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The Taste of Survival:

How Maria Ylagan Orosa Used Nutritional Science to Combat Malnutrition, Colonialism, and Imperialism in the Philippines

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STRENGTH FROM WITHIN

In times of war and scarcity, hunger gnaws and fatigue sets in. In the Philippines during World War II, thousands of civilians, soldiers, and prisoners of war suffered from a disease that robbed them of their strength as they fought against Japanese imperialism: beriberi disease. This disease, caused by a deficiency of vitamin B-1 (thiamine), leads to weakness, nerve damage, and in severe cases, heart failure.[1] Their salvation came not from America but from within the Philippines itself—Maria Ylagan Orosa.

Orosa was a pioneering Filipino chemist and innovator who fought colonialism and imperialism by addressing problems in food systems to increase national food production and nutrition. She addressed the issues of malnutrition and food insecurity through the invention of food products, innovations in food packaging and preservation, and the creation of recipes using indigenous plants and animals. During World War II, Filipino and American citizens and prisoners of war were suffering from beriberi disease. Orosa found a way to cure and prevent this disease using rice bran, or darak. By sifting the rice bran to get a flour called Tiki-Tiki, Orosa was able to create recipes and foods—such as her famous Tiki-Tiki cookies—that were nutritious and high in vitamins A, D, and E.[2] Simultaneously, Orosa was able to transform darak, an agricultural waste product that was used as cheap animal feed, into an affordable food product that prevented food waste and insecurity.

Figure 1: Maria Ylagan Orosa.[1]

THE SCOURGE OF BERIBERI DISEASE

In order to fully appreciate Orosa's life-saving contribution, it is important to understand the severity of beriberi disease. There are two major types of beriberi: wet beriberi, which affects the cardiovascular system, and dry beriberi which affects the nervous system.[3] Those affected may also suffer from poor memory, irritability, sleep disturbance, constipation, burning pain, muscle cramps, muscle atrophy, tachycardia (abnormally fast heart rate), chest pain, hypotension (low blood pressure), or heart failure.[1] Beriberi typically presents with three main symptoms: peripheral neuritis or damage to the nerves outside the spinal cord, cardiac insufficiency, and a tendency to accumulate fluid in the body's tissues or edema.[4]

The symptoms of beriberi disease vary greatly, often making it difficult to diagnose and treat. In severe cases, soldiers and prisoners could die suddenly of cardiac failure while others, with milder cases, can suffer for years, wasting away, their muscles atrophying until they become "a helpless and shrunken skeleton".[4] But how exactly does a

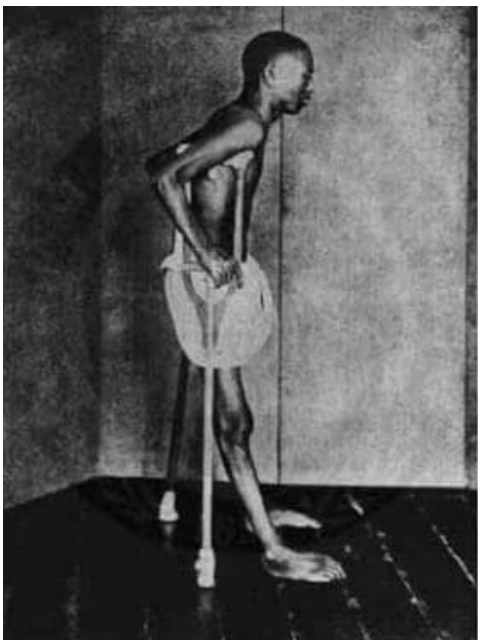

Figure 2: The effects of beriberi disease include muscle atrophy.[2]

deficiency in vitamin B-1 cause this?

Beriberi disease is a deficiency of thiamine pyrophosphate, which is the active form of vitamin B-1. Thiamine pyrophosphate is important as it helps enzymes break down carbohydrates for energy.[1] This vitamin is absorbed in the small intestine and more specifically in a section called the jejunum. The body uses two different methods to absorb thiamine depending on how much of the vitamin is available. When thiamine levels in the small intestine are low, the body works harder to absorb it into the bloodstream using an active transport portal, which acts like a small pump pulling the vitamin in. When the levels are high, absorption happens via a passive mucosal process allowing thiamine to flow without extra effort. Once a maximum of five milligrams is absorbed through the small intestine, the phosphorylation of thiamine occurs, which helps the vitamin become usable for the body to produce energy and complete other essential functions.[1]

Thiamine, which cannot be produced in the body, is mostly concentrated in the skeletal muscles but can be found in the brain, heart, liver, and kidneys—which also excrete it. The body can only store up to 30 milligrams of thiamine in its tissues at a time with its half-life lasting 9-18 days.[1] This short half life means that it needs to be constantly consumed, making a deficiency a more threatening issue. Now what does this have to do with rice?

A NATIONAL HERO — OROSA'S TIKI-TIKI FLOUR, RECIPES, AND PATRIOTISM

The Philippine Bureau of Science found that rice bran could be used to prevent beriberi disease. Rice bran turned out to be high in vitamin B and is about 21% fat, 12.5% protein, and 45% carbohydrates, making it high in calories.[5] The rice bran has a higher fat content than either wheat flour or plain rice, is as rich in protein as wheat flour, and has more protein than rice. The Philippine Bureau of Science was even able to originate an extract of "darak" or "Tiki-Tiki," that could be used as a concentrate by nursing mothers to cure infantile beriberi. The term darak refers to the outer portion of the grain after the husk is removed. The rice bran, once made into a flour, could be made into any baked goods while still tasting very similar to products made from wheat flour.[5]

The connection between the nutritional value of the nation's primary food staple, rice, which had been stripped by industrial milling practices and beriberi disease, was discovered in part from the seasonal presence of it. The highest rates of fatal cases in the Philippines occurred in September, October, and November. During these months, the imported rice was the main source of food and mostly came from large mills that highly processed the grains, producing whiter rice than that produced domestically. The imported white rice, particularly from Saigon, Shanghai, Northern China, Japan and Korea, had been processed in such a way that the nutritious outer layers — the source of the thiamine or vitamin B-1—were removed.[4] In these other Asian countries, rice milling removed the nutritious hulls on the grain on the farms to reduce the shipping volume of the rice whereas the Philippines, to protect against insects, did not remove the rice hull until one was ready to hull and mill the white rice.[4]

During industrial polishing and processing of the rice, the embryo — one of the most nutritious parts of the rice — is usually "knocked off" and included in the darak, along with the other outer grain layers, which are rich in protein, fat, and vitamins. In contrast, the inner portion of the grain is composed largely of starch and is deficient in vitamin B, making a diet based on this highly processed rice a major cause of beriberi.[5] Despite this finding, the Philippine Bureau of Education, an American-administered government office, promoted the consumption of imported goods such as canned foods and Western whole grains over rice.[6] Additionally, it was the official policy of the U.S. government on agriculture in the Philippines to focus on growing crops that could be exported and sold on the international market instead of producing the country's entire rice requirement domestically. This was because it was deemed more economically beneficial and any rice shortages could be mitigated by importing rice.[7] Therefore, the Philippines lacked a robust domestic system of rice production prior to World War II.

All of these factors compounded to a dangerous extreme when the Japanese invaded the Philippines in 1942 and took

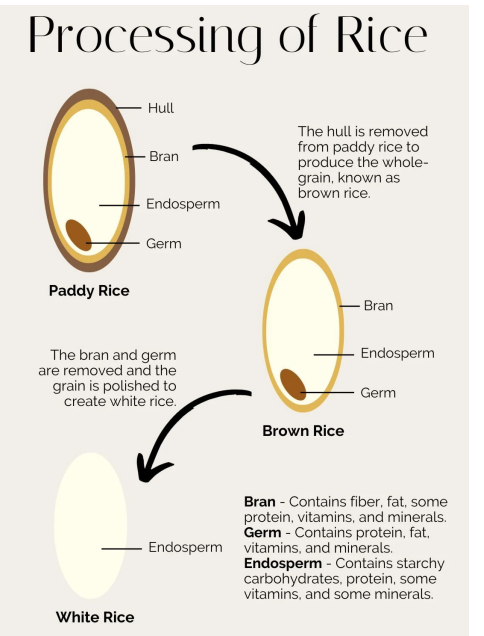

Figure 3: During the industrial processing of rice, the hull, the bran, and germ or embryo of the rice is removed.[3]

control over rice supplies. They controlled rice importation and cut off routes for rural farmers to deliver food provisions to those in urban cities so shortages of food such as rice and flour became common.[7] As head of the Plant Utilization Division of the Philippine Government's Bureau of Plant Industry, it was Orosa's job to feed these civilians and the 400,000 Filipinos serving in the U.S. military as part of the U.S. Army in the Old Philippine Scouts, Philippine Commonwealth Army, Recognized Guerilla Forces, and New Philippine Scouts.[8,9] These American and Philippine forces fought to liberate the islands from Japanese forces.[8,9] So, Orosa nourished them by creating recipes for Tiki-Tiki flour like her classic Tiki-Tiki cookies,

and distributing them across the nation through various methods.[2]

One of those methods relied on work from earlier in her career where she had founded the Home Extension Service. She and hundreds of other demonstrators went into communities across the Philippines to teach women new ways of food preparation and preservation as well as how to establish self-sustaining gardens. It was through this organization that she was able to teach women about food substitutes and cooking in emergency situations during the war. To further support these efforts she designed the palayok oven, an adaptation of the traditional palayok pot, so that families could bake nutritious foods, like the ones from her recipes, without electricity and from local flours, especially when imported ingredients and baked goods were too expensive or scarce.[9] Additionally, as a captain in the Marking Guerillas—underground resistance units fighting against Japanese occupation—Orosa smuggled her nutrient-rich rations inside hollow construction materials to Filipino and American prisoners of war, like the over 4,000 prisoners detained at the Santo Tomas Internment Camp on the campus of University of Santo Tomas in Manila.[9,10]

Through her process of sifting and refining darak into Tiki-Tiki flour, she created an inexpensive and potent source of vitamins B-1, A, D, and E.[2] This new use of darak—as flour for cooking instead of for animal feed— created new economic opportunities for rice farmers and decreased national dependence on foreign food imports like rice and flour. Thus, her recipes, including Tiki-Tiki cookies, became essential for not only nutrition but national survival. From her work promoting the consumption of rice bran and Tiki-Tiki flour, it is estimated that more than a hundred thousand tons of rice bran were produced annually in the Philippines from 1985-1994.[5]

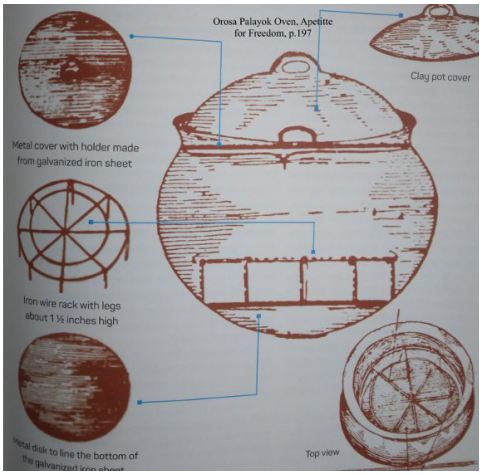

Figure 5: Orosa transformed the palayok, a traditional Filipino earthenware pot, into an oven by adding a rack to the bottom and a metal lid so as to allow families to bake food efficiently and without electricity.[5]

NOURISHING A NATION — OROSA'S LASTING IMPACT

Orosa's recipes are still used to this day and her discovery and promotion of rice bran and Tiki-Tiki flour, which have saved thousands of lives, are only one of her 700 inventions and innovations.[9] She developed new methods of preserving foods and produced and created Soyalac, a protein-rich soy-based drink.[9] Her most iconic invention, banana ketchup, is a tomato ketchup substitute made from mashed bananas, sugar, vinegar, and spices that was developed because tomatoes were difficult to grow in the Philippines and imported ketchup was costly. This innovation became a beloved Filipino staple, symbolizing resistance to colonial influence and pride in indigenous resources.[6]

Through her life's work, Orosa directly countered the colonial food regime established under American occupation, which promoted imported canned goods and Western foods as symbols of hygiene and modernity while pathologizing native Filipino foodways. She challenged this with every recipe, invention, and public training — insisting that true progress came not from mimicking the West, but from nurturing what already grew in Filipino soil. She argued that by preserving native foods at home, Filipino women performed a patriotic act of service.[9] Orosa's devotion to cultural preservation and domestic production also helped liberate her country from Japanese occupation. Her efforts were both a personal defiance of colonial and imperial food policy and a broader campaign to reclaim Filipino agency, self sufficiency, and pride.

Figure 4: Cookies made from Tiki-Tiki flour.[4]

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