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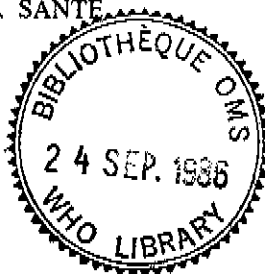
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INTEGRATION OF IMMUNIZATION ACTIVITIES IN THE CONTROL
OF IODINE DEFICIENCY DISORDERS AND VITAMIN A DEFICIENCY

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1. Introduction

EPI is a programme of very high priority and is recognized as a core thrust of the strategy for child survival in developing countries. From negligible coverage levels 10 years ago about 60% of children in developing countries now receive at least one dose of DPT. The central goal of the programme is to ensure that all children have access to immunization services by 1990. Implementation of EPI has strengthened basic health services and it is appropriate to consider how this infrastructure can be used to deliver other preventive health services.

Nutrition programmes for the control of iodine deficiency disorders (IDD) and vitamin A deficiency have features similar to EPI. They have, for instance, the same target groups and a similar delivery system and they are based on simple technologies with proven outcome. They need community awareness and involvement to a very large extent for their success. Any of these three programmes have the potential to make a considerable difference in the quality of human life in the developing world.

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The two nutrition programmes have been in operation in several countries for years and are at various levels of activity and performance. Integrating these with EPI in countries or regions within countries presents the opportunity to utilize EPI skills and improve performance.

This document will review the epidemiology of iodine deficiency disorders and ocular manifestations of vitamin A deficiency (xerophthalmia) and define how EPI infrastructure could be used to prevent these disorders.

2. Iodine Deficiency Disorders

2.1 Epidemiology

Iodine deficiency disorders include a spectrum of crippling conditions affecting health from foetal life to adulthood. These disorders are caused by a deficiency of the element, iodine, which is essential in minute amounts for normal human growth.

Endemic goiter and cretinism, the two best known and most easily recognizable forms of iodine deficiency disorders, have been recorded for centuries in many parts of the world. However, these are only a fraction of the disorders caused by iodine deficiency. Iodine deficiency can produce abortion, still-births, mental retardation, delayed major growth milestones, speech and hearing defects of varying severity and neuro-muscular disorders ranging from weakness to complete paralysis. Unfortunately, most of these manifestations are not recognized as due to iodine deficiency. Table 1 lists the spectrum of human iodine deficiency disorders in approximate order of increasing severity.

Iodine deficiency is a global problem of vast magnitude (Figure 1). Over 100 million people in the South East Asia Region suffer from endemic goiter, an estimated 6 million suffer from cretinism, and more than 35 million are mentally and/or physically disabled with intermediate forms of IDD. At its 1981 meeting, the WHO Regional Committee for South-East Asia passed a resolution urging Member States to "develop a plan of action in respect of goiter control in the context of formulated national and regional strategies for health for all with the objective of reducing prevalence of endemic goiter below 10% by the year 2000". This resolution was forcefully repeated in 1982 and in 1985. The Committee approved and endorsed a regional plan of action for IDD control. The Thirty-Ninth World Health Assembly in May 1986 passed a resolution emphasizing the need for the prevention and control of iodine deficiency disorders (WHA 39.31).

2.2 Current strategy for the control of IDD

Iodine-deficiency disorders are corrected by supplemental iodine. The common measures are the following:

- a) Iodination of common salt with potassium iodate;
- b) Parenteral or oral administration of iodinated oil;
- c) Iodination of drinking water
- d) Fortification of bread and other foods with iodine
- e) Direct administration of sodium iodate tablets.

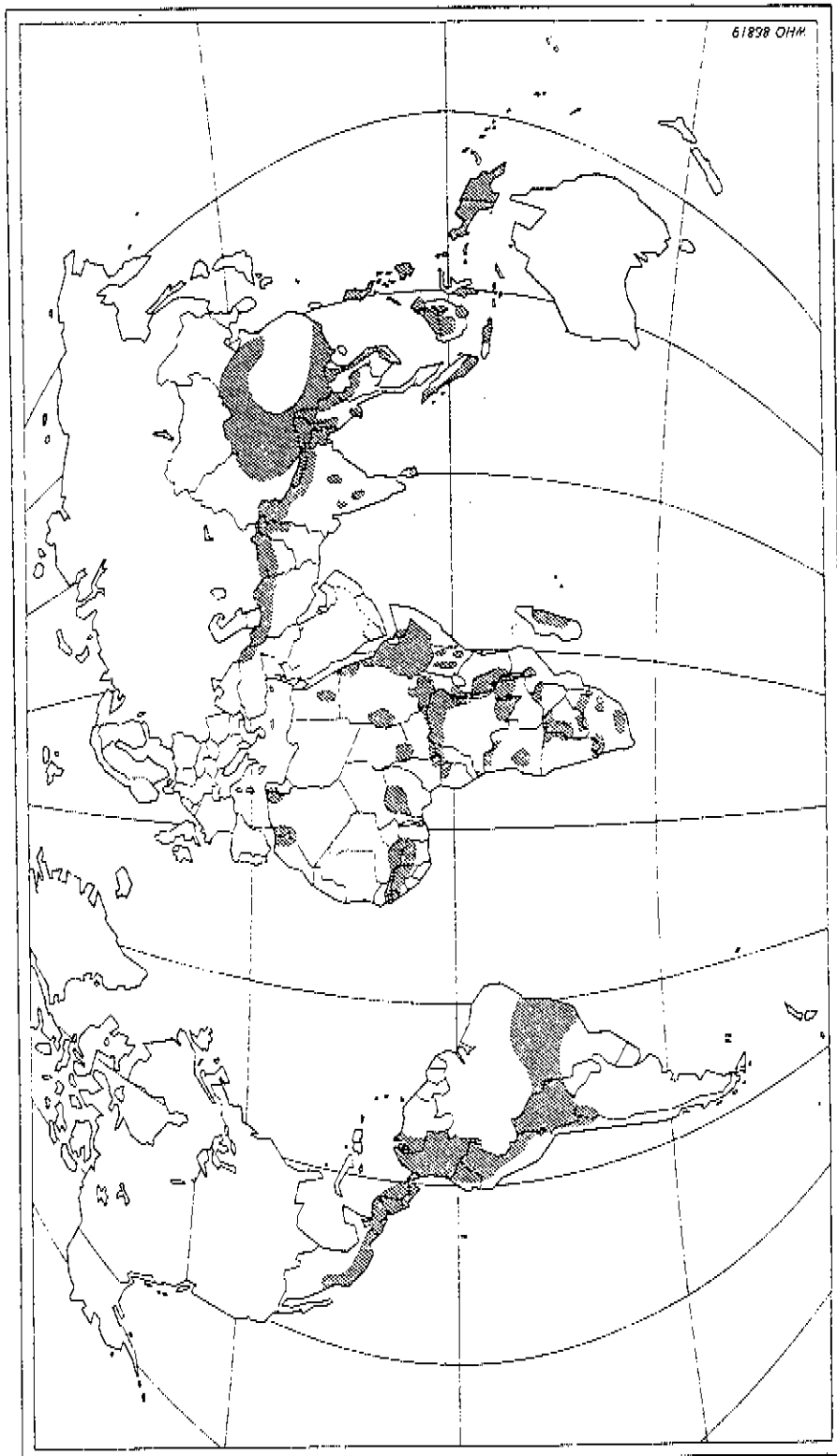
Table 1

TABLE 1. The spectrum of iodine-deficiency disorders
 in approximate order of increasing severity

Disorders	Levels of severity
Goiter	- Grade I - Grade II - Grade III - Multinodular
Hypothyroidism	- Varying combinations of clinical signs (depending on age of onset, duration and severity)
Subnormal intelligence	} Variable severity
Delayed motor milestones	
Mental deficiency	
Hearing defects	
Speech defects	
Strabismus (squint)	- Unilateral - Bilateral
Nystagmus	
Spasticity (extrapyramidal) proximal > distal	hip > girdle > knees > ankles shoulder > girdle > elbows > wrists body rigidity (does not bend freely)
Neuromuscular weakness	- Muscle weakness in legs, arms, trunk - Spastic diplegia - Spastic quadraplegia
Endemic cretinism	- Hypothyroid cretinism - Neurological cretinism
Intrauterine death (spontaneous abortion, miscarriage)	

Fig 1

DISTRIBUTION OF IODINE-DEFICIENCY DISORDERS IN DEVELOPING COUNTRIES



With the exception of a few countries which have adopted the strategy of iodination of drinking water or fortification of foods, the two most common measures being used globally are:

- Iodination of common salt with potassium iodate in such proportion that 10 G of iodinated common salt provides the daily requirement of 150 micrograms of iodine.
- Intramuscular administration of 1 ml of iodinated oil (mostly poppy seed oil), which provides sufficient iodine for 3 to 5 years. Infants are given 0.5 ml. Experience with oral iodinated oil is extremely limited and until more data become available, this approach cannot be recommended at this stage.

These methods have advantages and constraints. A consensus, emerging out of years of experience in a large number of developing countries, can be summed up as follows:

2.2.1 Iodination of common salt is the cheapest method of protection against IDD.

The technology is simple and cheap. The equipment needed can be easily fabricated and it can make a major impact on the incidence of iodine deficiency. A successful iodinated salt programme requires adequate production, quality control, transport to endemic areas, an effective delivery system and public education. When all these administrative and logistic difficulties are considered, salt iodination programme may not be the simplest strategy. Recent experiences in India, Nepal, Indonesia and Thailand have confirmed these problems and in none of these countries has the programme given satisfactory results.

However, in most developing countries, salt iodination is probably the best long-term solution. Most countries adopting salt iodination programme will have to seriously consider one or more of the following factors:

- a) It takes years to get the programme fully operative as it involves close collaboration of various government and private sectors (e.g. health departments, industry in charge of the production of iodinated salt and merchants dealing with the salt trade). Most of these countries will need alternative measures which could be put into operation immediately, at least in the hyperendemic areas, until an iodinated salt programme becomes fully effective. Parenteral administration of iodinated oil is an alternative strategy with great potential.
- b) Many developing countries have endemic areas which are either relatively inaccessible or where the normal salt trade does not penetrate. The numerous small islands in Indonesia and the villages in the mountaneous regions of Nepal are good examples of such areas. Salt iodination is unsuitable for covering such populations and they should receive iodinated oil injections every three to five years.
- c) Populations in all hyperendemic areas (high prevalence of goiter and cretinism) should be provided with iodated oil which has an immediate effect.

2.2.2 Iodinated oil prophylaxis

Iodinated oil prophylaxis is thus being adopted in many developing countries as an interim measure to lessen the tragic disabilities of IDD while the long-term solution of iodinated salt prophylaxis is being organized. There are problems with such prophylaxis as well.

a) Cost of iodinated oil

Iodinated oil for injection is manufactured in few countries using poppy seed oil as the vehicle. China has indigenously produced iodinated soya bean and walnut oil. India is currently testing the stability of iodinated peanut oil.

In 1986, the cost of a 1 ml dose including needle and syringe is about US\$ 0.25. Since a single dose gives protection for 4 years on an average, the cost of prophylaxis per person per year comes to US\$ 0.06 to 0.07.

b) Difficulty in coverage

The major hurdle in iodinated oil prophylaxis is the difficulty in reaching the individuals in the target group for intramuscular injection. In most countries it has not been possible to establish a separate cadre of workers for undertaking this task. Countries having an existing primary health care network, could include injection of iodinated oil as one of its activities. Nepal for instance, is utilizing the EPI project for sponsoring an iodinated oil prophylaxis programme.

c) Reluctance to intra-muscular injection

People in some developing countries, especially in the rural areas, are reluctant to take injections if they are not sick. Until and unless they are made aware of the dangers of iodine deficiency and the "benefits" of the injection any prophylaxis through injection will meet with limited success. Reluctance to intramuscular iodinated oil can be surmounted as has been shown in Nepal and Indonesia with appropriate communication support.

3. Vitamin A deficiency

The ocular manifestations of vitamin A deficiency, including nutritional blindness, have been matters of great concern to many countries in Asia, Africa and South America. Six to seven million pre-school children suffer from xerophthalmia, of whom half a million have active corneal lesions. Of the latter group, 250 000 will lose sight in one or both eyes and 60 to 80% of those who become blind die soon after. Recent research experiences in Indonesia have brought into focus another adverse effect of vitamin A deficiency. Children with a mild deficiency state had a high incidence of respiratory and gastro-intestinal tract infections and a higher mortality rate than a control group given vitamin A supplementation.

There is a renewed global interest in vitamin A deficiency and a strong determination by nations and international agencies to control and prevent vitamin A deficiency. In May 1984, the 37th World Health Assembly adopted a resolution (WHA 37.18) on prevention and control of this deficiency. A proposal for a 10 year programme of support to countries for the prevention and control of vitamin A deficiency, xerophthalmia and nutritional blindness was developed by WHO as a follow-up of the Assembly Resolution, (WHO Offset document NUT/84.5, Rev 1, February 1985). The United Nations Administrative Committee on Coordination (ACC) by decision 1984/4, endorsed the recommendation made by its Sub-Committee on Nutrition (SCN) that priority be given to preventing and controlling vitamin A deficiency.

3.1 Epidemiology

Vitamin A deficiency is widely prevalent in countries of Asia, Africa and South America. Figure 2 gives the geographical distribution of vitamin A deficiency and xerophthalmia in the world in 1984 by country category.

The target group includes children between 1-6 years, with the most vulnerable age from 1-3 years.

3.2 Current strategy for control

Like other specific deficiency diseases, vitamin A deficiency is corrected by any measure that provides vitamin A to the body. The following approaches are commonly used:

- a) Adequate intake of vitamin A through correct dietary practices.
- b) Prophylaxis with high doses of vitamin A.
- c) Fortification of foods or food ingredients with vitamin A, e.g. fortification of sugar with vitamin A in Guatemala, Costa Rica, Panama and Honduras and fortification of monosodium glutamate in the Philippines.

While fortification of food is not feasible for many developing countries, a practical approach is to start vitamin A prophylaxis with nutrition education as a complementary and long-term measure.

Regular consumption of food containing adequate amounts of vitamin A (as well as energy and protein) is the ideal long-term solution. Nutrition education of the mother to ensure their children getting adequate amounts of green leafy vegetables and certain fruits is the core thrust of a vitamin A deficiency control programme. However, in areas where such deficiency constitutes a public health problem, administration of a megadose of vitamin A (usually 200 000 IU of vitamin A every 4 to 6 months) is the best approach for control. In fact, this is the approach adopted by Bangladesh, India and Indonesia.

3.2.1 Megadose vitamin A prophylaxis programme

This is a relatively recent strategy which is based on studies which have demonstrated that a massive dose of vitamin A will be absorbed and stored in the liver and gradually released. A dose of 200 000 IU of vitamin A will meet needs for at least 4 months and in most cases up to 6 months. In most countries, the repeat dose is given in the sixth month. Two types of vitamin A preparation are in use, the capsule and the syrup. It is necessary for the field worker to administer the capsule or a measured quantity of syrup directly into the mouth of the child. Repeat doses sooner than 6 months might cause hypervitaminosis A.

While the technology is simple, the delivery of vitamin A supplements to all children in the target age-group every six months is not an easy task. Limited evaluations in India have demonstrated that the coverage has been adequate in the urban areas with concentrated populations and very much less in the rural areas, especially in remote areas.

The delivery of the vitamin A supplement is done mostly by the peripheral workers responsible for maternal and child health services as a part of the primary health care programme. In some countries, peripheral workers of other sectors and other programmes are involved. In India, for example, the peripheral worker of the nation-wide Integrated Child Development Service Programme of the Ministry of Social Welfare, known as "Anganwadi Worker", is responsible for selecting and enlisting the beneficiaries while the actual administration is done by the auxiliary nurse midwife. In Indonesia and the Philippines, specially designated "volunteers" undertake this task.

4. Operational constraints in the implementation of programmes for the control of iodine-deficiency disorders and xerophthalmia

In spite of the availability of iodinated oil and vitamin A capsules, control programmes in most developing countries have not been fully effective. Three main constraints have been identified:

a) It has proved difficult to identify health workers who could identify eligibles and give intramuscular iodinated oil injection for the IDD control programme. Many hyperendemic areas are in hills and mountaneous areas, which are relatively inaccessible.

b) The delivery of vitamin A capsules or syrup is not recognized as a high priority and is usually entrusted to the mobile peripheral worker. The coverage in areas with widely scattered populations or in difficult areas is always low. Capsules are frequently handed over to mothers for administration to their children. But without adequate awareness and motivation, mothers often do not do this.

c) Lack of awareness among the communities about the dangers of these two deficiencies and their prevention is the third major constraint. Several evaluations of vitamin A control programmes have identified lack of awareness not only among the potential beneficiaries, but even among the health workers. Some progress has been made in creating awareness for the need for vitamin A supplementation but little has been done to promote iodinated oil prophylaxis.

5. Potential interaction of EPI with activities for iodinated oil and vitamin A supplementation

Means of using the immunization delivery system to provide iodinated oil and vitamin A supplementation to eligible populations need to be further explored. Table 2 summarizes features of these three programmes and it brings out several similarities.

a) All the three programmes are based on simple technologies which are safe and have proven impact.

b) All three programmes need an individual who interacts with the target population.

c) The three programmes have the same target groups. Adult males are also targets for IDD control but are not considered as important.

d) Delivery of the preventive intervention in all the three programmes consists of injections and oral administration. The two nutrition programmes do not need a cold chain since both vitamin A preparation and iodinated oil are stable at ambient temperatures.

Table 2

Table 2. SALIENT FEATURES OF EPI AND TWO NUTRITION PROGRAMMES

	EPI	Vitamin A deficiency control programme	Control of IDD through injection of iodinated oil
<u>Target</u>	Infants and young children and pregnant women	Young children and lactating women	Children and women of child bearing age
<u>Methodology</u>	Injection and oral administration of vaccines	Oral administration of vitamin A Injection in severe cases	Injection of iodinated oil
<u>Impact</u>	Safe and assured preventive measure	Safe and assured preventive measure	Safe and assured preventive measure
<u>Needed Supplies</u>	Vaccine (oral and injectable) Syringes and needles Cold chain	Vitamin A capsules or syrup	Iodinated oil for injection Syringes and needles
<u>Responsible Government sector</u>	Health	Health	Health
<u>Type of health worker</u>	Any worker trained to give IM injection	Any peripheral worker	Any worker trained to give IM injection
<u>Community involvement and need for creating awareness</u>	Essential	Essential	Essential
<u>Government commitment</u>	Very high in most developing countries with adequate resources	High in some affected countries with marginal additional resources	Varies from one country to another. Supplies usually from UN and donor agencies
<u>Present status of programme</u>	High priority national programme in most developing countries	Priority activity in many affected countries National programme in some countries	Iodised oil prophylaxis is of priority in most hyper-endemic countries but implementation constrained due to logistics
<u>Commitment of international agencies</u>	High priority area for WHO, UNICEF, World Bank, USAID and others	Priority area for WHO, UNICEF and ACC/SCN of UN	Priority area for WHO UNICEF and ACC/SCN of UN
<u>Dosage</u>		100,000 under 1 year 200,000 1-6 (or 10) every 6 months	0.5ml under 1 year of age 1.0ml every 3-4 years for age 1-45 years
<u>Stability</u>		Tests have been carried out on enriched sugar and milk to temperatures of 40°C	Iodine oil has been used for contrast in x-ray and for injection at all latitudes

e) Community involvement is an essential pre-requisite for all the three programmes. Without this, the chance of programme survival is limited.

f) All three programmes have high government commitments. Programme support, in general, has been more generous for EPI.

6. Recommended action

6.1 Inform Ministries of Health and particularly EPI managers of the IDD and vitamin A deficiency problems and solicit their help in exploring ways in which the EPI can support control efforts.

6.2 Analyse any existing information on current programmes in which EPI is helping to provide iodine and/or vitamin A supplements and make this available, as appropriate to Regional and national EPI managers.

6.3 Encourage the implementation of integrated programmes in a few selected areas where the immunization service is operative and where major iodine and/or vitamin A deficiency problems remain. Within the South East Asia Region, the following might be considered as candidates:

- Samchi district, Buthan (high prevalence of IDD);
- Surat district, Gujarat State, India (high prevalence of IDD);
- Java province, Indonesia (high prevalence of vitamin A deficiency);
- Rangpur district, Bangladesh (high to moderate prevalence of IDD and vitamin A deficiency).

Develop similar lists for the other Regions.

6.4 WHO to provide the financial and managerial support needed to evaluate the results of any integrated implementation efforts. Provide a preliminary feedback to the 1987 Global Advisory Group Meeting along with recommendations for further actions which may be appropriate.

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