INTERNATIONAL COUNCIL FOR CONTROL
OF IODINE DEFICIENCY DISORDERS

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In this Issue:

Iodine requirements in pregnancy and infancy

A WHO Technical Consultation has produced new guidelines on iodine requirements and monitoring in these vulnerable age groups.

The Consultation, which met in Geneva, Switzerland in 2005, reached a general consensus on several important issues.

■ Universal salt iodization (USI) remains the key strategy to eliminate IDD

■ Where USI has been effective for at least two years, with salt adequately iodized and consumed by more than 90 percent of the population, it can be reasonably expected that the iodine needs of women of child-bearing age and pregnant and lactating women are covered by their diet, and that the iodine stored in the thyroid gland is sufficient to ensure adequate hormone synthesis and secretion. Thus, supplementation is not recommended.

■ Iodized salt may not provide enough iodine to meet a child's needs during complementary feeding, especially if the mother is only marginally iodine sufficient, unless complementary foods are fortified with iodine. It may be necessary therefore to give additional iodine to make sure that requirements are met until such time as the child starts to eat the normal family food.

■ Monitoring of both iodized salt quality and iodine nutrition are important to ensure that an optimal state of iodine nutrition is reached and then sustained.

The Consultation made several specific recommendations concerning requirements and indicators to control iodine deficiency disorders in pregnant and lactating women, and in children less than 2 years old. The complete results of the Consultation will be published in a special issue of the journal *Public Health Nutrition* in 2007.

Recommended iodine intake

Pregnancy

The Technical Consultation proposed to increase the current FAO/WHO Recommended Nutrient Intake for iodine during pregnancy from 200 µg/day to 250 µg/day (Table 1). A daily intake greater than this is not necessary and preferably should not exceed 500 µg/day, as such an intake may be associated with impaired thyroid function.

Lactation

During lactation the physiology of thyroid hormone production and urinary iodine excretion returns to normal, but iodine is concentrated in the mammary gland for excretion in breast milk. Thus using the urinary iodine concentration to estimate intake may lead to an underestimate of requirements. But because of the need to ensure that the infant gets enough iodine from breast milk to build reserves in the thyroid gland, it was recommended that lactating women should continue to consume 250 µg/day of iodine. This also represents an increase in the recommended intake of iodine by 50 µg/day compared with the previous Recommended Nutrient Intake. The intake preferably should also not exceed 500 µg/day.

Children less than two years of age

For children less than two years of age the previously recommended iodine intake of 90 µg/day remains the same. There was no attempt to propose a recommended iodine intake for preterm infants because of the lack of data.

Median urinary iodine concentration as an indicator of iodine status

The Consultation proposed that the median urinary iodine concentration was the best indicator to use in population surveys to assess the iodine nutrition of pregnant and lactating women, and of young children less than two years. However, further studies are required to provide better support for this statement. Moreover this indicator should not be used for the purposes of individual diagnosis and treatment. As an indicator of iodine intake, median urinary iodine concentration does not provide direct information about thyroid function. However, a low median urinary iodine concentration indicates that a population is at risk of developing thyroid disorders.

The Technical Consultation recommended that iodine status should be assessed in urinary iodine surveys conducted every 3 – 5 years using established methods. Table 2 shows the median urinary iodine concentrations proposed to classify pregnant women, lactating women and children aged 0 – 2 years old into categories of iodine intake.

Table 1: The daily recommended nutrient intake for iodine proposed for pregnant and lactating women and children less than 2 years old, and the daily intake that was considered should not to be exceeded.

Population Group	Recommended nutrient intake for intake (µg/d)	Excessive[a] iodine (µg/d)
Pregnant women	250	> 500
Lactating women	250	> 500
Children < 2 years	90	> 180

[a] *The term "excessive" means in excess of the amount required to prevent and control iodine deficiency.*

Table 2: The median or range in urinary iodine concentrations used to categorise the iodine intake of pregnant women, lactating women and children less than two years of age.

Population Group	Median urinary iodine concentration (µg/L)	Category of iodine intake
Pregnant women	< 150	Insufficient
	150 – 249	Adequate
	250 – 499	More than adequate
	≥ 500	Excessive[a]
Lactating women[b]	< 100	Insufficient
	≥ 100	Adequate
Children less than 2 years old	< 100	Insufficient
	≥ 100	Adequate

[a] *The term "excessive" means in excess of the amount required to prevent and control iodine deficiency.*

[b] *In lactating women, the figures for median urinary iodine are lower than the iodine requirements because of the iodine excreted in breast milk.*

Convincing food producers in Moldova to use iodized salt: a study tour in Switzerland

The Republic of Moldova, a country between Romania and Ukraine with a population of about 4.2 million, is one of the poorest nations in the Commonwealth of Independent States (CIS). Less than 2/3rds of households use iodized salt and the country remains iodine deficient.

Alexandra Eriksson, Arnold Timmer, Lilia Turcan
UNICEF Regional Office for Central and Eastern Europe & Commonwealth of Independent States and UNICEF Country Office Moldova

According to WHO criteria, Moldova is currently mildly iodine deficient. The first epidemiological survey carried out in children between 1996 and 1998 found high levels of iodine deficiency, with a median urinary iodine level of 78 µg/L and goiter prevalence rates ranging from 27% in the south of the country to 41% in the central zone. The government of Moldova is committed to the World Fit for Children goal for the sustainable elimination of IDD through USI. A national decree mandates the iodization of all table and animal salt without including salt used for processed foods. Even though the governmental decree requires all table salt to be iodized, the enforcement of this regulation remains problematic. Recent data indicate an increase in the household use of iodized salt -from 32% in 2000 to 60% in 2005.

The importance of food producers using iodized salt

Although being part of USI, the use of iodized salt in food manufacturing industries is frequently overlooked, even though a large proportion of the daily salt (and potentially iodine) intake is derived from processed foods, especially in industrialized countries. This is of particular importance for pregnant women, whose table salt intake may have decreased following the advice of health care providers, and who are the primary target group for the prevention of the irreversible consequences of iodine deficiency on the brain of the unborn child. UNICEF in CEE/CIS has therefore emphasized the importance of the use of iodized salt by food industries.

In order to ensure that iodized salt is used in commonly consumed foods such as bread, cheese, meat, meat products and pickles, both the government and the food industry need to agree and commit to its introduction. Until 2006, only one large bread producer in Moldova was using iodized salt in its production, moreover, this was only on a temporary basis. The use of iodized salt in food is hindered by the belief that iodized salt could have an impact on the quality of the final product's color, taste, texture or smell. Moreover, in many countries the competition between food manufacturers is strongly related to food price. Due to the poor economic conditions in Moldova, convincing food producers therefore was all the more difficult.

This Moldovan infant needs adequate iodine for normal development

Additionally, food producers hesitate to use iodized salt because they fear it will increase prices of their products, and worry that if the products are exported, they will be subject to inspection in the importing country. UNICEF focuses its support to increase the use of iodized salt by the food industry in three ways: a) providing scientific studies on the effects of iodized salt use in food processing; b) obtaining and sharing testimonials and practices from food producers that safely use iodized salt; c) exposing food industry members to successful practices in other countries.

A learning experience: a study tour to Switzerland

The UNICEF Regional Office for CEE/CIS and the UNICEF Country Office in Moldova collaborated with the Government of Moldova, Swiss food producers and ICCIDD Switzerland to organize a study tour. Switzerland was thought to be an ideal example for Moldova, with its long history in the struggle against IDD and its successful implementation of the use of iodized salt in cheese, bread, meat and pickles. The Moldovan delegation composed of government officials, food scientists and food producers arrived in Geneva in March 2006 for a visit to selected Swiss food industries.

The objective was to convince the Moldovan delegation of the feasibility and the safety of using iodized salt in their products by an exposure to Swiss practices. Even though the importance of adequate iodine nutrition was fully accepted by the study tour members, the use of iodized salt met resistance prior to the visit. The study tour started in Geneva at UNICEF with a briefing on the successful elimination of IDD in Switzerland by Dr. Hans Bürgi (ICCIDD Focal Point for Switzerland), and a presentation of the global situation by Dr. Bruno de Benoist (Chief, Micronutrient Unit, WHO Geneva). This was followed by a visit to three food companies in Switzerland: la Maison du Gruyère, producer of the famous Swiss hard cheese, BAER AG a family-owned soft cheese producer and Poully Tradition SA, a Geneva based industrial bakery.

The legal situation in Moldova

It was of great interest to the Moldovan delegation to understand the legal process in Switzerland; how the framework ensures a system which should be flexible and not too resource-consuming and finally how it guarantees the adequate iodine intake of the population. In Moldova, three major institutional bodies regulate the food production, which is not optimal. During the tour it became increasingly clear that the legal process had to be simplified in Moldova in order to implement the mandatory use of iodized salt in the food industry and to create an efficient system in the long run.

Resistance by the food industry

One main issue stressed by the Moldovan delegation was the perceived need to monitor the iodine content in the final food products. During the briefing and discussions with the food producers, the delegation asked questions concerning the procedures to measure the iodine content in processed foods. Dr. Bürgi assured delegation, "although there are ways to assess the level of iodine in food, it is not part of our surveillance program, because it is very cumbersome - it has been performed only twice in Switzerland in the past twenty-five years." "Periodic assessments of the iodine status in the population offer reliable and conclusive data on the functioning and adequacy of the salt iodization effort".

To ensure that food producers comply with the law in Moldova, random checks of the type of salt used in food processing companies could be included in the regulatory inspection.

This type of question reflects the fear that the iodine levels in processed foods could present a risk to the population, even though the amounts of iodine added to the salt are minute and the quantity of salt in recipes are very small. Moreover, it shows that the shift from non-iodized salt to iodized salt is still perceived as unnecessary risk-taking. Throughout the discussions it became increasingly clear to the Moldovans that it is much more efficient to monitor the type of salt used in food factories than to test iodine in the final products.

The second issue emphasized by the delegation was the effect of iodized salt on the quality of the product. This is a recurring question, but studies have repeatedly shown that the use of iodized salt in processed food has no impact on the flavor, taste, texture or the color of products. The amount of iodine added to salt is infinitely small and the potential negative impact of iodized salt on food quality is only a myth. Interestingly, a small scale study on the impact of iodized salt on the quality of pickles was done in Moldova (before the study tour to Switzerland), which found no effect, but this was not convincing for the delegation. The experts tasted the food products at the Swiss factories made with iodized salt to observe any possible difference in the taste, color or smell, but could not identify any changes.

The Poully Bakery in Geneva, where iodized salt is used in all baked goods

The Moldovan delegation discusses iodized salt during their visit to the Poully Bakery in Geneva

Cheese making with iodized salt in the Gruyere cheese factory

The outcomes of the tour

The visits and discussions persuaded the Moldovan delegation of the value of using iodized salt in the food industry and led the experts to make important statements at the end of the tour. It was agreed that the legal framework surrounding the use of iodized salt should be simplified, that iodized salt has no negative impact on the quality of food products to which it is added and that the measurement of the iodine content in the final product is not necessary.

The tour had strong persuasive effects because it showed that processed foods produced with iodized salt are consumed by the entire population of Switzerland without any side effects and that they are exported as well. Moreover, another key convincing argument is that these products are world-famous and even considered as national symbols, like the Gruyère cheese.

Ion Cretu, head of the department of food industry and regulations in Moldova, concluded the study tour with these revealing words: "…the barrier to the introduction of iodized salt in processed foods in Moldova is not a technical one but a mental one. We have lost a lot of time and much could have been done to reduce IDD".

Lessons learned

From the Moldovan experience and the other study tours organized in the CEE/CIS region such as the study tours in 2005 by a Latvian delegation to the Netherlands and a Turkish delegation to Bulgaria in 2006, Unicef is convinced that such study visits offer an effective way of dealing with the psychological block surrounding the use of iodized salt in food. Concerns can be dealt with through dialogue with other producers, observation of the production process and tasting the products. When Andrei Ciburciu, leading specialist at the Moldovan Department of Food Hygiene, admitted, "the study tour in Switzerland saved money in the long run", it was clear that it produced a real change in their way of thinking.

Food producers in Switzerland played an important role in transferring experience and knowledge on the use of iodized salt in the food industry in Moldova. Even though it took some effort to convince Swiss companies to host the study tour, the three food producers that were visited enjoyed the exchange of information and generally were interested to renew their knowledge on iodine related issues. The IDD situation in Switzerland would be a major health problem if the use of iodized salt was not widespread in the food industry. However new pressures by Swiss consumers who debate the use of additives, like iodine, in their food, could lead one day to a change in practices on the use of iodized salt. Therefore, not only could Moldova be an example for other countries of their region but it could one day turn out to be an example for Switzerland.

Assessment of iodine status using dried blood spot thyroglobulin

Dried blood spot thyroglobulin may be a valuable new indicator of iodine nutrition in children

Michael Zimmerman ICCIDD Deputy Regional Coordinator for Western Europe

Background

Despite significant global progress against the iodine-deficiency disorders (IDD), one in three school-age children remain iodine-deficient. Iodine deficiency is the single most important preventable cause of mental retardation worldwide. Three measures – urinary iodine (UI), goiter rate, and serum thyrotropin (TSH) – are recommended for assessment of iodine nutrition in populations (1), but each has limitations. UI is an indicator of recent iodine intake, but not of thyroid function. Because thyroid size decreases only slowly after iodine repletion, the goiter rate may remain high for several years after introduction of iodized salt (1,2). TSH is a sensitive measure of iodine status only in the newborn period (1,3). Thus, an additional indicator of thyroid function, sensitive to recent changes in iodine nutrition and applicable in children, would be valuable in monitoring iodine status in populations.

Thyroglobulin (Tg), a thyroid-specific protein that is a precursor in the synthesis of thyroid hormone, has no known physiological role outside the thyroid (4,5). If a sensitive assay is used, Tg can be detected in the serum of all healthy individuals (6,7). In the absence of thyroid damage, the major determinants of serum Tg are thyroid cell mass and TSH stimulation (7). Thus, serum Tg is elevated in iodine-deficient areas due to TSH hyperstimulation and thyroid hyperplasia. In 1994, WHO/ICCIDD recommended using serum Tg to assess iodine nutrition, and proposed that a median Tg concentration of <10 µg/L in a population indicated iodine sufficiency (8). However, data to support this Tg cut-off value were limited, and the recommendation was not included in the revised 2001 WHO/ICCIDD guidelines (1). A widely-used serum Tg assay has been adapted for use on dried whole blood spots (DBS) (9). But use of Tg for monitoring iodine status is limited by large interassay variability and lack of reference data for Tg in healthy, iodine-sufficient school-age children.

Objectives

Therefore, in a study coordinated by ICCIDD and WHO (10), the objectives were to:
1) develop standard reference material for the DBS-Tg assay using the CRM-457 Tg reference preparation
2) using this material, establish an international reference range for DBS-Tg in iodine-sufficient children that could be used for monitoring iodine nutrition
3) evaluate the standardized DBS-Tg assay and reference range in a longitudinal study of goitrous children before and after introduction of iodized salt.

Methods

Serum Tg reference material of the European Community Bureau of Reference (CRM-457) was adapted for DBS and its stability tested over one year. DBS-Tg was determined in an international sample of 5-14 y-old children (n=700). The children were euthyroid, antiTg antibody-negative, and residing in areas of long-term iodine sufficiency in South America, Central Europe, the Eastern Mediterranean, Africa, and the Western Pacific. The sample included children from five major ethnic groups: Lima, Peru (Hispanic); Zürich, Switzerland (White); Manama, Bahrain (Arabic); Cape Town, South Africa (Black); and Dalian, China (Asian). Subsequently, in a 10-month trial in iodine-deficient children, DBS-Tg and other indicators of iodine status were measured before and after introduction of iodized salt.

Results

Stability of the CRM-457 Tg reference standard on DBS over 1 y of storage at -20° and -50°C was acceptable. Although there were small differences in dried blood spot thyroglobulin between the sites and between younger and older children, these differences were minimal, and there were no gender differences. Overall, the data indicate age-, site- or gender-adjusted reference ranges for dried blood spot thyroglobulin are unnecessary for children in the age range of 5-14 yrs. It is therefore recommended to use a single reference range for screening and monitoring of iodine nutrition in this age group. The dried blood spot thyroglobulin reference interval for iodine-sufficient school-age children is 4-40 µg/L.

In the intervention, before introduction of iodized salt, median DBS-Tg was 49 µg/L and over 2/3rds of children had DBS-Tg values >40 µg/L. After 5 and 10 mo of iodized salt use, median DBS-Tg decreased to 13 and 8 µg/L, and only 7% and 3% of children had values >40 µg/L. DBS-Tg correlated well at baseline and 5 months with urinary iodine and thyroid volume.

Conclusions

The availability of reference material and an international reference range facilitates the use of DBS-Tg for monitoring of iodine nutrition in school-age children. WHO is currently preparing a statement recommending this test to monitor iodine status in children. DBS-Tg, used in conjunction with UI to measure recent iodine intake and thyroid volume to assess long-term anatomic response, may be a useful biological indicator for monitoring thyroid function in children after introduction of iodized salt (10).

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Ethiopia remains severely iodine deficient

With a population of 70 million suffering from drought, flooding and armed conflict, only 28% of Ethiopian households have access to iodized salt.

One third of the population of Ethiopia survive on less than 1 USD a day. Children in particular are highly affected by malnutrition. Forty per cent of children are severely and moderately underweight, 52 per cent are stunted and 11 per cent are wasted. Malnutrition is the underlying cause for more than 50 per cent of deaths of children under five years of age. Currently, only 28% of households have access to iodized salt.

Although IDD is a major public health problem in Ethiopia, there are recent signs of progress. In 2003, steps were made toward increasing population access to iodized salt through training of 18 salt producing companies and quality control laboratory technicians located in 4 regions on salt iodization. In 2004, agreements were signed between the Federal Ministry of Health and the Ethiopian salt producing companies and salt iodization machines were distributed. As Ethiopia scales up production of iodized salt, more work needs to be done on technical issues like quality control and packaging before being able to get most of the Ethiopian salt production iodized.

A soldier turns salt producer

Just three years ago, Wolday Teklemicheal was a soldier. Now, he along with 26 of his old army buddies, have been demobilized, and formed a co-operative that is producing iodized salt. Shiwott, as they have called their cooperative, operates out of a recently constructed tin factory, in Mekelle, the regional capital of Tigray in Northern Ethiopia. "We chose a donkey piled with iodized salt for our logo," explains Wolday, " as the donkey is what carries the salt here from the distant salt mines and donkeys are what people use to carry the iodized salt back to the community."

Wolday Teklemicheal, salt producer in Mekelle

UNICEF, working in partnership with the Regional Health Bureau, helped to set up the business by providing the salt crusher, the iodine mixer and supplies of iodine, as well as training. Unfortunately, previously, all salt iodization was done in Eritrea, and now along with the other legacies of the war, Ethiopia has very limited capacity to produce iodized salt. UNICEF's investment in Shiwott is part of a larger effort across the country to increase the availability and use of iodized salt.

While large segments of the population are at risk of iodine deficiencies, yet not aware of the advantages of iodized salt, the challenges to create more of a local market are considerable. Not far from the Shiwott factory and their whole sale store, is Mekele's main salt market. Haji Kahsay Ahmed, 75 years old, has been in the salt business for more than 20 years. Sitting with his business partner, behind a massive wall of salt bricks, they buy direct from the salt miners in the remote parts of Tigray and Afar and then resell to buyers in Addis. With little profit margin, it is a tough and competitive business. He understands the benefit but thinks a lot more will need to be done to get more salt iodized.

The members of Shiwott Cooperative agree. "The main problem is the community is not yet aware of all the advantages" explains Wolday. "They know the taste of salt but they do not know what it includes." Shiwott has the potential to produce more than 200 quintals of iodized salt a day but is producing under capacity because of the limited market.

To remedy the problem, they are working with UNICEF and the Regional Health Bureau to strengthen community awareness about the advantages of iodized salt. Already they have initiated activities in schools, churches and through the radio. 'It is crucial the community see the value it can make to their life," says Wolday, who like most of his coop members had no idea before they starting their business that it was so important, "We are happy that we are helping to improve the health of our people."

Many young Ethiopian women suffer from severe iodine deficiency and endemic goiter. This increases their risk for complications during pregnancy and may impair mental development of their offspring.

An eye-opening trip to Ethiopia

Personal stories **Carolyn Becker,** M.D Division of Endocrinology, Columbia University Medical Center, NY, USA

It was December 28, 2004, and the flight from the capital city of Addis Ababa to Lalibela in northern Ethiopia was spectacular: overhead, bright blue skies and below, the magnificent hills and valleys of the Abyssinian Massif (the Ethiopian central plateau). Soon after finding our hotel, my colleagues and I set out for a mountain range northeast of Lalibela to find the beautiful church of Ymrehanna Krestos, a 12th-century church built within a cave.

However, to get there requires a long, hot, dusty drive, followed by a long, hot, dusty hike. When we started up the rocky path to Ymrehanna Krestos, we first caught sight of children, barefoot and skinny. Then we came across the women, sitting in the dust with their palms up, begging for food, water, or anything we could give. Initially, their eyes held my gaze, but then I looked down and saw the goiters, massive goiters unlike any I had ever seen. Similar images were to confront me later in Lalibela, then in the cities of Gondar in the north and Arbe Minch in the south. The images continue to haunt me today.

Outside the capital city of Addis Ababa, goiters (also called "sickness of the thick neck") are endemic in Ethiopia, illustrating the persistence of severe iodine deficiency even in 2005. The country's civil war with Eritrea in the late 1990s permanently disrupted its supply of Eritrean iodized salt and now over 70% of Ethiopian households use noniodized salt from the neighboring country of Djibouti. Not surprisingly, surveys have shown a resurgence of IDD throughout Ethiopia. Of course, endemic goiters are the most blatant manifestations of IDD; much more insidious are stunted growth, mental and psychomotor retardation, and significantly lower IQ among children with IDD, as well as higher rates of infertility, miscarriage, birth defects, and stillbirths in adult women with IDD. Iodine deficiency represents a major threat to the socioeconomic health of Ethiopia and a moral challenge to us all.

The good news: in Ethiopia, 10 new salt iodizing plants have recently been built. On my next trip to Ethiopia, I hope to visit them all.

2007 Unicef report suggests global progress against iodine deficiency is slowing

In the 2007 report, "The State of the World's Children 2007: Women and Children: The Double Dividend of Gender Equality", Unicef provides current global figures on the percentage of households with access to iodized salt. As shown in the Table 1, global progress toward universal salt iodization, which was rapid during the 1990's, has slowed over the past decade. Only about half of households in the least developed countries have access to iodized salt. The data for individual countries is given in Table 2. These findings argue for renewed efforts to reach the remaining one-third of the global population not covered by iodized salt.

Table 1: From the Unicef Reports 1997-2007 on the State of the World's Children: percentage of households using iodized salt over the last decade, by region

	2007	2006	2003	2000	1997
Sub-Saharan Africa	67	64	67	62	47
Eastern and Southern Africa	60	60	–	–	–
West and Central Africa	73	68	–	–	–
Middle East and North Africa	65	58	53	48	75
South Asia	54	49	53	65	58
East Asia and Pacific	85	85	80	74	48
Latin America and Caribbean	86	86	81	89	80
CEE/CIS	50	47	39	25	26
Developing countries	71	69	68	68	55
Least developed countries	53	53	54	57	33
World	70	68	67	66	54

Table 2: Unicef State of the World's Children 2007. Percentage of households using iodized salt, by country

Countries and territories	% of households using iodized salt
Afghanistan	28
Albania	62
Algeria	69
Angola	35
Argentina	90
Armenia	97
Azerbaijan	26
Bangladesh	70
Belarus	55
Belize	90
Benin	72
Bhutan	95
Bolivia	90
Bosnia and Herzegovina	62
Botswana	66
Brazil	88
Bulgaria	98
Burkina Faso	45
Burundi	96
Cambodia	14
Cameroon	88
Cape Verde	0
Central African Republic	86
Chad	56
Chile	100
China	93
Colombia	92
Comoros	82
Congo, DR	72
Costa Rica	97
Côte d'Ivoire	84
Croatia	90
Cuba	88
Dominican Republic	18
Ecuador	99
Egypt	78
El Salvador	62
Equatorial Guinea	33
Eritrea	68
Ethiopia	28
Fiji	31
Gabon	36
Gambia	8
Georgia	68
Ghana	28
Guatemala	67
Guinea	68
Guinea-Bissau	2
Haiti	11
Honduras	80
India	57
Indonesia	73
Iran	94
Iraq	40
Jamaica	100
Jordan	88
Kazakhstan	83
Kenya	91
Korea (DPR)	40
Kyrgyzstan	42
Lao (PDR)	75
Lebanon	92
Lesotho	91
Libyan Arab Jamahiriya	90
Madagascar	75
Malawi	49
Maldives	44
Mali	74
Mauritania	2
Mauritius	0
Mexico	91
Moldova	59
Mongolia	75
Morocco	59
Mozambique	54
Myanmar	60
Namibia	63
Nepal	63
New Zealand	83
Nicaragua	97
Niger	15
Nigeria	97
Oman	61
Palestinian Territory	64
Pakistan	17
Panama	95
Paraguay	88
Peru	91
Philippines	56
Romania	53
Russian Federation	35
Rwanda	90
Saint Kitts and Nevis	100
Sao Tome and Principe	74
Senegal	41
Sierra Leone	23
South Africa	62
Sri Lanka	94
Sudan	1
Swaziland	59
Syrian Arab Republic	79
Tajikistan	28
Tanzania (United Republic of)	43
Thailand	63
Macedonia	94
Timor-Leste	72
Togo	67
Trinidad and Tobago	1
Tunisia	97
Turkey	64
Turkmenistan	100
Uganda	95
Ukraine	32
Uzbekistan	57
Venezuela	90
Viet Nam	83
Yemen	30
Zambia	77
Zimbabwe	93

Source: MICS, DHS and UNICEF.

The Kazakhastan salt iodization program: a remarkable public health success

On December 16, 2006, a front-page story in the New York Times (later reprinted in the Times of India and other major newspapers worldwide) by Donald McNeil Jr. entitled "On the Brink: In Raising the World's I.Q., the Secret's in the Salt" described the success of Kazakhstan's iodized salt campaign. The story and photographs are excerpted below.

Valentina Sivryukova knew her public service messages were hitting the mark when she heard how one Kazakh schoolboy called another stupid. "What are you," he sneered, "iodine-deficient or something?" Ms. Sivryukova, president of the national confederation of Kazakh charities, was delighted. It meant that the years spent trying to raise public awareness that iodized salt prevents brain damage in infants were working. If the campaign bore fruit, Kazakhstan's national I.Q. would be safeguarded. In fact, Kazakhstan has become an example of how even a vast and still-developing nation like this Central Asian country can achieve a remarkable public health success. In 1999, only 29 percent of its households were using iodized salt. Now, 94 percent are. Next year, the United Nations is expected to certify it officially free of iodine deficiency disorders.

That turnabout was not easy. The Kazakh campaign had to overcome widespread suspicion of iodization, common in many places, even though putting iodine in salt, public health experts say, may be the simplest and most cost-effective health measure in the world. Each ton of salt needs about two ounces of potassium iodate, which costs about $1.15. "Find me a mother who wouldn't pawn her last blouse to get iodine if she understood how it would affect her fetus," said Jack C. S. Ling, the chair of ICCIDD.

The 1990 World Summit for Children called for the elimination of iodine deficiency by 2000, and the subsequent effort was led by Professor Ling's organization along with Unicef, the WHO, Kiwanis International, the World Bank and the foreign aid agencies of Canada, Australia, the Netherlands, the United States and others. Largely out of the public eye, they made terrific progress: 25 percent of the world's households consumed iodized salt in 1990. Now, about 66 percent do.

But the effort has been faltering lately. When victory was not achieved by 2005, donor interest began to flag as AIDS, avian flu and other threats got more attention. And, like all such drives, it cost more than expected. In 1990, the estimated price tag was $75 million – a bargain compared with, for example, the fight against polio, which has consumed about $4 billion. Since then, according to David P. Haxton, ICCIDD executive director, about $160 million has been spent, including $80 million from Kiwanis and $15 million from the Gates Foundation, along with unknown amounts spent on new equipment by salt companies. "Very often, I'll talk to a salt producer at a meeting, and he'll have no idea he had this power in his product," Mr. Haxton said. "He'll say 'Why didn't you tell me? Sure, I'll do it. I would have done it sooner.' "

The cheap part, experts say, is spraying on the iodine. The expense is always for the inevitable public relations battle. In some nations, iodization becomes tarred as a government plot to poison an essential of life – salt experts compare it to the furious opposition by 1950s conservatives to fluoridation of American water. In others, civil libertarians demand a right to choose plain salt, with the result that the iodized kind rarely reaches the poor. Small salt makers who fear extra expense often lobby against it. So do makers of iodine pills who fear losing their market.

Breaking down that resistance takes both money and leadership. "For 5 cents per person per year, you can make the whole population smarter than before," said Dr. Gerald N. Burrow, a former dean of Yale's medical school and ICCIDD vice chairman. "That has to be good for a country. But you need a government with the political will to do it."

In the 1990s, when the campaign for iodization began, the world's greatest concentration of iodine-deficient countries was in the landlocked former Soviet republics of Central Asia. All of them – Kazakhstan, Turkmenistan, Tajikistan, Uzbekistan, Kyrghzstan – saw their economies break down with the collapse of the Soviet Union. Across the region, only 28 percent of all households used iodized salt. "With the collapse of the system, certain babies went out with the bathwater, and iodization was one of them," said Alexandre Zouev, chief Unicef representative in Kazakhstan.

Salt, excavated from a field at the Aral Tuz salt processing plant, in train carriages

Dr. Toregeldy Sharmanov, who was the Kazakh Republic's health minister from 1971 to 1982, when it was in the Soviet Union, said the problem was serious even then. But he had been unable to fix it because policy was set in Moscow. "Kazakh children were stunted compared to the same-age Russian children," he said. "But they paid no attention. It was a scandal." In 1996, Unicef, which focuses on the health of children, opened its first office in Kazakhstan and arranged for a survey of 5,000 households. It found that 10 percent of the children were stunted, opening the way for international aid. (Stunting can have many causes, but iodine deficiency is a prime culprit.) In neighboring Turkmenistan, President Saparmurat Niyazov solved the problem by simply declaring plain salt illegal in 1996 and ordering shops to give each citizen 11 pounds of iodized salt a year at state expense.

In Kazakhstan, President Nursultan A. Nazarbayev, was supportive. But even so, as soon as Parliament began debating mandatory iodization in 2002, strong lobbies formed against the measure. The country's biggest salt company was initially reluctant to cooperate, fearing higher costs, a Unicef report said. Cardiologists argued against iodization, fearing it would encourage people to use more salt, which can raise blood pressure. More insidious, Dr. Sharmanov said, were private companies that sold iodine pills. "They promoted their products in the mass media, saying iodized salt was dangerous," he said, shaking his head. So Dr. Sharmanov, the national Health Ministry, Ms. Sivryukova and others devised a marketing campaign. Comic strips starring a hooded crusader, Iodine Man, rescuing a slow-witted student from an enraged teacher were handed out across the country. A logo was designed for food packages certified to contain iodized salt: a red dot and a curved line in a circle, meant to represent a face with a smile so big that the eyes are squeezed shut. Also, Ms. Sivryukova's network of local charity women stepped in. Her volunteers approached schools, asking teachers to create dictation exercises about iodized salt and to have students bring salt from home to test it for iodine in science class.

Ms. Sivryukova described one child's tears when he realized he was the only one in his class with noniodized salt. The teacher, she said, reassured him that it was not his fault. "Children very quickly start telling their parents to buy the right salt," she said. One female volunteer went to a bus company and rerecorded its "next-stop" announcements interspersed with short plugs for iodized salt. "She had a very sexy voice, and men would tell the drivers to play it again," Ms. Sivryukova said. Even the former world chess champion Anatoly Karpov, who is a hero throughout the former Soviet Union for his years as champion, joined the fight. "Eat iodized salt," he advised schoolchildren in a television appearance, "and you will grow up to be grandmasters like me."

Mr. Karpov, in particular, handled hostile journalists adeptly, Mr. Zouev said, deflecting inquiries as to why he did not advocate letting people choose iodized or plain salt by comparing it to the right to have two taps in every home, one for clean water and one for dirty. By late 2003, the Parliament finally made iodization mandatory.

scooping up samples, it would be missed. The $15,000 tank and sprayer were donated by Unicef, which also used to supply the potassium iodate. Today Aral Tuz and its smaller rival, Pavlodar Salt, buy their own.

Asked about the Unicef report saying that Aral Tuz initially resisted iodization on the grounds that it would eat

In Kzyl-Orda, seventh graders passing information booklets to one another about the importance of iodized salt.

Today in central Kazakhstan, a miniature mountain range rises over Aral, a decaying factory town on what was once the shore of the Aral Sea, a salt lake that has steadily shrunk as irrigation projects begun under Stalin drained the rivers that feed it. Drive closer and the sharp white peaks turn out to be a small Alps of salt – the Aral Tuz Company stockpile. Salt has been dug here for centuries. Nowadays, a great rail-mounted combine chews away at a 10-foot-thick layer of salt in the old seabed, before it is towed 11 miles back to the plant, and washed and ground. Before it reaches the packaging room, as the salt falls through a chute from one conveyor belt to another, a small pump sprays iodine into the grainy white cascade. The step is so simple that, if it were not for the women in white lab coats

up 7 percent of profits, the company's president, Ontalap Akhmetov, seemed puzzled. "I've only been president three years," he said. "But that makes no sense." The expense, he said, was minimal. "Only a few cents a ton." Kazakhstan was lucky. It had just the right mix of political and economic conditions for success: political support, 98 percent literacy, an economy helped along by rising prices for its oil and gas. Most important, perhaps, one company, Aral Tuz, makes 80 percent of the edible salt.

That combination is missing in many nations where iodine deficiency remains a health crisis. In nearby Pakistan, for instance, where 70 percent of households have no iodized salt, there are more than 600 small salt producers.

"If a country has a reasonably well-organized salt system and only a couple of big producers who get on the bandwagon, iodization works," said Venkatesh Mannar, a former salt producer in India who now heads the Micronutrient Initiative in Ottawa, which seeks to fortify the foods of the world's poor with iodine, iron and other minerals. "If there are a lot of small producers, it doesn't."

Now that Kazakhstan has its law, Ms. Sivryukova's volunteers have not let up their vigilance. They help enforce it by going to markets, buying salt and testing it on the spot. The government has trained customs agents to test salt imports and fenced some areas where people dug their own salt. Children still receive booklets and instruction.

Experts agree the country is unlikely to slip back into neglect. Surveys find consumers very aware of iodine, and the red-and-white logo is such a hit that food producers have asked for permission to use it on foods with added iron or folic acid, said Dr. Sharmanov, the former Kazakh Republic health minister. And the salt is working. In the 1999 survey that found stunted children, a smaller sampling of urine from women of child-bearing age found that 60 percent had suboptimal levels of iodine. "We just did a new study, which is not released yet," said Dr. Feruza Ospanova, head of the nutrition academy's laboratory. "The number was zero percent."

Sentinel screening of iodine status in western Cameroon finds excess iodine intake

D.N. Lantum, E.L. Monyuytaa,
and **J.N. Bonglaisin**
West and Central Africa Region, ICCIDD;
and the University of Yaounde, Cameroon

Introduction

Iodine deficiency in western Cameroon was first observed in 1973-74 (1). Endemic IDD was later described in this district by Lantum and collaborators in 1991 (2, 3). After this, universal salt iodization (USI) was introduced into Cameroon as a corrective intervention. In 2002, in a study by the Ministry of Health, a median UI of 190 µg/L was reported (4). Because Bamoungoum in western Cameroon is one of the 20 Sentinel Zones for monitoring the effectiveness of the national USI program, ICCIDD carried out an impact evaluation there in 2006.

School survey

In May 2006, a team led by Professor Dan Lantum (ICCIDD Focal Point for Anglophone West Africa) surveyed six primary schools of the district. The research team explained the health problems of IDD and goiter. The school children were happy and excited that goiters were no longer seen in the community, but they were not aware of the importance of iodized salt in their mothers' kitchens. The age range of the participating children (n=646) was 9-14 years. All the children were asked to bring to school a sample of salt collected from their mother's kitchen for testing for iodine. The next day, the children lined up in the open field in front of the school and the research team went round testing their salt samples using a Rapid Test Kit. Each was asked to loudly proclaim the color change after the test and what it signified. Cries of: "The colour is violet/blue! My salt sample contains iodine!" filled the schoolyard.

Dan Lantum testing household salt for iodine in schools in Bamougoum, Cameroon, May 2006

A subsample of salt collected from the children was also analyzed by titration for iodine content. Goiter was palpated in the children and spot urine samples (n=183) were collected and were tested titrimetrically. Since all iodized salt consumed in Cameroon is produced by three refineries at the Douala Port, in addition to iodized salt imported from Senegal, salt samples were collected from these sources and analyzed for iodine content.

Surprising results

In 1991, the total goiter rate (TGR) in this region was 53% (3), while the median UI was 30 µg/L, indicating moderate-to-severe IDD. By 2006, the TGR was 2%, but the median UI was high, at 389 µg/L, and the range was 270-735 µg/L (Table 1). Twenty percent of children showed adequate iodine nutrition (UI 100-300 µg/L), while 80% had UIs in the excess range (UI >300 µg/L) (Table 2).

In the samples of iodized salt from the refineries, although the regulation in force stipulates a concentration of 100 ppm (5), the values in four sources ranged from 28-225 ppm; one sample had salt iodized at 878 ppm (6) (Table 3). However, the iodine content of salt samples in households showed a range of 15-40 ppm.

Discussion

The results suggest iodized salt producers were not strictly following the level of iodization stipulated by the regulation in force (5). This is an indication that quality control of their product needs to be improved. Proper training of technicians at the refineries is therefore indicated, as well as frequent inspections by the Ministries of Health and Commerce. There was a marked difference in iodine content of iodized salt at production and at household levels. This is due to the losses (evaporation) of iodine during the salt distribution chain - which can take months or even years between the factory at Douala and a household at Bamoungoum.

The median UI of 389 µg/L and the finding that 80% of children were excreting iodine in the excess range is of concern and raises the issue of possible iodine toxicity. This emphasizes the urgent need for careful monitoring of iodized salt production and IDD status. Excess iodization of salt is expensive and unnecessarily inflates the cost of USI programs. High intakes of iodine in children are associated with increased thyroid volume, suggesting adverse effects on thyroid function (8).

Recommendations

The IDD control program in western Cameroon, in place for 15 years, demonstrates the effectiveness of USI in eliminating IDD. But as Bamoungoum is only one sentinel zone out of 20, this raises the question: is Bamoungoum representative of the entire country? Similar impact studies should be conducted in other sentinel zones or a new national survey should be done. More frequent monitoring of the USI/IDD program in Cameroon is needed, and, specifically, a revision of salt iodization regulations to the recommended range, that is, 25-45 ppm as iodine or 35-65 ppm as potassium iodate (9).

Table 1: Median urinary iodine concentration by school in Bamoungoum, western Cameroon in 2006

School	n	UI (µg/L)
Ecole Publique de Mbi A	39	387
Ecole Publique de Mbi B	40	327
Ecole Publique Mbi 2	13	339
Ecole Catholique St Antoine de Doumelong	27	340
Ecole Publique de Chefferie Bamoungoum	32	600
Ecole Publique Camp Militaire	32	345
Total	**183**	**389**

Table 2: Distribution of urinary iodine concentrations in children in Bamoungoum in 2006

UI (µg/L)	%	Iodine intake
0-20	0	Severe Deficiency
20-<50	0	Moderate
50-<100	0	Mild
100-<300	20.2	Adequate
300 and above	79.8	Excess

Table 3: Iodine concentrations salt samples at production point in Douala, March 2006

Brand	n	Iodine (ppm)
Socapursel	12	28
Sotrasel	12	38
Aigle	10/8	41/52
SSS/SOREPCO	28/14	144/879

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Personal stories

Two Kiwanians travel to Siberia to test the effect of iodine on animal productivity

The Republic of Tuva, population about 350,000, belongs to the Russian Federation. It lies next to Mongolia at the geographic center of Asia, and mountain ranges isolate it from the rest of Siberia. It has long been affected by severe IDD.

John Green and **Jerry Brenner** Kiwanis Chapter, New Jersey, USA

In 1999 Dr. Robert DeLong, ICCIDD Board Member from Duke University, USA, was invited to evaluate IDD in Tuva. He examined children in remote villages and found high rates of IDD. As an interim solution, Dr. DeLong proposed adding iodine to salt blocks for animals. He felt this would bring iodine to the local people through meat and related products like milk, cheese and butter. His proposal was based on similar work done in the UK in the 1920s. Dr. DeLong met with the President of Tuva and an agreement was reached. If salt processing and iodination equipment were provided to the government of Tuva, then the government of Tuva would furnish salt, iodine and funding for the project.

Tuvans in traditional dress

With the agreement in hand, Dr. DeLong ordered the processing machinery and submitted a grant request to Kiwanis/UNICEF for money to cover the equipment and to conduct follow-up medical studies. The grant request was turned down: it was felt Tuva was so remote that monitoring would be too difficult. Since the salt processing machinery was already ordered, and almost ready for shipment, two Kiwanians from New Jersey, USA, John Green and Jerry Brenner convinced the Kiwanis Foundation to adopt the project and raise funds; living up to their motto: "Young Children – Priority One!"

The equipment finally arrived in Tuva in September 2002 and was installed and tested. Further talks with government officials indicated the equipment would be operated and funded by the Republic of Tuva. The equipment was placed under the control of the Ministry of Agriculture because its interim use was aimed at livestock. Unfortunately, since then there has been very little progress in salt iodination in Tuva.

Manufacture of the iodized salt blocks in Tuva

However, John and Jerry were determined to get iodine to children in remote areas of Tuva. They made several trips to Tuva in an effort to provide iodized salt blocks to farmers, and to determine the effects of iodized salt on the productivity of the livestock. They worked closely with a local doctor, Dr. Rimma Chubarova. Dr. Chubarova, who supervised all the local study work, from the manufacture of the salt blocks to the selection of farms and the recording of all results, didn't speak English. John and Jerry can not speak Russian. But somehow they managed.

A study was done in 2005-2006. The Tuvan Ministry of Agriculture produced iodized salt blocks that were distributed to three "test" farms and three other farms served as controls. The farms were similar in the number of animals maintained and their general care and conditions (feed, water and housing). All farmers received free block salt for a period of six months and all were compensated for their participation (3000 Rubles or a little more than $100).

"…if we can demonstrate increased livestock productivity due to iodine, all farmers will want to use salt with iodine and that *may* get more iodine to the citizens of Tuva." John Green

John and Jerry examining salt iodization machinery in Tuva

During the study, in addition to live births, information was gathered on the amounts of iodine contained in the milk and urine of the animals before and after 6 months of iodine supplementation. In the iodine supplemented farms, all types of livestock – cows, ewes and does – showed increases in productivity. Overall, animal productivity doubled in the farms receiving iodine.

In a poor country like Tuva, increasing animal productivity by iodine supplementation could provide an economic boost. The participating farmers recognized the clear differences between "test" and "control" farm productivity. They have discussed iodized salt at their local meetings and will insist on iodized salt blocks in the future. Prof. Robert Delong, commenting on the results of the study, said: "This type of data for animals is not unprecedented, but it is of great importance, to my mind. It demonstrates that iodine supplementation can have important economic advantages for animal husbandmen. Milk and meat from supplemented animals benefits humans. Probably iodization of animals should have greater attention in all areas of severe iodine deficiency."

New cretins discovered in southern Xinjiang, China

Chen Zu-Pei ICCIDD Reginal Coordinator for China and East Asia

Prof Chen Zu-Pei was surprised to find several young cretins during a recent field study in July 2006 in Akesu Prefecture of Southern Xinjiang. He identified 16 cretins aged less than 15 years, with the youngest being 3 years old. Responding to his report of severe iodine deficiency in this region, the Chinese Ministry of Health immediately sent a team to confirm the findings and expand the investigation to three counties located in Akesu and Hetian Prefectures.

The team, led by Prof. Sun Dianjun and Prof. Chen Zupei, worked for two weeks and then held a 3-day workshop. Thirty six cretins less than 10 years old were identified (mainly neurological cretins); of these, 14 cases were aged less than 6 years. The cretins were found in villages where mainly non-iodized rock salt is used. In the local primary schools, it was estimated that 10 IQ points were lost (measured by the China Ravens' Test) and 16% of school children exhibited mild mental retardation (IQ in the range of 50-69).

The MOH decided on the following urgent measures:

■ To implement an iodized oil program in the three counties where

endemic cretins were identified. This program is planned to last until iodized salt can be made available.

■ To expand the investigation to the entire region of southern Xinjiang. The total population of this region is 8 million living in 5 prefectures, in which there are 3 prefectures with potential new cretins.

■ The government of Xinjiang was to hold a Teleconference Advocacy Meeting

■ To expand the investigation into the Western areas of China where the coverage of iodized salt is below 70%; these provinces include Tibet, Xinjiang, Qinhai, Gansu, Ningxia, Sichuan. Chongqing and Yunnan. This program will start in early 2007.

■ A monitoring plan will be developed for identifying high-risk areas.

■ National Training Courses will be organized for health workers in the region on identifying endemic cretinism.

Meetings and Announcements

Canada Supports Salt Iodization for Afghan Children

The Government of Canada has announced a $500,000 contribution to the Micronutrient Initiative to provide salt iodization programs for 10 million Afghans. Iodine deficiency--prevalent in Afghanistan--causes many infants to be born mentally impaired, and lessens the ability of children and youth to learn and work. This initiative in Afghanistan is expected to prevent over 100,000 children from being born mentally impaired. "We are pleased that the Canadian government continues to invest in cost-effective micronutrient programs that have the power to reach millions of children in the world's poorest countries," said Venkatesh Mannar, President of the Micronutrient Initiative. "In Afghanistan, where the prevalence of iodine deficiency is among the highest in the world, eliminating vitamin and mineral deficiencies is critical for people's health and well-being as well as to national economic development."

Prof. Chandrakant Pandav (l) receiving an appreciation award for longstanding service from the ICCIDD Chair, Jerry Burrow

ICCIDD Annual Board Meeting

The ICCIDD Annual Board Meeting was held in Manila, Philippines, on February 3-4, 2006. The meeting was graciously hosted by Dr. Theo San Luis, ICCIDD Focal Point for the Philippines. The meeting began with Reports of the Chair, Executive Director, Secretary and Treasurer. Discussions on resource development for ICCIDD included the changing development aid environment, new bilateral aid potential, the role of foundations, and the potential of advertising and product endorsements. Organizational goals that were discussed included the work plan, a vision statement, dealing with national programs, improving regional relations, the Global Network and collaborations on country monitoring. Committee reports were given by Resource Development, the Salt Committee, the Science Committee, as well as reports on the Newsletter and new ICCIDD Website. The working budget for 2007 was approved, and lifetime service awards were distributed. The meeting was immediately followed by the 8th Congress of the Asia-Oceania Thyroid Association, February 4-6, 2007, at the Westin Philippine Plaza Hotel in Manila.

ICCIDD Board members at their 2007 meeting in Manila

The 2007 Micronutrient Forum Meeting

The first international meeting of the Micronutrient Forum will take place on 16-18 April 2007 in Istanbul. The theme of the conference is, "Consequences and Control of Micronutrient Deficiencies: Science, Policy, and Programs – Defining the Issues."

Thyroid Disease in Older Adults: Diagnosis, Management, and Clinical Impact

The American Thyroid Association will hold this meeting on Friday, May 18, 2007, in Washington, DC. It is endorsed by the American Geriatrics Society. For information: website: www.thyroid.org; or contact: thyroid@thyroid.org.

The 60th World Health Assembly

The 60th World Health Assembly will take place on 14-23 May 2007, at the Palais des Nations in Geneva, Switzerland.

Abstracts

Effect of a mandatory iodization program on thyroid gland volume based on individuals' age, gender, and preceding severity of dietary iodine deficiency: a prospective, population-based study.

Vejbjerg P et al. J Clin Endocrinol Metab.2007 Jan 30; [Epub ahead of print]

The authors aimed to prospectively evaluate the effect of four years' mandatory iodization of salt (13 ppm iodine) on thyroid volume in two regional areas in Denmark with mild or moderate iodine deficiency. Two separate cross-sectional studies were performed before (n=4649) and after (n=3570) salt iodization. Women aged 18-65 years, and men aged 60-65 years were examined, and thyroid ultrasonography was performed. A lower median thyroid volume was seen in all age groups after iodization. The largest relative decline was found among the younger females from the area with previous, moderate iodine deficiency. After iodization there were no regional differences in median thyroid volume in the age groups less than 45 years of age.

Iodine nutrition status of exclusively breast-fed infants and their mothers in New Delhi, India.

Gupta R et al. J Pediatr Endocrinol Metab. 2006;19(12):1429-35.

The authors assessed the iodine nutrition of exclusively breast-fed infants and their mothers. Spot urinary iodine (UI) and serum TSH levels were measured in 175 infants and their mothers. Iodine content of salt used by participants was also analyzed. The median UI levels in mothers and infants was 124 µg/L and 162 µg/L, respectively. Serum TSH was elevated in 29% of mothers and 2% of infants. No correlation was observed between individual mother-infant UI or serum TSH levels. Over 90% of the salt samples tested had adequate iodine concentration.

Iodine status of Tasmanians following voluntary fortification of bread with iodine.

Seal JA et al. Med J Aust. 2007;186(2):69-71.

The aim of this study was to describe iodine status of Tasmanians following voluntary fortification of bread with iodine in October 2001. Cross-sectional UI surveys of Tasmanian schoolchildren aged 8-11 years were done. Median UI was 75 µg/L in 1998, 72 µg/L in 2000, 105 µg/L in 2003,

109 µg/L in 2004 and 105 µg/L in 2005. Median UI in post-intervention years (2003-2005) was significantly higher than in pre-intervention years. Switching to iodized salt in bread appears to have resulted in a significant improvement in iodine status in Tasmania. Given iodine deficiency has been identified in other parts of Australia and in New Zealand, mandatory iodine fortification of the food supply in both countries is worthy of consideration.

Child development: risk factors for adverse outcomes in developing countries.

Walker SP et al. Lancet. 2007;369(9556):145-57.

Poverty and associated health, nutrition, and social factors prevent at least 200 million children in developing countries from attaining their developmental potential. The authors reviewed the evidence linking compromised development with modifiable risks in children from birth to 5 years of age. Iodine deficiency was one of four key risk factors where the need for intervention is urgent: the others were stunting, inadequate cognitive stimulation and iron deficiency anemia. The risks often occur together or cumulatively, with concomitant increased adverse effects on the development of the world's poorest children.

Iodine deficiency persists in the Zanzibar Islands of Tanzania.

Assey VD et al. Food Nutr Bull. 2006;27(4):292-9.

The authors aimed to establish the prevalence of iodine-deficiency disorders in two Zanzibar Islands, a community assumed to have ready access to iodine-rich seafoods. In schoolchildren, goiter prevalence was 21.3% for Unguja and 32.0% for Pemba. The overall median UI was 128 µg/L. For Unguja the median was 186 µg/L, a higher value than the median of 53 µg/L for Pemba. The household availability of iodated salt was 63.5% in Unguja and 1.0% in Pemba. The community was not aware of IDD or iodated salt. These findings contradict the common assumption that an island population with access to seafood is not at risk for IDD.

Efficacy of daily and weekly multiple micronutrient food-like tablets for the correction of iodine deficiency in Indonesian males aged 6-12 mo.

Wijaya-Erhardt M et al. Am J Clin Nutr. 2007;85(1):137-43.

The authors aimed to compare the efficacy of daily and weekly multiple micronutrient food-like tablets (foodLETs) on iodine status in infants. In a double-blind, placebo-controlled trial, 133 Indonesian males aged 6-12 mo were randomly assigned to 1 of 4 groups: a daily multiple-micronutrient foodLET providing the Recommended Nutrient Intake (RNI)(DMM), a weekly multiple-micronutrient foodLET providing twice the RNI (WMM), a daily 10-mg Fe foodLET (DI), or placebo. At baseline, only 31% of subjects had a UI <100 µg/L. At 23 wk, the DMM group had the highest increment in UI; however, after adjustment for initial UI, the changes in UI were not different between the 4 groups. The DMM group had the greatest reduction in the proportion of iodine-deficient infants. The authors concluded that daily consumption of a foodLET providing the RNI during infancy can improve iodine status.

Urine iodine measurements, creatinine adjustment and thyroid deficiency in an adult United States population.

Haddow JE et al. J Clin Endocrinol Metab. 2007 Jan 2; [Epub ahead of print]

The aim of the study was to determine if low urine iodine was associated with thyroid deficiency in the US. Using the NHANES III data set, median TSH and total T4 values were examined according to deciles of urine iodine (with and without creatinine correction). Among the 5,963 men and 5,722 women, median UI did not vary with increasing age, while median creatinine levels decreased. UI and creatinine concentrations were lower among women. TSH increased with age, while total T4 decreased. Neither TSH nor total T4 median values were associated with UI. A multivariate regression analysis revealed only a weak association between UI and markers of thyroid function. The authors concluded that in the United States, the non-pregnant, adult population is iodine sufficient.

Selenium and goiter prevalence in borderline iodine sufficiency.

Brauer VF et al. Eur J Endocrinol. 2006;155(6):807-12.

The authors investigated the influence of selenium (Se) on thyroid volume in 172 subjects from area with borderline selenium and iodine sufficiency. The mean urinary Se (USe) and UI concentrations were 24 µg Se/L or 27 µg Se/g creatinine, and 96 µg I/L or 113 µg I/g creatinine. Subjects with goiter (n=89) showed significantly higher USe levels than probands with normal thyroid volume. The authors concluded that USe is not an independent risk factor for the development of goiter in borderline iodine sufficiency.

Thyroid hormone synthesis and secretion in humans after 80 milligrams of iodine for 15 days and subsequent withdrawal.

Theodoropoulou A et al. J Clin Endocrinol Metab. 2007;92(1):212-4.

The study aim was to determine whether, in human thyroid, administration of large doses of iodine for a relatively long time results in alterations of intrathyroidal hormonal (HI), T4 and T3, and total iodine (TI) content, as well as whether changes in serum concentration of thyroid hormones and TSH would occur after iodine administration or discontinuation. In 33 euthyroid patients, Lugol solution (80 mg iodine) was administered for 15 d. Groups of six to eight patients underwent operation 0, 5, 10, and 15 d after iodine withdrawal. Intrathyroidal HI content and serum T4 and T3 were unchanged during and after iodine discontinuation. TI was increased during iodine administration and returned to control values 5 d after discontinuation of iodine. Serum TSH was increased during iodine administration and returned to control values 10 d after iodine withdrawal. The authors concluded that administration of high doses of iodine increased intrathyroidal TI, but did not change HI or serum T4 and T3.

Design: **Urs Imholz** 8706 Feldmeilen, Switzerland

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Michael B. Zimmermann, M.D., the editor of the Newsletter, at the Human Nutrition Laboratory, Swiss Federal Institute of Technology Zürich, ETH Zentrum, Schmelzbergstrasse 7, LFW E19, CH-8092 Zürich, Switzerland, phone: +41 44 632 8657, fax: +41 44 632 1470, iccidd.newsletter@ilw.agrl.ethz.ch.

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