Africa, Box 3001, Addis Ababa, Ethiopia.

Centre d'études économiques et sociales de l'Afrique occidentale (CESAO). CESAO aims to promote comprehensive participatory development through primary research and related activities, primarily in the francophone countries of West Africa. Also provides technical training and supports integrated, participatory development projects. BP 305, Bobo-Dioulasso, Burkina Faso.

International Institute of Tropical Agriculture (IITA). IITA, established in 1960, aims to contribute to sustainable and increasing food production in the humid and subhumid tropics by conducting international agricultural research and outreach activities in partnership with African national agricultural research systems, particularly on maize, cassava, cowpea, plantain, soybean, and yam. For more information write to: IITA, Box 5320, Ibadan, Nigeria. Tel.: 41 32 49, Telex: 31417 TROPIB NG, Cable: TROPFOUND IKEJA. Also, Alley Farming Network for Tropical Africa (AFNETA) was founded in November 1988, following a workshop organized by IITA and International Livestock Centre for Africa as a research and development network. The aims are promoting basic and applied research on alley farming, and food-based agroforestry, and testing relevant technology and use of the concept in the diverse environments of tropical Africa among National Agricultural Research Systems. Contact address: c/o IITA at address above. Tel: 234 22 4003 00, Telex: TDS IBA NG 20311 (Box 015) -TROPIB NG 31417.

Institut d'Ophthamologie tropicale de l'Afrique (IOTA). Established in 1952, in Bamako. IOTA addresses problems of blinding diseases in West Africa, carries out studies on ophthalmology, public health, epidemiology, and offers high level surgical expertise and provides training in ophthalmology. It is a WHO collaborating Centre for Prevention in Blindness. Member countries in Africa are: Benin, Burkina Faso, Côte d'Ivoire, Mali, Mauritania, Niger, Senegal, Togo; in Europe, France. Contact: Serge Resnikoff, Director PO Box 248, Bamako, Mali. Tel: (223) 22 27 22, Fax: (223) 22 51 86.

ASIAN/WESTERN PACIFIC-BASED REGIONAL CENTRES/ ASSOCIATIONS/AGENCIES

Asian Vegetable Research and Development Centre (AVRDC). AVRDC assists countries in setting up vitamin A gardens using indigenous foods. A vitamin A home garden has been developed that can supply a family of five with 100% of the recommended dietary allowance of vitamin A all year round. Garden contributions of vitamin C and iron were also very good, and calcium and protein yields were moderate. Contact address: PO Box 42, Shanhua, Tainan, Taiwan, Republic of China, 74119. (Source of description: Mamdani and Ross, 1988, see "Supplementation.")

LATIN AMERICAN-BASED REGIONAL CENTRES/ASSOCIATIONS/AGENCIES

Caribbean Food and Nutrition Institute (CFNI). CFNI is a specialized centre of the Pan American Health Organization. The institute is also responsible to an Advisory Committee on Policy that includes representatives of member governments. Technically, it is guided by a Scientific Advisory Committee of food and nutrition specialists. The institute's goal is to improve the food and nutrition situation in its member countries through the following activities: service, education, training, information dissemination, coordination, and research. Each activity is carried out in close collaboration with member governments. Educational materials produced by CFNI include posters, booklets, audio-tapes, and videotapes on a wide range of nutrition topics. A nutrition quarterly bulletin entitled "CAJANUS" is available free of charge to subscribers in the Caribbean and Latin America; US $6.00 for other developing countries and US $12.00 for developed countries. Contact address: University of the West Indies, PO Box 140, Kingston 7, Jamaica. (Source of description: American Public Health Association.)

Instituto de Nutrición de Centro America y Panama (INCAP). INCAP is a regional institution supported by its donor countries, PAHO/WHO, and other international donors working in the area of food and nutritional sciences. It seeks to promote the practical application of research and strengthen the technical capacity of its members to solve existing food and nutrition problems. Activities at INCAP include training and formal education programs, technical assistance, research, and information services. The INCAP library houses journals, reports, books, and other materials and has access to computerized bibliographic databases including MEDLARS/MEDLINE. The library responds to information requests and provides copies of documents. It also provides technical and material support to libraries and documentation centres in the region. Materials produced include bibliographic packets, annotated bibliographies, distance teaching manuals, and audiovisual materials. "Avances en Alimentación y Nutrición" is a quarterly publication produced for dissemination of information about recent research and projects related to food and nutrition issues in the INCAP region. Contact address: Centro Regional de Documentación, Apartado 1188, 01901 Guatemala, Guatemala. Tel: (5022) 723762, Fax: (5022) 736529, Telex 5696 INCAPGU. (Source of description: American Public Health Association).

OTHER INTERNATIONAL/NONGOVERNMENTAL ORGANIZATIONS

Academy for Education Development (AED). The AED is an independent, non-profit service organization committed to addressing human development needs through education, communication, and information. Working with governments and international agencies, AED in 1991 provided services in 77 countries, including operation of 30 project field offices in 23 countries. Initiatives focus on basic education, human resource development, and social marketing. Headquarters: AED, Inc., 1255 23rd Street, NW, Washington, DC, USA, 20037. Tel: (202) 862-1900, Fax: (202) 862-1947, Telex: 197601 ACADED WSH.

American Public Health Association (APHA). International Clearinghouse on Infant Feeding and Maternal Nutrition. A centre for information and materials on health and nutrition of women and children, Clearinghouse provides access to information through its documentation centre, disseminates information to practitioners in the field, strengthens the capacity of field-based organizations to produce and disseminate information, and promotes networking among organizations and individuals. A bulletin, *Mother and Children* is produced three times a year in English, French and Spanish. The feature article in 1994 (issue 13, No. 1) contained an article on "Combatting anaemia in adolescent girls: A report from India," and the most recent issue (1995, Vol. 14, No. 1, 2) is a special edition of *Mother and Children* for the 4th World Conference on Women. The issue addresses various nutrition and health concerns of women. Contact address: Clearinghouse, APHA, 1015, 15th Street NW, Washington, DC, 20005, USA. Tel: (202) 789-5600, Fax: (202) 789-5661.

Appropriate Health Resources and Technologies Action Group (AHRTAG). Founded in 1977, AHRTAG, supports the goal of health for all by promoting primary health care. AHRTAG provides technical support, training, and resources to organizations in developing countries to enable them to manage their own information services, expand their publishing activities, and improve access to locally relevant materials. African partners include Egypt, Mozambique, Senegal, and Tanzania. AHRTAG has special interests in diarrheal diseases, primary health care management, training, and health education, and publishes and distributes its own newsletters (e.g., Dialogue on Diarrhoea, AIDS Action, and ARI News—all available in English and French.) AHRTAG has compiled an International Breastfeeding Resource Kit that lists organizations involved in promoting breastfeeding, with a section on publications and audiovisual materials. Free to readers in developing countries. Contact: AHGTAG, Three Castles House, 1 London

Bridge Street, London, UK, SE1 9SG. Tel: (44 71) 378 1403, Fax: (44 71) 403 6003, Telex: 912881 TXG, E-mail: GEO2:AHRTAG

Helen Keller International (HKI). HKI, a US-based NGO founded in 1915, provides technical assistance to strengthen existing vitamin A activities and expand vitamin A programs. The services provided include the development of educational and training materials and the dissemination of current literature and information on vitamin A. A pamphlet describing low-cost "Selected publications and training materials for vitamin A deficiency control" is available from HKI; includes slide sets, reports, teaching aids, and pamphlets. Contact address: Helen Keller International, 90 Washington Street, New York, NY 10006, USA. Tel: (212) 943-0890, Fax: (212) 943-1220.

International Baby Food Action Network (IBFAN). IBFAN, PO Box 34308, Nairobi, Kenya; or IBFAN, c/o GIFA, CP 157, 1211 Geneva 19, Switzerland; or IBFAN, c/o Action, 3255 Hennepin Avenue South, Suite 230, Minneapolis, MN 55408, USA.

International Development Research Centre (IDRC). Founded in 1970, IDRC, focuses on supporting research to identify long-term, practical solutions to pressing development problems, and on the development of science and technology capacity in developing countries. Priority themes of IDRC include food systems under stress, health and the environment, biodiversity, and information and communication for environment and development. Support is given directly to scientists working in universities, private enterprise, government, and non-profit organizations. IDRC is funded by the Government of Canada and is directed by an international Board of Governors. Head office: IDRC, PO Box 8500, Ottawa, Ontario, Canada K1G 3H9. Tel: (613) 236-6163, Fax: (613) 563-0815. Regional Office for West and Central Africa: IDRC, BP 11007, CD Annexe, Dakar, Senegal. Regional Office for Eastern and Southern Africa: IDRC, PO Box 62084, Nairobi, Kenya. There are also regional offices in Singapore, New Delhi, Cairo, Montevideo, and Johannesburg.

International Eye Foundation. This is a private, voluntary, non-profit international organization dedicated to the prevention and cure of blindness in developing countries. The foundation works in the areas of food technology, nutrition education, food science, food product development, diet and disease prevention, and health promotion. Operations provide training, equipment and medicines, clinical services, operational research, and development of community-based programs in 10 countries of Latin America, the Caribbean, Africa, and Eastern Europe. The organization conducts research and program evaluation, produces audiovisual materials for professionals, maintains a resource library and provides reference services. Annual reports of the foundation are distributed free. Eye care in developing nations is $20.00. Contact: Laire Isaacson, 7801 Norfolk Avenue, Bethesda, MD 20814, USA. Tel: (301) 986-1830, Fax: (301) 986-1876.

International Food Policy Research Institute (IFPRI) was established to identify and analyze alternative national and international strategies and policies for meeting food needs in the world, with particular emphasis on low-income countries and poorer groups within these countries. IFPRI's research is conducted on the complex issues associated with food production, distribution, consumption, and trade. IFPRI pays particular attention to Africa because of the urgent, complex, and long-term nature of problems faced by this region. IFPRI's research in Africa mainly concerns the identification of improved technology policies, poverty alleviation, and sustainable development strategies. In addition to annual reports and various scientific documents, the institute publishes IFPRI Report which is available free of charge from: International Food Policy Research Institute, 1776 Massachusetts Avenue, NW Washington, DC 20036, USA. Tel: (202) 862-5600, Fax: (202) 467-4439, Telex: 440054.

International Vitamin A Consultative Group (IVACG). The purpose of IVACG, which was established in 1975, is to guide international activities aimed at reducing

vitamin A deficiency in the world. The group offers consultation and guidance to various operational and donor agencies that are seeking to reduce vitamin A deficiency. IVACG sponsors international meetings of experts in the field. A call for abstracts is distributed before each meeting. IVACG has a publication program that has produced a number of valuable technical resources. Single copies of publications are available free to professionals in developing countries and for US $3.50 to those in other nations. For information about IVACG meetings and publications contact: IVACG Secretariat, c/o The Nutrition Foundation, Incorporated, 1126 16th Street NW, Washington, DC 20036, USA.
Tel: (202) 659-9024, Fax: (202) 659-3617, Telex: 6814107 NUFOUND,
Cable: NUTRITION WASHINGTON DC.

International Women's Tribune Centre (IWTC). The IWTC has produced a number of resource materials on women and technology; many IWTC publications are free to people in the Third World. The Tech and Tools book: A Guide to Technologies Women are Using Worldwide, (1986, 200 pp., order no. R5) has useful appendices which list appropriate technology centres, journals, and catalogues. The Tribune, IWTC's quarterly newsletter reporting on women and development issues, is free to groups in the Third World. For ordering information write: IWTC, 777 United Nations Plaza, New York, NY 10017, USA.

The Manoff Group is a technical assistance organization that has 25 years of experience in social marketing in nutrition and health programs in developing countries. Manoff has specialized in assisting governments, NGOs, and international organizations to develop and implement behaviour-change strategies that include breastfeeding, weaning practices, growth monitoring, and micronutrient malnutrition. Contact: Marcia Griffiths, The Manoff Group, 2001 S Street, NW, Washington, DC 20009, USA . Tel: (202) 265-7469, Fax: (202) 745-1961.

Micronutrient Initiative (MI) was established in 1992 by CIDA, IDRC, UNDP, UNICEF, and the World Bank as a means of harmonizing global efforts to fight micronutrient deficiencies, especially in vitamin A, iron, and iodine, by the year 2000 in keeping with the goals of the World Summit for Children. MI seeks to speed up worldwide activities toward elimination and control of micronutrient malnutrition by identifying collaboratively and addressing through established capacities critical elements of sustainable global and national strategies for controlling micronutrient malnutrition. Contact address: Micronutrient Initiative Secretariat, c/o IDRC, PO Box 8500, Ottawa, Ontario, Canada. Tel: (613) 236- 6163, Fax: (613) 236-9579.

Program Against Micronutrient Malnutrition (PAMM) is an international collaborative effort working toward the elimination of iodine, vitamin A, and iron deficiencies by the year 2000. PAMM assists governments to develop the technical capability and management systems to achieve sustained elimination of micronutrient deficiencies by holding workshops and offering technical support and training in skills needed to implement control measures. Training is an important component of PAMM's program. See section 7.2 on training opportunities, materials, and videos. PAMM also publishes a newsletter. For more information contact: PAMM, Centre for International Health, Emory University, School of Public Health, 1518 Clifton Road, NE, Atlanta, GA 30322, USA.
Tel: (404) 727-5417 or 727-5416, Fax: (404) 727-4590.

Sight and Life Task Force. The Sight and Life Task Force was founded in 1986 by F. Hoffmann-La Roche Ltd to help combat xerophthalmia among children living in countries where vitamin A deficiency is a public health problem. Since 1986, Sight and Life has provided assistance in the form of materials (e.g., high doses of vitamin A), finances, or services to 93 intervention projects in 41 countries, 38 research projects in 16 countries, and 26 projects in training and education, and has handled 11 requests for technical assistance from 4 countries. Sight and Life also produces an annual report, a newsletter,

special bulletins on selected topics, and educational materials such as training manuals, pamphlets, videos, and books, some of which are available in a number of languages. For a listing of these and an order form, contact: Sight and Life Task Force, PO Box 2116, Basel, Switzerland. Fax: (41 61) 688 1910.

Teaching Aids at Low Cost (TALC). This organization is dedicated to increasing access to educational materials on health and nutrition. TALC has an extensive listing of books and slide sets that it can provide at low cost. For example, the following slide sets (including scripts) are available: "Xerophthalmia: the diagnosis and prevention of nutritional blindness"; "Primary eye care"; "Foods of West Africa" (describes the preparation and nutritional value of foods commonly fed to children); and "A community workers' newsletter" that describes how a community health program can produce its own newsletter to help isolated workers. TALC has compiled a listing of 42 free newsletters on various topics that affect health, and also offers two libraries containing a selected range of up-to-date medical information selected by experts. For more detailed information or for order forms, write: TALC, PO Box 49, St Albans, Herts, UK, AL1 4AX. Tel: (727) 53869, Fax: (727) 46852, Telex: 266020 CORALP G. Ref.:TALC .

MULTILATERAL AND BILATERAL ORGANIZATIONS

Canadian International Development Agency (CIDA). Founded in 1968, CIDA is a Canadian organization offering financial and technical aid, expert services, equipment, and other forms of assistance to developing countries. Through CIDA, the Canadian government funds projects that support the efforts of developing countries to promote greater social, economic, and political equity. CIDA administers most of Canada's ODA budget and sets priorities based on the Development Assistance Charter. 25% of ODA in Canada will be committed to support efforts to provide "basic human needs" as a means of enhancing Canada's focus on addressing the security of the individual. Nutrition and nutrition in emergencies are among the eight categories of priority needs together with primary health care, basic education, family planning, water and sanitation, shelter, and integrated basic human needs. For more information contact CIDA, 200 Promenade du Portage, Hull, PQ, Canada K1A 0G4. Tel: (819) 997-5456, Fax: (819) 953-5469.

Food and Agriculture Organization (FAO). Established October 1945 as a major United Nations agency to deal with the global food and agricultural issues, FAO activities are aimed at raising the levels of nutrition and standards of living of people in the member countries and to secure improvements in the efficiency of production and distribution of all food and agricultural products. In 1984, FAO contributed to the United Nations 10-Year Plan to Control and Prevent Vitamin A Deficiency, Xerophthalmia and Nutritional Blindness to increase production of vitamin A and carotene-rich foods and ensure their increased consumption. Safeguarding Sight is a 4-page pamphlet summarizing FAO actions against vitamin A deficiency. Contact address: Vitamin A Program, Food Policy and Nutrition Division, Viale Terme di Caracalla, Rome, 00100. Tel: 396 5797 3330, Fax: 396 5797 3152.

International Network of Food Data Systems (INFOODS). INFOODS was established in 1983 under the aegis of the Food and Nutrition Programme for Human and Social Development of the United Nations University to promote global collaboration among those concerned with the (nutrient and non-nutrient) composition of foods. The goal of INFOODS is to improve the amount, quality, and availability of food composition data; to develop standards and guidelines for the collection, compilation, and reporting of food component data; and to establish regional organizations that can provide database support and services for the national needs and permit data interchange among different regions of the world. Regional INFOODS associations include OCEANIAFOODS, ASEANFOODS, LATINFOODS, and EUROFOODS. An AFROFOODS initiative, to

focus on food composition in Africa through a proposed regional network of food and nutrition organizations, plus two more regional databases are in the late stages of development. A directory of all available food composition tables and databases in the world has been compiled and distributed, and a revised edition is planned. Contact address: Food and Nutrition Programme for Human and Social Development, United Nations University, Charles Street Station, PO Box 500, Boston MA 02114-0500, USA. Tel: (617) 227-8747, Fax: (617) 227-9405, Telex: 6503978146 MCI UN. Or, Barbara Burlingame, Crop and Food Research, Palmerstone North Research Centre, Private Bag 11030, Palmerstone North, New Zealand. Tel: (64 6) 351-8300, Fax: (64 6) 351-7050, E-mail:burlingame@crop.palm.cri.nz.

International Atomic Energy Agency (IAEA). The IAEA supports a number of research programs in the area of human nutrition. All programs involve some aspect of isotope usage or radiation although this component may be relatively small. The main mechanisms of support are coordinated research, technical cooperation including training, and analytical services. Research programs include extensive work on iron, zinc, and iodine including dietary availability and human dietary intake of trace elements. Contact address: Section of Nutritional and Health-Related Environmental Studies, IAEA, PO Box 100, A-1400 Vienna, Austria. Tel: (43 1) 2360 1657, Fax: (43 1) 234564. (Source of description: SCN News No. 9, 1993.)

Opportunities for Micronutrient Interventions (OMNI). Developed and funded by the Office of Health and Nutrition of the US Agency for International Development in Washington, DC, the OMNI project is a comprehensive 5 year (1993-98) effort to control and prevent micronutrient deficiencies in developing countries . Participating countries will be selected based on their micronutrient malnutrition problems, the commitment by local officials (public and private) to micronutrient activities, and their capacity to achieve and sustain a demonstrable impact. For information contact the OMNI Project, c/o John Snow Inc., 1616 North Fort Myer Drive, Suite 1100, Arlington, VA 22209, USA. Tel: (703) 528-7474, Fax: (703) 528-7480.

PHNLINK is an electronic network service conceived in 1993 by the Human Development Department at the World Bank. The objective is to establish a low-cost, rapid, and effective information sharing mechanism through linking electronically individuals and groups particularly in developing countries. Three electronic services offered by PHNLINK are PHNFLASH, QCARE, and PARTNERS.

PHNFLASH is a weekly newsletter and archiving service on population, health, and nutrition issues which is distributed through electronic mail to some 1500 subscribers around the world. This medium has been used by other organizations and groups (such as MI, OMNI, APHA Clearinghouse on Infant Feeding and Maternal Nutrition, and Population Centre of Johns Hopkins University) for sharing their information and news with others. QCARE is a discussion group on health quality assurance and improvement in developing countries. PARTNERS is a Health Network developed jointly by WHO, UNDP, and the World Bank to support the implementation of health reform in developing countries, with more than 234 subscribers in 27 countries.

To subscribe send an electronic mail message addressed to Listserv@tome.worldbank.org. In the text body type: subscribe PHNFLASH Your First Name Your Last Name (do not add any additional words to the specified command, and send a separate message for each service).

UN Administrative Committee on Coordination/Sub-Committee on Nutrition (ACC/SCN). A focal point for harmonizing the policies and activities in nutrition of the United Nations system. Almost all UN and bilateral donor agencies concerned, directly or indirectly, with nutrition issues are members of the SCN. The SCN compiles and disseminates information on nutrition, reflecting the shared views of the agencies concerned. It sponsors working groups on intersectoral and sector-specific topics, and has launched 10-

year programs to address two major micronutrient deficiencies: vitamin A and iodine. The major activities of SCN are: issuing regular reports on the world nutrition situation; holding symposia and workshops; producing a newsletter called SCN News and state-of-the-art papers to summarize current knowledge on selected topics; and assessing the flows of external resources to address nutrition problems. The Secretariat is hosted by WHO in Geneva, Switzerland. Contact address: ACC/SCN, c/o WHO, Avenue Appia, 20, CH-1211 Geneva 21, Switzerland. Tel: (41 22) 791 0456, Fax: (41 22) 798 8891.

United Nations Children's Fund (UNICEF). A specialized agency of the United Nations that aids governments in their efforts to undertake long-range and far-reaching programs benefiting women and children. In general, UNICEF pursues two fundamental goals: to help developing countries meet some of the immediate needs of their young and to help them strengthen their long-range services for children as essential parts of their overall development efforts. UNICEF has been the main advocate for "adjustment with a human face." UNICEF goals and strategies for the 1990s have focused on survival, development, and protection of children. Some of the major goals for the year 2000 include: reducing by a third of the mortality rates for infants and young children and for mothers in childbirth by half; virtually eliminating severe malnutrition and reducing moderate malnutrition by one-half of 1990 levels; eradicating polio; eliminating neonatal tetanus; and immunizing at least 80% of young children against other diseases; reducing child deaths due to diarrhea by 70% and cutting ARI mortality by 25%; eliminating blindness caused by vitamin A deficiency; eliminating IDD and reducing anemia by one third. UNICEF produces various publications and documents: UNICEF Annual Report in English, French, and Spanish; Annual Progress Report of the Executive Director in English, French, Russian, and Spanish; the State of the World's Children Report in Chinese, English, French, Russian, and Spanish; UNICEF Video, Film and Radio Catalogue. In addition, a variety of books, monographs, reports, and serials about women and children in developing countries are produced by UNICEF. Contact address: your national UNICEF office, or UNICEF House, Three United Nations Plaza, New York, NY 10017, USA. Tel: (212) 326-7000.

UN Development Fund for Women (UNIFEM). UNIFEM's mission is to enable women of the developing world to achieve their objectives for economic and social development, and, by so doing, improve life for women and men alike. UNIFEM directly funds programs and projects that enable women to enhance their economic and civic activities that ensure that the needs of both women and men receive consideration when large-scale assistance is given to developing countries, through involvement in programming and project design, monitoring, and evaluation. In Africa, UNIFEM's recent support has focused on helping to improve the livelihood of some of the continent's poorest women farmers, especially those battling against environmental degradation, and on helping women in small-scale commercial and trading activities. Created in 1976, UNIFEM works in autonomous association with the United Nations Development Programme. For further information on UNIFEM, its work, and its publications contact: Information Officer, UNIFEM, 304 East 45th St, Room 612, New York, NY 10017, USA. Tel: (212) 906-6453, Fax: (212) 906-6705.

United States Agency for International Development (USAID). Since the 1960s, USAID has played a major role in supporting research and programming to develop a sound scientific foundation for action and implementing mechanisms for international coordination, consensus building, and information sharing. To improve the prospects for child survival in the developing world, USAID has focused efforts on breastfeeding promotion, improved infant and child feeding practices, vitamin A supplementation and other interventions to address major micronutrient deficiencies, as well as supplementary feeding of mothers and children. To fight micronutrient deficiencies, USAID has supported IVACG beginning in 1975; INACG beginning in 1977; Centre for Epidemiology and Preventive Ophthalmology at Johns Hopkins University, the VITAL project (1989-94); and the OMNI (Opportunities for Micronutrient Interventions) Project to support

long-term country programs, short-term technical assistance, training, and information dissemination. USAID publishes various newsletters and information sheets. Contact address: Office of Health and Nutrition, Bureau for Global Programs, USAID, Washington, DC 20523-1808, USA. Tel: (703) 875-4600, Fax: (703) 875-4686.

Vitamin A Field Support Project (VITAL). The VITAL Project, funded by USAID and managed by the International Science and Technology Institute, ended in mid-1994. For information about ordering publications VITAL has produced, contact the OMNI Project, c/o John Snow Inc., 1616 North Fort Myer Drive, Suite 1100, Arlington, VA 22209, USA. Tel: (703) 528-7474, Fax: (703) 528-7480.

World Health Organization (WHO) is a major UN agency charged to act as the world's directing and coordinating authority on questions of human health. WHO has developed a host of networks and mechanisms for generating data, applying facts to problems, and recommending solutions that will lead to sustained improvements in health. A "Nutrition publication catalogue" giving information on publications in the area of nutrition is available from WHO. "Let there be sight" is a pamphlet produced by WHO on vitamin A containing useful information in the form of articles, a poster, and a map. Contact address: B. Underwood, Nutrition Unit, Division of Food and Nutrition, WHO. Avenue Appia, 1211 Geneva 27, Switzerland. Tel: (41 22) 791 4146, Fax: (41 22) 791 4156. For the Regional Office for Africa contact: Regional Officer, Nutrition, Regional Office for Africa, PO Box 6, Brazzaville, Congo. Tel: 242 83 18 79, 242 83 38 65, Fax: 242 83 18 79. For the Eastern Mediterranean Regional Office contact: Regional adviser for nutrition. PO Box 1517, Alexandria, Egypt, 21511. Tel: (20 3) 482 0223/0224, Fax: (20 3) 483 8916.

ANNEX: ACC/SCN STATEMENT ON THE CONTROL OF VITAMIN A DEFICIENCY

The following statement was agreed upon by participants at the ACC/SCN Consultative Group Meeting on Strategies for the Control of Vitamin A Deficiency, supported by the Canadian International Development Agency and the Micronutrient Initiative, and held at the Micronutrient Initiative, Ottawa, 28-30 July 1993.

The elimination of vitamin A deficiency as a public health problem has been identified as a high priority in international nutrition and health by the International Conference on Nutrition, the World Summit for Children and the World Health Assembly. Control of vitamin A deficiency in many areas of the world will lead to substantial and lasting improvement in childhood survival as well as preventing the scandal of irreversible blindness due to malnutrition.

The cause of vitamin A deficiency is a lack of pre-formed vitamin A, carotene and sometimes fat and oil in the diet. Promoting the year-round availability and adequate consumption of vitamin A/carotene-rich foods and dietary fat is fundamental to eradicating the deficiency. Because prevention of vitamin A deficiency is an integral part of the overall strategy to improve nutritional well-being and child health, and to conserve limited resources, vitamin A programmes should be integrated with other programmes concerned with health and development. Efforts to identify, advocate, plan, implement, evaluate, and monitor the control of vitamin A deficiency should as far as possible be combined with the control of other co-existing nutritional deficiencies. The following specific points concerning vitamin A deficiency control were agreed:

1. A combination of interventions is usually needed to prevent vitamin A deficiency; these include dietary modification (including the production, processing, marketing and consumption of vitamin A/carotene-rich foods), breastfeeding promotion, food fortification, and supplementation. The appropriate combination of interventions may change over time, depending on trends in the level of deficiency, programme outreach to vulnerable population groups, availability of technical inputs, and administrative and political priorities.

2. Periodic situation analyses and the evaluation of programme cost-effectiveness provide a basis for adjusting strategies, especially in relation to population responses to intervention activities, and provide the opportunity for phasing out programme components, as appropriate.

3. In all circumstances, the promotion and protection of breastfeeding is a fundamental aspect of preventing deficiency of vitamin A. Promotion should include attention to initiation, optimal breastfeeding practices, and duration, as required by local situations. Enhancing the nutritional status of the mother is a valuable component of such breastfeeding promotion activities.

4. Nutrition education is an essential component of programmes aimed at preventing vitamin A deficiency. Dietary modification can also be supported by other means, such as social marketing and promotion of home production.

5. If dietary sources of vitamin A are not readily available to those at risk of deficiency, intervention activities should include improving their availability. Efforts may be needed to improve the production, processing, preservation, pricing and marketing of such foods. Bioavailability of the vitamin A should be increased by ensuring that diets contain sufficient fat and that intestinal parasites are controlled.

6. Dietary modifications that increase vitamin A intake will often improve the status of other micronutrients, particularly iron and vitamin C. For example, many foods that promote iron absorption (especially green leafy vegetables, animal products and some fruits) are also good sources of vitamin A. Furthermore, improving vitamin A status can also improve iron status through an interaction between these two nutrients. Therefore, a combined food-based approach to deficiencies of vitamin A and of iron should be pursued.

7. Where feasible, food fortification is a highly recommended intervention for the prevention of vitamin A deficiency. Consumption of processed foods by the target population, food technology expertise, and multisectoral commitment are requisites for successful food fortification programmes. Social marketing may also have an important role in increasing awareness of the problem and creating demand for action. Early participation of the food industry in this process and an effective food control system are essential.

8. In situations where vitamin A deficiency is endemic in the population, certain opportunities may be taken to provide high-dose preparations of vitamin A. The first of these is with immunization contacts from 6 months of age, especially the 9 months measles contact. Secondly, if the mother is in contact with health services (e.g. attended delivery or postnatal visit), provision of a single large dose of vitamin A within the first 4 weeks after birth can improve the vitamin A content of breast milk and hence offer protection of the breast fed infant. Thirdly, for children between 1-5 years, other contacts with health services may also be appropriate for providing supplements; in this case adequate record-keeping is necessary to reduce the dangers of excess supplementation and to ensure that potency of preparations is maintained by regular turnover of stocks.

9. Case management of measles and of severe protein-energy malnutrition requires the therapeutic use of high-dose preparations of vitamin A where there is a risk of subclinical deficiency; this use should not be limited to children with clinical vitamin A deficiency. The goal here is an immediate effect on the course of morbidity and on reduction of case fatality rates. Such case management is complementary and additional to approaches for controlling vitamin A deficiency at a population level.

10. Political support and sustained allocation of government resources are needed for the development, implementation and maintenance of vitamin A programmes. Support from international organizations (multilateral, bilateral, and non-governmental) is important in fostering political commitment, and often in providing financial support in line with local priorities.

11. Linking research and human resource development with intervention activities continues to be important in initiating, maintaining and building on vitamin A interventions.

12. Effective management is essential to the success of any type of vitamin A programme. Experience has shown that the success of vitamin A programmes is limited more by management problems than by lack of appropriate intervention technologies. Development of an effective management system will usually require as much attention as the choice of intervention. Similarly, evaluation of vitamin A programmes should involve management aspects as well as impact.

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