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Scientists in Developing Countries and Their Roles in Research for Development

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If one asks the question: What can a scientist do in developing countries, given the urgency of the many and complex problems and give the the challenges of limited manpower, resources and facilities? The answer would be that on the one hand, we scientists want to use our imagination, curiosity and know-how to advance our knowledge. But, one the other hand the urgency of the country's problems call for our contributuion too. Scientists can not afford to conduct scientific work for scientific merit only.

In developed countries, scientific research tends to be conducted to search for new knowledge, for the advancement of theoretical formulations, the development of new inventions and innovation, and is often sophisticated. The frustration faced by scientists in developing countries is an opportunity to conduct good scientific work given the limited resources and conduciveness of the academic climate due to competing urgent needs of the country. This is often further aggravated by the perception that scientific research is a luxury for developing countries and should be done only when a country becomes more developed and has extra resources. This is an absolute misperception.

Let me share with you a perspective of a young scientist, back in the late 1950s.

During those early years of my work, nutrition research was not recognized to be an important element in development. My interest in this subject was triggered by the findings from my very first experience in heading a team of Thai scientists to work with foreign scintists in conducting the first nationwide nutrition survey in Thailand. It was the first time that we had solid data that various nutrition related problems existed in many regions of Thailand. One striking problem that I saw at the Ubon provincial hospital in April 1960 was the tremendous number of kidney stones that were removed from patients as young as a few months old up to 50-60 years of age.

At that time very little was known about the nature and cause of the problem.

Children who had such a stone suffered a lot of pain caused by obstruction, every time they urinated. Regrettably, the only remedy available then was surgical removal of the stone. The problem was so prevalent and so many of our youngsters were suffering, not to mention the burden on the family to care for these young children and the burden on our economy to provide treatment.

Historically, the disease had been reported in the United Kingdom about 200 years ago. Even further back, a stone was found in an Egyptian mummy of a young adult 16 years of age who died 5,000 years ago. The disease was widespread in developed countries some hundred years ago, but disappeared over time. Today, the stone belt lies between the middle-east and south-east Asia.

From the natural history of the disease, its etiology must have been multiple, thus, there could have been many unknowns in the euqation. With this realization, several methodologies were meeded for various phases of the study. Clinical data were complemented with biochemical and epidemiological studies. An epidemiological study was designed to compare potential causal factors, such as the disease distribution pattem and dietary intakes between children living in the stone—endemic area against non-endemic areas, belonging to the same ethnic origin. The chemical compositions and physical characteristics of the stone, as well as biochemical and physiological states of children living in these two areas were investigated.

After almost ten years of investigation, we were able to derive a specific hypothesis that phosphorus is the missing nutrient, causing an imbalance of metabolism. The deficiency resulted in crystalization of oxalate, which was comsumed in a large amount in the diet. Clumping of the crystals and other urinary metabolites occur in stagnate urine accumulated in the bladder due to low fluid intake, despite an acid environment. And a stone is eventually formed.

This hypothesis was verified in animal experimentation and human subjects from the disease endemic areas. Once verified, a treatment regimen was used successfully to cure patients at the early state of stone formation. A public health strategy was also formulated and tested with a population in their usual living conditions. The prevention was shown to be effictive.

Let me emphasize here that this research reflects the need for an imterdisciplinary, holspistic approach in identifying the unknown etiology of a problem. A wide range of scientific expertise in medical sciences was required. Importantly, investigations in various aspects were essential to elucidate the cause and suggest preventive measures.

From this work, it was confrmed and intemalized that research for development does not necessarily address only sophisticated research for developing new knowledge and technology. Equally important is research for fevelopment that addresses the country's problems. In this case, nutrition for physical well being which is fundamental to our human resources development. This study demonstrates that science is necessary to form a basis for policy making and planning of intervention.

Let me give you another example of nutrition deficiency which has provoked a lot of interest worldwide, the problem of protein-energy malnutrition, or its abbreviated name, PEM. In the 1960s, a large number of infants and young children in Africa were reported to be suffering from severe protein deficiency. "Protein-gap" became the catch word.

Looking at Asian diets, including Thai's, rice constitues a large part of habitual diets and contributes both protein and energy. Due to the bulk of diets, energy deficits might have been more serious among young Thai children. Being concerned about overemphasis on protein, I initiated investigation on the feeding practices and intakes of our rural young children. It was verified that the energy deficit actually accounted more than protein deficiency. This had an important policy implication, i.e., recommending that when feeding young infants the need to emphasize adequate amounts of energy as well as protein intakes.

Regarding protein, the protein quality of plants is inferior to animal sources due to missing essential amino acids. When I was in the States, I carried out a study to supplement amino acids such as Iysine and threonine to improve protein quality. However supplementation with pure amino acids is not likely to be effective given several constraints in developing countries.

I therefore, explored the possibility of including legumes, which are known to contain sulfur-containing amino acids missing from rice. We formulated infant rice with one or two of these legumes to increase both energy density and the quality of protein. Furthere, we introduced this infant formulae for nationwide implementation. But we had learned the difficulty in the past of distributing foods produced centrally. Our scientists went another step to innovatively develop appropriate technology, the procedures and technology of which suit the local situation. Also, community participation was promoted. We successfully incorporated these elements with others in primary health care and this resulted in a marked improvement in the nutritional status of young children.

Even today, appropriate infant omplementary foods and feeding remain a challenge for many developing countries, particularly among populations consuming cerealbased diets. Traditional feeding practices further aggravate the problem due to untimely feeding, and improper quantity and quality food to complement breastfeeding. Moreover, as the community improved, needs also change. Scientists are required to look at different technological developments that suit the current situation.

At Present, developing countries are progressing rapidly. New challenges emerge, and new scientific exploration remain essential. Therefore, it becomes even more important that scientists in developing countries be prepared to cope with the country's changing needs. Scientific progress in developing countries will continue to require basic as well as applied sciences and technological development. Problems in developing countries are complex. The application of scientific findings to effectively tackle the problem requires interdisciplinary efforts. Scientists need to share their knowledge and findings with other professionals. Although the difficulties of interdisciplinary efforts are well appreciated, we should not be apprehensive. It is crucial for success and we do not have the luxury of working in isolation. We should take this as another challenge. And, I can assure you that the outcomes are always rewarding.

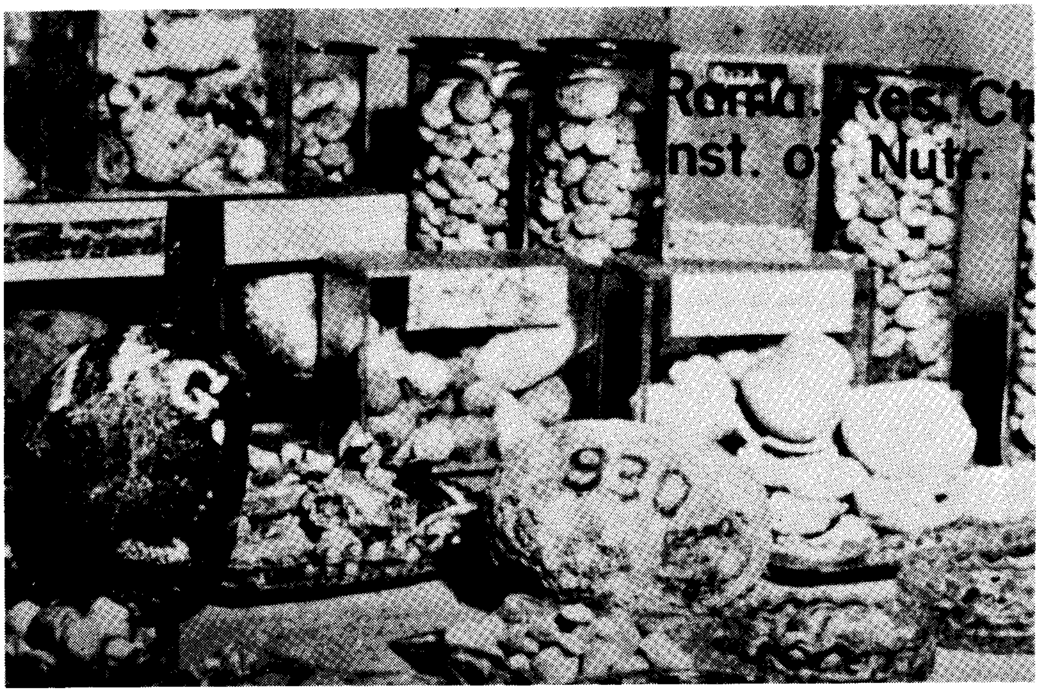
Finally, I would like to encourage scientists in Thailand and in other developing countries in Asia to strengthen science and technology through research and manpower development. Having the comparative advantage of being so similar in our cultural and historical backgrounds, we should attempt to increase our collaboration. I believe, we have several common challenges that need science and technology for the fullest benefit of developing countries.

Author's Background.

Professor Dr. Aree Valyasevi was named an outstanding Thai scientist in 1994.

He is a role model as a researcher and research promotor, directing research which addresses the problems of the country and the developing world. He believes that combining various research methodologies including basic and applied medical and social sciences has maximized the benefits of research for the Thai population's well-being and fulfilled the country's goal of human development. His pioneering and persevering eforts as well as his long and continuous commitments are reflected in his research and the work of those who are following his path, all of which has contributed significantly to human resource development.

Picture 1. About 15 pediatric patients, mostly only 2-5 years of age, suffering from urinary bladder stone. I asked them to line up in the pediatric ward. They were either waiting for, or had just had a stone removed from the urinary bladder.



Picture 2. Another intriguing encounter was the stone museum, and unusual kind of museum. Thousands of stones of various sizes which had been removed from patients were displayed. There was a huge stone weighing 1 kilogram removed from a man 60 year old who had suffered from it for more than 40 years. Many of the smaller ones were removed from children before school age.