Pan American Health Organization

ADVISORY COMMITTEE ON MEDICAL RESEARCH

Eighth Meeting

Washington, D.C., 9-13 June 1969

Item 11.5 of the Agenda


SCIENTIFIC GROUP ON HYPOVITAMINOSIS A


Ref: RD 8/11

20 May 1969


PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION

Washington, D.C.
INTRODUCTION

Hypovitaminosis A attracted attention as a public health problem in Latin America and the Caribbean area at the first and second Pan American Health Organization Technical Advisory Committee Meetings on Nutrition in 1962 and 1968 and as a result of the worldwide WHO Survey of Xerophthalmia in 1962 (1).

Although hypovitaminosis A is a well known problem in S.E. Asia, where preventive measures are attempted, it has received only minor attention in this respect in Latin America and the Caribbean.

The ocular manifestations of severe deficiency are relatively clear and in theory should be easy to quantify. Due, however, to deficient morbidity and mortality statistics, it is difficult to define accurately even these parameters of the problem. Nutrition workers are relatively unqualified in the diagnosis of eye disease and alternately many physicians are unaware of the nutritional etiology of xerophthalmia.

The milder forms of hypovitaminosis A present even greater problems in assigning priorities in the context of public health. From experiments in animals, however, it can be assumed that prolonged low intake of vitamin A and its precursors may have a serious effect on growth and development and on resistance to infectious diseases.

*Prepared for the 8th Meeting of the PAHO Advisory Committee on Medical Research by Dr. J.G. Chopra, Adviser, Nutrition Research, and Dr. J. Kevany, Regional Adviser in Nutrition, Pan American Health Organization, Washington, D.C.*
Results of many nutrition surveys show that dietary vitamin A deficiency is widespread in sectors of the population in many parts of this hemisphere. Partial and total blindness resulting from severe vitamin A deficiency in association with protein-calorie malnutrition has also been reported, often associated with high case fatality rates. Xerophthalmia is of special importance where distribution of skim milk has been made to population groups whose diets are deficient in both protein and vitamin A as in some parts of Latin America and the West Indies.

It is apparent, therefore, that hypovitaminosis A represents a public health problem in this hemisphere. Despite the apparent interest in this subject in scientific literature however, and the considerable epidemiological data available for this hemisphere, relatively little action has been taken to combat or control this disorder either in its severe or milder form. Local health services lack criteria for the diagnosis, treatment and prevention of the disease and consequently interest in action programs has been minimal. Though the increased consumption of foods rich in vitamin A and beta-carotene is an ideal long-term solution to the problem, alternative methods for interim use are not currently available to health agencies.
As the agency responsible for international health services in Latin America and the Caribbean, it is important that the Pan American Health Organization take some action in this respect. A technical group was therefore convened to evaluate the vitamin A situation in this region and to assist in defining lines of action for the future. This group met in the Pan American Health Organization headquarters in Washington, D.C., from 28 to 30 November 1968. The following summary represents the synthesis of their views on the question of hypovitaminosis A in the Americas.

**DEFINITION OF HYPOVITAMINOSIS A AND CRITERIA FOR DIAGNOSIS**

The following definition was proposed for hypovitaminosis A, as it may be applied to human populations in the context of public health practice:

"The presence of depleted tissue stores and low serum levels of vitamin A which may result from a prolonged deficient dietary intake and lead to serious clinical lesions of the eye."

Criteria for diagnosis of hypovitaminosis A should include:

a. clinical  
 b. biochemical  
 c. dietary

Any one indication by itself is not sufficient proof of vitamin A deficiency, but should arouse suspicion. Many factors,
nutritional, physiological and pathological, can influence vitamin A status and must be taken into account.

A. **Clinical Criteria for Diagnosing Hypovitaminosis A**

Abnormalities of the eye are the only reliable signs for diagnosing clinical vitamin A deficiency in man. There is insufficient proof that follicular hyperkeratosis depends exclusively on the depletion of the tissue stores of vitamin A. The following points are important to consider in clinical diagnosis of eye lesions resulting from avitaminosis A:

1. The ocular changes indicating vitamin A deficiency are nyctalopia and xerophthalmia.
   
   a. Nyctalopia or night blindness is caused by loss of function of the rods and is manifested by impairment of vision at low light intensity. It is preceded by a decrease in dark adaptation. Nightblindness, however, may also be due to non-nutritional causes as in congenital nightblindness, retinitis pigmentosa and Oguchi's disease.
   
   b. Xerophthalmia is a dyskeratosis of the transparent epithelia of conjunctiva and cornea exposed to the atmosphere and to the light in the inter-palpebral space. The conjunctiva shows "xerosis", that is, evidenced by poor maintenance of the covering film and the keratinization of the
epithelium—resulting in an unwettability by tears, combined with opacity, stiffness of the conjunctiva manifested as thickened folds, especially on movements of the eye.

2. Bitot's Spots - The accumulation of an abnormal greasy foamy substance often causes formation of Bitot's spots. These are whitish, sometimes triangular plaques especially adjacent to the temporal region of the limbus. Bitot's spots may accompany the generalized conjunctival xerosis. They are then usually part of the ocular manifestations of vitamin A deficiency and the subjects more commonly a preschool child or infant. However, Bitot's spots are also frequently observed, usually in school-age children and adults, as isolated and often minimal lesions in subjects with no evidence of vitamin A deficiency.

B. Biochemical Criteria for the Evaluation of Hypovitaminosis A

1. The estimation of the concentration of retinol in the blood plasma is the most convenient way at the present time in field studies of population groups to determine the prevalence of hypovitaminosis A resulting from insufficient intake of vitamin A.

2. Plasma vitamin A concentration should be considered in accordance with some guides for their interpretation.
Guidelines proposed by the Office of International Research (O.I.R.) of the National Institutes of Health of the U.S.A. (2) should be followed until more precise criteria becomes available.

The following prevalence should be considered evidence for the existence of a public health problem related to hypovitaminosis A in population groups:

- a) A prevalence of less than 20 micrograms of retinol per 100 milliliters of plasma in 15 percent or more of the population.

- b) A prevalence of less than 10 micrograms of retinol per 100 milliliters of plasma in 5 percent or more of the population.

In view of the marked differences in serum levels between sex and age groups noted in some surveys, these subcategories should be tabulated separately.

3. In the interpretation of the findings, it is emphasized that the sector of the population with plasma vitamin A concentrations of less than 10 micrograms per 100 milliliters represents a high risk group, unprepared to face nutritionally adverse conditions such as temporary shortage of foods rich in
vitamin A due to seasonal variations, infections, protein-calorie malnutrition or selective dietary supplementation with protein alone.

C. Criteria for the Evaluation of Vitamin A Intake

1. In evaluating dietary intake of vitamin A, the allowance proposed in the 1965 report of the FAO/WHO expert group on vitamin requirements should be followed (3). Intake of total protein, animal protein, calories and fat should be considered together with vitamin A requirements. Protein deficiency impairs intestinal absorption, transport and metabolism of retinol, and depresses conversion of carotene to the vitamin. Very low fat may decrease the availability of vitamin A and carotene.

2. Dietary intake of vitamin A should be reported in micrograms of actual retinol, beta-carotene and/or vitamin A active carotenoids, since the suggested correction for the efficiency of utilization of beta-carotene and other active carotenoids is tentative. Total retinol equivalence should be calculated as the sum of:

\[
\text{mcg. retinol} + \text{mcg. B-carotene} \times \frac{1}{6} + \text{mcg. pro-vitamin A carotenoids other than beta-carotene} \times \frac{1}{12}
\]
When the estimated distribution of vitamin A activity between beta-carotene and other carotenoids in a mixture is not well established, the micrograms of the mixture should be multiplied by 1/9, as an estimate of its retinol equivalence.

3. Dietary surveys should show the seasonal variations in vitamin A intake. The seasonal context of data obtained at a single point in the year should be stated.

THE AVAILABLE DATA IN THE AMERICAS

Among infants and young children, the most common evidence of severe avitaminosis A are xerophthalmia and keratomalacia.

The regular occurrence of xerophthalmia cases in an area is indicative of a very serious preschool public health nutrition problem. The high case fatality rate of at least 25 percent contributes to under-estimation of its magnitude. The severity of the eye lesions and the fatality are inversely related to age and are greater in males than in females. Advanced xerophthalmia however is not likely to be found in the course of surveys as it usually occurs in severely malnourished pre-school children who are more apt to be in the hospitals, inaccessible at home, or to have died.
This condition is generally found in those parts of Caribbean, Central and South American areas where living standards for the majority of people is low. The preschool child, and more specifically those from six months to four years of age, represent the most vulnerable sector in the deprived groups, and these are especially difficult to reach and protect.

In the past reliance has chiefly been placed on the diagnosis of cases of xerophthalmia to map the occurrence of severe hypovitaminosis A. While it is true that a highly endemic area of xerophthalmia undoubtedly indicates a serious hypovitaminosis A problem, it must be recognized that the population potentially "at risk", as indicated by dietary and biochemical data, is much larger. Thus, the problem may be much more extensive than is indicated by the prevalence of eye lesions alone. As the young child with xerophthalmia usually suffers from concurrent severe protein-calorie malnutrition, the prevalence of this condition is a useful indicator. The proportion of cases of severe protein-calorie malnutrition with xerophthalmia in the preschool population in Latin America varies from less than 1 percent to over 75 percent depending upon the locality. The prevalence appears to be related to vitamin A activity in
the presence of protein-deficient diets and is probably due to impaired transport and storage of the vitamin and also the decreased conversion of B-carotene.

In a survey carried out by Escapini in Latin America and the Caribbean, in which 2532 children were examined in eleven countries, 14.7 percent revealed evidences of malnutrition of which 1.4 percent had eye lesions manifested as ulcers or keratomalacia (4). Xerophthalmia in the malnourished group alone was 9.7 percent. The incidence of xerophthalmia was greatest from July to December and corresponded directly to seasonal increases of gastro-intestinal infections of childhood.

Furthermore, in 500 cases of malnutrition examined in a children's hospital in San Salvador, 13.2 percent had advanced eye changes with degree of malnutrition as shown in Table 1. It was observed that 14.5 percent of the children with third-degree malnutrition showed xerophthalmia in varying degrees.

Biochemical Data

Levels of vitamin A in the serum, because of the readiness with which the vitamin is taken up by the liver, do not reflect status except in extremes of hypo and hypervitaminosis A. Furthermore, in the absorptive phase they are much influenced by intake. Serum carotenoid levels are under the influence of dietary
intake in the recent past and resemble this qualitatively and quantitatively.

Biochemical data is therefore difficult to correlate with average intake and clinical manifestations. It may be used, however, to indicate the probability of inadequate intake when 15% or more of the persons surveyed have serum values less than 20 mcg per 100 ml, and/or 5% or more present serum values less than 10 mcg per 100 ml. Persons with less than 10 micrograms percent vitamin A are likely to have significantly depleted liver stores and can be considered as potential clinical cases.

The data presented in Table 2 include serum vitamin A values from ICNND surveys in Latin America and the West Indies. From 5 to 45 percent in the overall populations surveyed had serum vitamin A levels under 20 micrograms percent. Vulnerable groups including children and pregnant women had even higher portions of low or deficient values.

Dietary Data

From 1951 to 1966 in 14 countries, national nutrition organizations, sometimes in collaboration with outside agencies, made dietary surveys in 156 localities covering some 4400 families.
Survey sites in 16 countries were selected to represent different areas, and coverage was more extensive in some cases than in others; seasonal variations were rarely recorded. Foods were weighed in daily visits to homes for seven days or sometimes less, and nutrients were calculated with food composition data from various Latin American areas, most commonly of uncooked foods.

Table 3 shows the proportion of families in each of these countries receiving less than half the recommended amounts of vitamin A. In all the areas included, an average of 54 percent of the families were in the low category.

Since the vitamin A value of vegetable foods may have been overestimated in the food composition tables used, more localities would actually fall into lower intake levels than indicated in the tabulations.

Data tabulated in some countries by socio-economic level showed that lower intakes of calories, fat, total protein, animal protein, preformed vitamin A, and vitamin A equivalents usually corresponded to lower socio-economic levels. Rural and indigenous classes often belonged to these lower levels.
ICNND Surveys in South America and the West Indies

Food intake data in these surveys were collected by the one-day recall technique at survey centers, by interview with housewives. Data on foods consumed in a locality were pooled and locality averages calculated. The food composition data used was essentially that described in the preceding section, and vitamin A was expressed in International Units.

A distribution of the 147 localities surveyed (shown in Table 4) shows that about 25 percent consumed less than 1000 International Units of vitamin A per person per day, and 60 percent, less than 3000 I. U. An acceptable intake was usually estimated at about 3500 I. U. per person per day. The variations by country were great and reflected time of year as well as place.

The average vitamin A intake for the nine areas was over 3000 I. U. per person per day. The low intakes for Colombia may reflect under-reporting and the data for Northeast Brazil represent a problem area following a prolonged drought. Values obtained by Brazilian workers, in another year, showed higher levels (5).
A distribution of Central American families by vitamin A intake level and by country is shown in Table 5. Intake averaged 612 micrograms per day, varying between countries from 453 micrograms to 832 micrograms. About 37 percent of the vitamin A was preformed. This proportion also varied between countries, and was lowest in Guatemala with the highest composite intake.

Over half of all the families had less than 400 mcg. of vitamin A per person per day, a very deficient level compared to allowances recommended by the 1965 FAO/WHO Expert Committee on vitamin requirements of the order of 1100 micrograms (3). Because the vitamin A value of vegetable foods given in the food composition tables used may be over-estimated, intake levels may be even lower.

The preliminary results of INCAP-NIH survey on 202 preschool children of rural and semi-rural sectors in four of the Central American countries showed that the average intake of the group as a whole was 40 percent of the estimated needs. Only seven percent of the children had intakes of 600 micrograms or over, a level close to the estimated needs of the average. Forty-two percent of the vitamin A value of the diets in the group as a whole was from animal sources.
The ICNND survey in 15 localities in Northeast Brazil (6) showed that the average vitamin A intake of 170 children under 2 years of age was 137 mcg, representing 27 percent of the recommended allowance (3). In this survey 53 consumed less than half and only 7 percent approached the recommendations of FAO/WHO expert committee (3) for vitamin A.

The biochemical and dietary surveys have revealed the fact that there is a low daily consumption of vitamin A in all levels of the population in several countries of this hemisphere. At present endemic xerophthalmia appears to be confined to those parts of Central and South America where the living standards for the majority are low.
RECOMMENDATIONS ON TREATMENT AND PREVENTION OF VITAMIN A DEFICIENCY

A. Treatment

The Committee recommends the following course of treatment in manifest cases of vitamin A deficiency.

1. First three days: 10,000 I. U. per kilogram of actual body weight per day of watermiscible vitamin A orally, plus the same amount intra-muscularly, equal to a total of 20,000 I. U. per kilogram* per day. Next three days: 10,000 I. U. per kilogram per day orally.

2. A maintenance dose of two or three times the recommended allowance for age or about 5000 I. U. per child per day orally, which may be provided by about 10 ml. of cod liver oil.

3. Vigorous treatment of the underlying condition which is frequently associated with xerophthalmia.

4. Adequate food intake, with particular reference to amount and quality of dietary protein and calories.

*For the convenience of local health workers, dosage schedules are expressed as I. U. instead of retinol.
B. Specific Protection

Specific protection measures are directed at those groups which are susceptible to severe manifestations of vitamin A deficiency; young children, and pregnant and nursing women.

Infants and preschool children

It is suggested that 100,000 I. U. of watermiscible vitamin A be administered orally one to four times a year for at least two years, to all children from the third month of life on, in areas where avitaminosis A is a public health problem. The proposed dose is in the order of magnitude of the recommended allowances, and may be administered at quarterly intervals. Such a program could be linked to existing programs of maternal and child health.

Pregnant and lactating women

The Committee does not recommend administration of vitamin A to pregnant women beyond the daily allowances recommended by the WHO/FAO Expert Committee on vitamin requirements which is that for the normal adult. According to some indications, high doses of vitamin A during pregnancy may have harmful effects on the foetus (7).
On the other hand, the Committee suggests that lactating women be given an oral dose of 100,000 I. U. of watermiscible vitamin A immediately after delivery to protect the child during the first weeks of life. This can easily be done through maternity services. The Committee also suggests that the collaboration of the traditional midwives be enlisted in referring lactating mothers to health centers for preventive dosage.

The new-born child should not be given a high dose of vitamin A since the very young seem particularly susceptible to hypervitaminosis A (8).

Although the Committee recognizes that information on the effectiveness of the proposed measures is still scarce, it feels that they may be useful in the protection of vulnerable groups.

Abundant evidence indicates that watermiscible preparations of preformed vitamin A are best utilized by the body, whether administered orally or intramuscularly and should be used whenever available.
PREVENTION

A. Specific Measures

1. Enrichment with vitamin A of foods such as dried skim milk, etc., widely distributed by international, bilateral and national programmes.

2. Enrichment of dietary supplements, in particular low-cost high protein foods for infants and preschool children.

3. Enrichment of items in very general use, such as cereal products, vegetable oils, other fats, etc.

B. General Measures

Measures for improving nutritional conditions in a population include nutrition education of the consumer to encourage the preferential consumption of those animal products, cereals, vegetables and fruits varieties which are richest in vitamin A or its precursors, especially in areas where hypovitaminosis A is prevalent.

Although food habits do change, the desired direction of change is often difficult to accomplish. Conditions under which food habits originally change, and the obstacles which may impede a desired change, must be known. The social
anthropologist can provide such knowledge, essential for increasing consumption of foods to meet nutritional needs.

Through national food and nutrition policies, governments should stimulate increased production of foods known to be good sources of vitamin A. These foods should be acceptable and within economic reach of the needier sectors of the population. Fruit, vegetable and animal production should be so planned as to provide year-round vitamin A sources. These measures require the joint planning and collaboration of the agricultural, social, educational and health sectors.

RECOMMENDATIONS FOR FURTHER RESEARCH

Action by international organizations is desirable for the encouragement of:

1. The standardization and cross-checking of techniques used in the study of hypovitaminosis A in the region, particularly:
   a. chemical methods for the estimation of retinol and carotenoids in blood.
   b. methods for measuring the efficiency of dark adaptation.

2. Surveys of food consumption of individuals, particularly of the vulnerable groups, in areas or population sectors
3. The improvement of food composition tables by accumulation of further data on retinol and carotenoid content, especially in foods which form important sources of these substances.

4. Recording through population census figures the prevalence of blind individuals and the ages at which blindness began.

5. Epidemiology of xerophthalmia in the preschool child, especially those aspects leading to practical application of health measures.

6. The effectiveness of various preventive techniques for the control of vitamin A deficiency.

7. Techniques for the fortification of dietary staples with vitamin A under varying commercial and socio-economic conditions.

CONCLUSIONS

The general consensus of the clinical, biochemical and dietary data presented indicates that hypovitaminosis A is a problem of public health importance in the Americas. While
indications of vitamin A deficiency are greater in some geographic areas or countries than in others, a portion of the population in most areas is affected, commonly the young children in the poorer groups.

The international agencies should stimulate action to control and prevent this disease through national health services and encourage research to fill identified gaps in the current knowledge of vitamin A nutriture. Some important measures are proposed and areas for needed research indicated in this report.
### Table 1

**Eye Lesions and Mortality in 500 Cases of Advanced Malnutrition**

*Children's Hospital, San Salvador*

<table>
<thead>
<tr>
<th>Stage of malnutrition</th>
<th>Number</th>
<th>With eye lesions Percent</th>
<th>Mortality Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1 and 2</td>
<td>108</td>
<td>8.3</td>
<td>11.1</td>
</tr>
<tr>
<td>Stage 3 (Kwashiorkor)</td>
<td>275</td>
<td>12.4</td>
<td>18.2</td>
</tr>
<tr>
<td>Stage 3 (Marasmus)</td>
<td>117</td>
<td>19.7</td>
<td>29.9</td>
</tr>
<tr>
<td>(All forms stage 3)</td>
<td>(392)</td>
<td>(14.5)</td>
<td>(21.7)</td>
</tr>
</tbody>
</table>

All stages 500 13.2 19.4
Table 2

Serum Vitamin A Levels in Latin America and the West Indies

(ICNND Data, 1959-1967)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Overall Population</th>
<th>Persons under 15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of subjects</td>
<td>Serum Levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% distribution</td>
</tr>
<tr>
<td>Central America</td>
<td>5,879</td>
<td>12.8 1.5</td>
</tr>
<tr>
<td>Panama</td>
<td>763</td>
<td>6.8 0.3</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>983</td>
<td>9.6 0.5</td>
</tr>
<tr>
<td>Guatemala</td>
<td>1,219</td>
<td>9.8 1.7</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1,095</td>
<td>13.0 1.6</td>
</tr>
<tr>
<td>Honduras</td>
<td>923</td>
<td>18.0 3.5</td>
</tr>
<tr>
<td>El Salvador</td>
<td>896</td>
<td>20.0 1.3</td>
</tr>
<tr>
<td>S. America/W. Indies</td>
<td>2,910</td>
<td>19.0 4.4</td>
</tr>
<tr>
<td>Venezuela</td>
<td>329</td>
<td>4.9 0.0</td>
</tr>
<tr>
<td>Paraguay</td>
<td>886</td>
<td>6.5 0.1</td>
</tr>
<tr>
<td>Uruguay</td>
<td>111</td>
<td>12.0 0.0</td>
</tr>
<tr>
<td>Colombia</td>
<td>156</td>
<td>16.0 1.2</td>
</tr>
<tr>
<td>West Indies</td>
<td>530</td>
<td>27.7 7.7</td>
</tr>
<tr>
<td>Brazil</td>
<td>342</td>
<td>29.0 14.0</td>
</tr>
<tr>
<td>Chile</td>
<td>143</td>
<td>30.0 2.8</td>
</tr>
<tr>
<td>Bolivia</td>
<td>413</td>
<td>37.0 8.1</td>
</tr>
<tr>
<td>All countries</td>
<td>8,789</td>
<td>14.9 2.5</td>
</tr>
</tbody>
</table>
Table 3

Distribution of Families by Vitamin A Intake Level

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of localities</th>
<th>Number of families</th>
<th>Families with half the recommended allowances of vitamin A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panama</td>
<td>4</td>
<td>104</td>
<td>88%</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1</td>
<td>20</td>
<td>85%</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>2</td>
<td>59</td>
<td>78%</td>
</tr>
<tr>
<td>Guatemala</td>
<td>12</td>
<td>180</td>
<td>68%</td>
</tr>
<tr>
<td>Mexico</td>
<td>26</td>
<td>900</td>
<td>64%</td>
</tr>
<tr>
<td>Peru</td>
<td>18</td>
<td>732</td>
<td>47%</td>
</tr>
<tr>
<td>Colombia</td>
<td>28</td>
<td>896</td>
<td>45%</td>
</tr>
<tr>
<td>Venezuela</td>
<td>1</td>
<td>36</td>
<td>45%</td>
</tr>
<tr>
<td>Brazil</td>
<td>8</td>
<td>215</td>
<td>42%</td>
</tr>
<tr>
<td>Ecuador</td>
<td>5</td>
<td>139</td>
<td>33%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>105</strong></td>
<td><strong>3281</strong></td>
<td><strong>54%</strong></td>
</tr>
</tbody>
</table>
Table 4

Distribution of Localities in South America and the Caribbean by per Capita Intake of Vitamin A

(24-Hour Recall Data, ICNND, 1959-65)

<table>
<thead>
<tr>
<th>Countries or Areas</th>
<th>Localities</th>
<th>Percent Distribution</th>
<th>Vitamin A Intake, I. U.*</th>
<th>Total Intake I. U.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecuador</td>
<td>8</td>
<td>&lt;1000 0 0 12 37 50</td>
<td>4384</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>16</td>
<td>0 0 0 0 0 100</td>
<td>6980</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>13</td>
<td>100 0 0 0 0 0 391</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Indies</td>
<td>31</td>
<td>0 16 29 16 39</td>
<td>4101</td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>13</td>
<td>0 8 31 54 8 3025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td>8</td>
<td>12 25 25 12 25</td>
<td>2671</td>
<td></td>
</tr>
<tr>
<td>N.E. Brazil</td>
<td>15</td>
<td>100 0 0 0 0 0 533</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venezuela</td>
<td>18</td>
<td>11 44 28 17 0 1965</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paraguay</td>
<td>25</td>
<td>23 36 12 4 20 2700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All areas</td>
<td>147</td>
<td>26 17 16 14 26</td>
<td>3068</td>
<td></td>
</tr>
</tbody>
</table>

*1 I. U. 0.3 mcg. retinol equivalent
### Table 5

**Distribution of Central American Families by Level of Vitamin A Intake: ICNND-INCAP Surveys, 1965-67**

*(24-Hour Recall Data)*

<table>
<thead>
<tr>
<th>Countries</th>
<th>Number of families</th>
<th>Vitamin A Equivalent per Person per Day, mcg.*</th>
<th>Total Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;400</td>
<td>400-</td>
</tr>
<tr>
<td>Guatemala</td>
<td>307</td>
<td>43</td>
<td>14</td>
</tr>
<tr>
<td>El Salvador</td>
<td>393</td>
<td>68</td>
<td>10</td>
</tr>
<tr>
<td>Honduras</td>
<td>429</td>
<td>64</td>
<td>15</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>453</td>
<td>53</td>
<td>12</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>555</td>
<td>52</td>
<td>13</td>
</tr>
<tr>
<td>Panama</td>
<td>457</td>
<td>49</td>
<td>21</td>
</tr>
<tr>
<td><strong>All areas</strong></td>
<td><strong>2594</strong></td>
<td>55</td>
<td>14</td>
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*1 mcg. of vitamin A (retinol) = 3.3 i.u. of vitamin A.*
SUMMARY

Technical Group on Hypovitaminosis A in the Americas

Hypovitaminosis A attracted attention as a public health problem in Latin America and the Caribbean area at the first and second Pan American Health Organization Technical Advisory Committee Meetings in Nutrition, 1962 and 1968, and as a result of the worldwide survey of xerophthalmia sponsored by the World Health Organization in 1962.

Results of many nutrition surveys show that a low dietary intake of vitamin A is widespread in sectors of the population in many parts of this hemisphere. Clinical and biochemical studies also indicate that hypovitaminosis A exists in certain portions of the population. Partial and total blindness resulting from severe vitamin A deficiency, in association with protein-calorie malnutrition, has been reported often associated with high-case fatality rates. It may be concluded that hypovitaminosis A represents a public health problem in this hemisphere.

It was considered important that the Pan American Health Organization provide some guidelines to the control and prevention of this condition and a technical group was convened for this purpose in 1968.

The following definition was proposed for hypovitaminosis A, as it may be applied to human populations in the context of public health practice:
"The presence of depleted tissue stores and low serum levels of vitamin A which may result from a prolonged deficient dietary intake and lead to serious clinical lesions of the eye."

Criteria for diagnosis should include clinical, biochemical and dietary measurements. Any one indication by itself is not sufficient proof of vitamin A deficiency, but should arouse suspicion. Many factors, nutritional, physiological and pathological, can influence vitamin A status and must be taken into account.

From available data, it was evident that xerophthalmia is generally found in those parts of Caribbean, Central and South American areas where living standards for the majority of people are low. The preschool child, or more specifically from 6 months to four years of age, represents most vulnerable group in the socially deprived sectors and is especially difficult to reach and protect.

The biochemical data from ICNND surveys in Latin America and the West Indies showed that from 5 to 45 percent of the overall population surveyed had serum vitamin A levels under 20 micrograms percent. Vulnerable groups including children and pregnant women had even higher proportions of low or deficient values.

In the case of vitamin A values of the diets, the intake was also deficient for a large majority by the standards of the FAO/WHO expert committee.
Based on the available information, the committee made specific recommendations for the treatment and prevention of vitamin A deficiency and defined areas in which PAHO should encourage research.
REFERENCES


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