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Preventing blindness: vitamin-A fortified "Ultra Rice"

by Keane Shore



**Fortified rice is the most natural way to ensure
that children receive enough vitamin A**

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Last fall, small concrete mixers were turning as usual in rural Indonesia, but not to pour footings for new buildings. Instead, their operators were laying foundations of another kind. They were using the machines to mix Ultra Rice — a new vitamin A-fortified food product — with local commercial rices, to improve the health of communities.

Conducted by researchers at the Program for Appropriate Technology in Health (PATH) and the [Micronutrient Initiative](#), the field trials in Indonesia's Kupang district hold promise for people where vitamin A deficiency disorders are common. Loss of vision is the most obvious result of this global public health problem, which often culminates in death. According to the World Health Organization, Bangladesh, India, Indonesia, Nepal and the Philippines are among the 23 countries at highest risk. Each

year, up to 2.5 million deaths and 500,000 cases of blindness could be prevented if at-risk populations had access to adequate vitamin A.

Staple food

Rice is a staple food for most vitamin A-deficient populations. Although vitamin pills are almost universally available, some groups view pills as something to take only during an illness, or as too expensive to take at all. Ultra Rice is "a technology which works by giving people the vitamin in the most natural way, in the foods they are used to eating," says [Mahshid Lotfi](#), a senior program specialist at the Micronutrient Initiative, which is housed at IDRC. "You don't have to change people's attitudes, their way of life, what they eat — you don't have to do any of the things that always prove very difficult to do, and even more difficult to sustain."

Leading cause of blindness

Vitamin A deficiency is the single largest cause of blindness on Java, Indonesia's most populous island, where it accounts for at least 20% of blindness cases among preschool children. In some villages, the prevalence of active xerophthalmia, a deficiency-related disorder that clouds the cornea, is as high as 7%. However, even in places where severe cases are uncommon, the existence of mild vitamin A deficiency can have adverse implications for health and survival.

Developed with funding from the Micronutrient Initiative, Ultra Rice looks just like rice, but blends broken rice grains into a paste with vitamin A, binders and stabilizers designed to withstand tropical heat and humidity. Ultra Rice grains are then reconstructed using machines similar to commercial pasta makers, which operators can adjust to mimic the appearance of any one of the world's dozens of natural rice varieties. Ultra Rice is then mixed with natural rices at ratios of between 1:200 (0.5%) and 1:100 (1%), depending on patterns of rice consumption and the degree of vitamin A deficiency.

Taste tests

In informal taste tests conducted in 1994, some Indonesians were able to identify the Ultra Rice, particularly when it was present at higher proportions in the final blend. However, they were more likely to spot differences between varieties of local rice. The idea of using a concrete mixer to produce fortified rice blends flowed out of extensive research and field testing by PATH.

Pricing Ultra Rice

During the trials held last year, parents were quick to grasp the significance of Ultra Rice, says Dr Lotfi. Mothers in the Kupang district were well aware that the slightly whiter grains of what they called *Beras Vita* (*beras* is the Indonesian word for rice; *vitA* means both life and vitamin A), held benefits for their children — and said they were willing to pay a small premium for it. However, to gain acceptance, Ultra Rice cannot cost much more than regular rice, especially in Indonesia where the government controls prices of this staple. And the children who most need this product tend to be in families that are least able to pay more.

"Price is very important," says Dr Lotfi. "In Indonesia, rice is not just a commodity, it's important politically. You can't tamper with it, because the whole nation lives on rice."

Not a new idea

Fortification of foods is not a new idea in the North. Food processors routinely add vitamins or trace elements to milk, breakfast cereals, fruit juices and even salt. But this practice is far less common elsewhere, with the exception of iodized salt, which is rapidly spreading in the developing world. Dr Lotfi hopes the Micronutrient Initiative and PATH can help make the consumption of Ultra Rice and other fortified foods a part of life throughout the South. To further this goal, the two organizations were

finalizing negotiations in late 1996 that will clear the way for technology transfers to any interested nations, via the donation of all relevant patents on the production of Ultra Rice to PATH.

Keane Shore is an Ottawa-based writer and editor.

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New Weapon in War on Micronutrient Deficiencies

by Michael Boulet



Goitres are one of the most visible signs of iodine deficiency disorders

A recent breakthrough in food-fortification technology that allows two essential elements — iodine and iron — to be added to table salt represents a major advance in international efforts to prevent health problems associated with micronutrient deficiencies.

For more than 20 years, scientists have tried without success to fortify salt with iodine and iron in such a way that the two micronutrients do not react and lose their potency. When iron and iodine interact, the amounts available for absorption by the human body is significantly reduced, explains [Levente Diosady](#), a Professor of Food Engineering at the University of Toronto.

Physical Barrier

This breakthrough involves covering iodine particles with a capsule made from dextrin, a water-soluble starch compound, which serves as a physical barrier between the two elements. The double-fortification technology was developed with support from the [Micronutrient Initiative \(MI\)](#) and IDRC. The MI is an international secretariat based at IDRC that aims to eliminate health problems resulting from deficiencies

in iron, iodine, and vitamin A.

Iodine-fortified salt was introduced in North America and parts of Europe during the 1920s as a means of combating iodine deficiency disorders in the population. Iodine is an essential component of thyroid hormone, a substance that contributes to brain development in the fetus and regulates human metabolism. [Iodine deficiency](#) is the single greatest cause of preventable mental retardation in the world. Other related disorders include lethargy, physical disabilities, goitre, still-births, and neonatal deaths.

Double Trouble

In theory, the combination of iodine and iron in salt can simultaneously combat iodine and iron deficiency disorders, which together affect more than one-third of the world's population. [Iron deficiency](#) is the most common nutritional problem in the world, particularly among women, infants, and children. Health problems associated with a lack of iron in the diet include anemia, fatigue, learning problems, pregnancy complications, premature births, and maternal mortality.

Iodine is naturally present in water and soil, although some soils contain very low amounts. As a result, seafood is a more reliable source of iodine than crop plants. Around 1.6 billion people in more than 100 countries live in areas where iodine is not available in sufficient quantities. Those most at risk include approximately one-third of the population of China. Iodine deficiency is also a severe problem in the Himalayas, the Andes, India, and West Africa.

Future Studies

Researchers at the Hospital for Sick Children in Toronto are testing the efficiency of absorption of iodine and iron in double-fortified salt into the human body. Later this year, the new salt will undergo further tests by University of Ghana scientists. The IDRC-funded trials will target women and their families in areas of Ghana where iron- and iodine-deficiencies are endemic.

Michael Boulet is a research analyst at IDRC.

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Children's Health in Ghana's North

by Jason Lothian



**Researchers in northern Ghana
are probing the causes of child illness and death**

The guinea savannah of northern Ghana, home of the *Nankana* and *Kassena* people, is possibly the most risky place on earth to live during infancy. For every 1,000 children born, 222 die before age 5. Malaria takes most of them, but in northern Ghana death comes in many guises.

"Children die of malnutrition here. Measles, diarrhoeal disease, lung infection, it's all real here, it's not some faraway place," says [Dr Fred Binka](#), Director of the Navrongo Health Research Centre.

Wired to the world

In some senses, Navrongo is an isolated place: a 12-hour drive from the capital, Accra, and linked by unreliable telephone lines. Fortunately, the Centre is equipped with radio modem, computers, and a satellite ground station that permit communications and information exchange through the [HealthNet](#) project.

The Centre employs some 120 staff, from medical doctors to computer analysts and field workers hired from the area itself. Together, they are building a large database containing the names, ages, and movements of almost all the district's population, as well as pregnancies, births, illnesses, recoveries, and deaths.

Vitamin A trials

This ambitious research effort goes back to 1989 and a project supported by the United Kingdom's Overseas Development Assistance (ODA) studying the effects of Vitamin A on the health of children. In

time, VAST (Vitamin A Supplementation Trial), as the project was known, involved 22,000 children -- over 80% of the children in the district. A child mortality risk-factor study -- supported by IDRC -- was begun within the VAST project, as was detailed mapping, demographic, socio-cultural, and economic research.

Almost every child born after January 1, 1984 is recorded in the database. Field workers check on each child every 3 months. Community leaders are paid to communicate births, deaths, and pregnancies to the centre. When a child dies, the family is interviewed and the circumstances of death are reviewed by three medical doctors. If two of the three doctors agree about a cause of death, it is recorded. Otherwise, the cause of death is considered unknown.

The spirit child

An unsettling local practice uncovered through the project is responsible for the deaths of an estimated 4% of children born in the region. It is known as the 'spirit child' phenomenon. A spirit child is one who is born deformed, or whose birth results in the death of the mother or is followed by sickness in the family. A baby who cries too much is often sufficient proof of the presence of a spirit child.

For the *Nankana* and *Kassena* there is only one option: the spirit child must be killed. The village soothsayer makes the pronouncement and performs the deed with a lethal herbal potion. Some observers suggest that the practice could be the response of a society in which food security is tenuous and, therefore, is poorly endowed to look after disabled or orphaned children.

Unreported deaths

"We realized we were not being informed of all the neo-natal deaths," says Dr Binka. "If a child had a sixth finger, or for whatever reason was called a spirit child, we would not be told of the birth. Nor would we hear of the death," says Dr Binka.

Therefore, the team began recording pregnancies along with births and deaths. Still, Dr Binka believes the figure of 4% underestimates the number of deaths attributable to the spirit child phenomenon.

The solution, Dr Binka believes, lies in the South. When *Nankana* and *Kassena* people travel to the cities they take almost all of their culture with them. They organize their communities around a chief and soothsayer. But they don't take the spirit child phenomenon with them. "How do you leave that behind?" asks Dr Binka. "Somewhere in that mystery is the answer."

Digital mapping

Finding responses to these and other questions is facilitated technically by computers and satellites used to map the district and population. A handheld device about the size of a calculator uses satellites to isolate landmarks such as family compounds or irrigation canals. A geographic information system can couple this information with the project's research data.

Some types of research require data to be spatially represented -- family planning, for instance. Information on a screen reveals discrepancies better than numbers or charts. Dr Alex Nazzer, the project's coordinator for family planning and District Director of Health Services, calls the digital mapping a gold mine. With a computer map that shows where family planning is being practised, the areas that require renewed attention become obvious.

Malaria

Perhaps the Centre's greatest challenge is combatting malaria. DDT spraying was a way of controlling

mosquitos until the insects built up an immunity to such chemicals. Next came early diagnosis and treatment. Unfortunately, malaria now has three levels of resistance to modern drugs. Currently, the disease is at the second level in the Navrongo area.

"The worst part is that chloroquine, our first-level drug, is very cheap to employ -- only 200 cedis (approx. US\$0.14) for a course. The second-line drug costs 1,200 (US\$0.84) a dose. Finally, the third-line drug costs 8,000 (US\$5.63)," says Dr Binka.

Insecticide-treated bednets

The disease can strike several times a year. Subsistence farmers cannot absorb the financial burden of paying for drug treatment. Therefore, with support from WHO, IDRC, and the Canadian International Development Agency, the Navrongo team is investigating insecticide-impregnated bednets as an alternative for malaria control. The mosquito nets are expensive but long-lasting. Even a second-hand net with holes, but treated with insecticide, offers considerable protection. The idea is more radical than it seems because most people have never slept beneath a mosquito net. There was concern that people would not use them.

Huge success

For Dr Binka and his staff, the trial has been a huge success. Not least because the control group for the experiment, the half of the population not protected by nets, are now buying their own. Dr Binka thinks malaria deaths could be halved if everyone had a net.

"They know they sleep better at night, they are stronger on the farm and they get sick less often. What further proof does a working man or woman need?" he asks.

At the compound of the Akanson family, 22 people sleep under nets. Immaculate Akanson, the 70 year-old matriarch of the clan, enjoys the benefits of the bednets. "Ever since I was born, malaria has been my disease," she says through her interpreter, grandson Benjamin. "Malaria was so acute it could make you lose your appetite, you couldn't work, you couldn't sleep and it gave you fever and vomiting."

With research advances on child mortality, malaria control, and vitamins, the Navrongo Health Research Centre is becoming known as one of the best of its kind in the world. Dr Binka attributes much of that success to the trust the Centre has built among the local people.

Jason Lothian, Gemini News Service, reporting from Northern Ghana.

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[The Intellectual Arrogance of the North](#) *Large-scale production of the world's first safe and effective malaria vaccine could begin in 1997. But the vaccine might already have been in use if not for the "intellectual racism" of scientists in the North.*

[Infectious Diseases: A Growing Global Threat](#) *An early warning system is needed to help fight the spread of infectious disease -- the leading cause of death and disability in the world.*

[The Micronutrient Initiative](#) *Eliminating micronutrient malnutrition can significantly improve the health and socio-economic wellbeing of billions of people.*

[An Electronic Lifeline](#) *New satellite technology is helping health professionals in Africa and other regions access the most up-to-date medical information.*

[GIS for Health and the Environment](#) *How geographic information systems can be used to monitor tropical diseases, water quality, environmental toxicology and overall rural health.*

[Net Gain: A New Method for Preventing Malaria Deaths](#) *A finely spun net could prevent as many as one third of all child deaths in Africa.*

Additional resources:

[World Health Organization's \(WHO\) Division of Control of Tropical Diseases Internet Site](#)

[U.S. Centers for Disease Control \(CDC\) Home Travel Information Page](#)

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