The Role of Research in the Conservation of Our Nutritional Resources

SOURCES OF FUNDAMENTAL NUTRITION

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contagious and infectious disease.

Poor Soils and Deficient Diets

A parallel evident and known to all of us in the case of the poor whites of the South who, while stuffing themselves all day long are actually suffering from malnutrition because of the unbalance of their diets and the mineral and protein deficiencies of the food with which they are stuffing themselves – deficiencies actually arising from poor soils or poorly managed soils.

"We Are The Soil"

In a sense we are the soil itself, made out of the soil, its minerals, the vitamins which derive from the minerals, and their effects upon glands, growth, metabolism and even character and intelligence. In this respect the Russian assertion that environments can have as much effect as the genes of inheritance is not so far off the beam as some of our more strict Mendelians would have us believe. Any cattle or horse breeder knows that poor or unbalanced nutrition can change completely the behavior, the breeding capacity, the physique and even the intelligence of an animal carrying the most carefully selected genes. This is notably true of some of our human stock in the Mid-South with fine and pure blood lines distorted and deformed by a poor nutritional environment.

The Obstacles To Better Food

With respect to the bulk increase in food to feed a starving world, Dr. Compton has much to say in his paper. I would quarrel with none of it. Indeed I could, I think, add to it instances, increasing constantly and daily, of new means by which high protein foods can be obtained in quantity by what might be described as artificially productive or technological means. I believe that even with the knowledge we possess today (which is perhaps as little as ten per cent of what there is to know concerning food production) the world could feed itself better on the whole than it has ever been fed before. The means are at hand. The limiting factors are bad distribution, wars, political disorders, ignorance and the maneuverings and stupidities of high level politicians.

As early as Eighteen Fifty a brilliant Swedish traveller and feminist, Frederika Bremer, exploring the reaches of the Mississippi Basin, expressed the belief that rich area could easily feed adequately 250 million people. This is, I believe, an underestimate. We are limited in such production today only by lack of adequate distribution and markets, by a poor and on the whole, exploiting and shortsighted agriculture. Necessity and a better agriculture in the United States could provide food from the soil without technologically chemical aids, for a population at least three times our present population of 150 million and at the nutritional level to which we are accustomed today or even at a better level.

The Rise of Farm Knowledge

I think it conservative to say that we have learned more of soil, of agriculture and animal husbandry, and of the nutritional aspects of soil within the past fifteen to twenty years than in the whole history of the world before, and that what we know is only about ten per cent of what there is to know. There have always been good farmers and good agricultural practices, many of them regarded in the very recent past as "superstitions" but recently proven to have the soundest of scientific bases. But, and this is a very big BUT, the farmers of the past did not know *why* these good practices worked and were unable to connect such elements as nutrition with the resistance of susceptibility of plants and animals, to disease and even in the case of plants to their susceptibility or resistance to attack by insect pests and those borderline organisms which apparently belong neither to the world of plants or of animals.

Agriculture an Exact Science

In our work at Malabar Farm and in my own concentrated work with farm, gardens and soils over a lifetime, it has become increasingly apparent that good and profitable agriculture is not merely a dignified and complicated profession; it is also an exact science. It seems, for example, increasingly clear that the balances of minerals and organics in relation to optimum production of any given crop are as exact as the laws and balances of chemistry and physics. Any diversion from those balances results in inferior yields both in terms of bulk and of nutrition. There is also increasingly weighty evidence to indicate that any diversion from that exact balance increases in proportionate degree the susceptibility of the given crop to disease and to attack by insects.

Importance of Animal Diets

Carrying this assumption one degree further we have had every indication that livestock feeding upon that given crop in turn experience similar variations in susceptibility or resistance to disease and perhaps even to insect pests in direct relation with the variations from that exact balance in the soils themselves. The sole exception in the case of insects might apply to those insects which arrive in such vast quantities and with such vast appetites that they will feed upon anything at hand even though it be unpalatable or actually poisonous.

Within the last few years a wholly miraculous world has been opened up in agriculture, animal husbandry and horticulture – a world which includes factors relating to nutrition and to health which hitherto were unknown or at least went unanalyzed . . . the world of the antibiotics and the world of the trace elements such as zinc, copper, manganese, boron and many others. It has been known for centuries in Middle Europe that a poultice of mouldy bread would cure and heal a stubborn wound or an ulcer

but it was only discovered a few years ago that the cure was effected not by the bread itself but by a substance called penicillin which was produced by the mould which fed upon the bread.

Role of the Trace Elements

It has been known for centuries in India and even among our old-time farmers here, that a poultice of fresh cow manure was effective in disinfecting and curing a wound, and that fresh cow manure would stop cannibalism among chickens and increase the rate of growth, and disease resistance in hogs following cattle, but it was discovered less than two years ago that the principal element involved was the new Vitamin B 12 of which the cow, utilizing her own stomach, is the world's greatest manufacturer. Then another amazing fact appeared in the picture – a fact which fitted exactly into the general pattern which has been emerging slowly out of the soil through plants, animals and people and their nutrition, resistance and health. *The cow could not manufacture vitamin B 12 nor could it come into existence elsewhere* without the presence of minute quantities of the trace element cobalt since cobalt is a part of the molecular structure of the vitamin itself.

Experiments With Cobalt

This factor in turn linked in directly with a long known and dreaded malady variously known as droopneck, salt sickness and by other names, which occurred in certain definite regions of the United States, notably Northern Florida and Southern Georgia and parts of Michigan and Vermont. For generations this malady, which afflicted people with lack of vitality and intelligence and a perpetually tired feeling and cattle with loss of appetite to the point of starvation, remained a mystery and by some it was even looked upon as an infectious disease endemic to those given areas. Then it was discovered that the disease was really a form of anemia which responded to none of the accepted treatments for the disease. The first clue to a cure came from an animal husbandry instructor at the Michigan State College of Agriculture when he began experimentation by feeding to the stricken animals various trace elements in chemical salt forms available to their metabolism. He got no results whatever until he hit upon cobalt, when within less than ten days after he began the treatment the animals were again on their feet and eating heartily. Since then the anemia both in animals and people has been cured in those areas both by the use of cobalt salts in direct therapy and by adding cobalt to the soils in which it had been totally lacking or had existed in a form unavailable to plants and consequently to animals and people in the given area. In the case of the cattle and possibly in the case of humans, the lack of cobalt had made it impossible for them to create through their metabolism the immensely important vitamin B 12, and acute anemia resulted. Vitamin B 12 as a substance, is of very recent discovery but it has already proven when used by injection into the veins, virtually a certain cure for the most virulent forms of pernicious anemia and of anemia which for various reasons failed to respond to the previously known and used treatments of the malady.

Patterns and Balances In Nature

Perhaps what might be called "the chicken litter" story is the most complete evidence of at least one of those patterns which exist in nature and are as yet undiscovered, and of laws and checks and balances which operate within the realm of health, nutrition and disease prevention and are gradually being put together bit by bit and understood. The story is in itself revolutionary and when its full implications are realized may be as important in the field of nutrition and disease as the great discoveries of Pasteur and his followers. It involves a whole chain of reactions involving the trace elements, notably cobalt, as well as the moulds and antibiotics.

War Changed Poultry Conditions

Briefly the story came about through the inquiries of large scale poultry operators who during the war were short of labor and consequently were unable to change frequently the chopped straw and other materials in which their chickens ran about in the houses where they were kept continually enclosed under unnatural conditions. This, it had been universally taught, was a procedure absolutely disastrous to the health and welfare of the poultry. The proper procedure was to clean out the litter every few weeks or months and thoroughly disinfect the hen houses with strong doses of corrosive disinfectant. It was considered absolutely fatal to bring in new hens or to raise young chicks on litter used previously by other chickens. Under normal labor conditions this practice was scrupulously followed by all poultry growers who kept hens enclosed under the modern high pressure egg producing systems.

A Puzzling Question For Farmers

Under this disinfecting program, poultry growers everywhere were plagued by various poultry diseases and in particular by cannibalism among the chickens when numbers of them would turn upon a certain hen and peck her to death. All the remedies and nostrums employed were only temporary palliatives with the exception of a crude remedy just coming into recognition at the time the final discoveries were made. This was the feeding daily of fresh cow manure for which the chickens showed a great liking and which appeared to appease their cannibalistic instincts. Here, of course, was a clue though it passed unnoticed because the other parts of the pattern were not yet available.

When during the war, the big poultry growers were unable to clean out the litter and disinfect their henhouses regularly, they were forced to put new pullets and even chicks on old litter accumulated sometimes to a depth of a foot or two. They then

observed that even in the case of new hens on old litter their egg production increased, the disease rate went down and cannibalism disappeared entirely. In effect they got exactly the opposite results from those which had been universally and direfully predicted by the poultry experts. The poultry raisers wanted to know why, and they asked the Research authorities to find out. Here was a perfect case of a practice which "worked" contrary to all apparently scientific knowledge, but the reasons were unknown.

Poultry Sought High Proteins

Various agencies worked on the answer but the principal work was done by the Wooster Ohio State Agricultural Experiment Station. There they discovered that although there was no grain whatever left in the old litter, the hens went on scratching, pecking and eating something in the mouldy straw. Investigation showed that they were actually obtaining in considerable quantities a high protein substance known as the animal protein factor which was being manufactured by the moulds within the old litter which was itself in what might be described as a state of being composted. The next step was the discovery elsewhere of vitamin B 12 and the consequent revelation that vitamin B 12 was the most important and virtually the determining ingredient of the animal protein factor. The hens were getting this vitamin out of the old litter which manufactured it *for* them and stopped the craving which led to their unnatural cannibalism. Moreover, the protein factor produced by the moulds operating on the litter in the process of composting kept them in good health and induced them to produce more eggs which were of a much higher fertility than those produced under the old fresh straw-antiseptic-disinfectant treatment. Going still further it was found that the moulds within the old litter were also busily manufacturing antibiotics, perhaps of great variety including many as yet unknown, which were actually attacking and destroying disease germs far more effectively than the old-fashioned prescribed disinfectants.

Disinfecting Destroyed Anti-biotics

At Wooster, disease rates and actual mortality on young chicks placed directly upon old-used litter proved on an average of many trials to be as low as four per cent as against eighteen per cent in pens heavily disinfected and supplied with fresh clean straw. Actually, of course, the old process of disinfecting the henhouses regularly did much more harm than good for it destroyed, partially at least, not only the disease bacteria but also all benevolent bacteria and the moulds which produced not only the animal protein factor with its vital vitamin B 12 but the very antibiotics which were far more effective as disease killers than the conventional disinfectants.

Farm Wives Knew How Not Why

Of course it was long evident and known that in the flocks of farm housewives who permitted their birds to run free with access to the cowstable and pasture and on litter in the laying houses which had not been changed for years, the incidence of coccidiosis, range paralysis and other contagious and infectious diseases was virtually unknown and cannibalism was unheard of. The feeding of fresh cow manure to chickens kept constantly enclosed should have been a clue. It provided them with quantities of the animal protein factor and consequently with vitamin B 12 in abundance. In passing, it is worth noting that only recently it was discovered that small quantities of aureomycin added to the feeds of young animals increased their growth rate by as much as 50 per cent.

Trace Elements Fed Cattle

All of these discoveries fitted in with the experiments, observations and discoveries which we ourselves had made at Malabar and which we had followed because they "worked." We have never placed any animal on concrete but directly upon our good gravel loam soils heavily bedded with straw. In the dairy barn we used the pen stabling system by which cows were kept running loose in sheds upon a foundation of manure to which a heavy layer of good clean straw is added daily and in which moulds and benevolent bacteria are permitted to grow and even luxuriate for a period of three to four months. Trace elements, including the known and indispensable ones — cobalt, copper and manganese — have been fed regularly to the animals since the farm was set up. The soils in the open fields are kept high in organic material and heavily manured to condition them as high producers of fungi, moulds and antibiotics.

Some of our own results have been nothing short of remarkable in view of the old systems. In a milking herd of over one hundred cows, mastitis, the universal plague of dairymen, is unknown, milk fever and acetonemia are never encountered. The bacteria count of the milk is the lowest in the country, and brucellosis abortus or Bang's disease is disregarded although we import heifers constantly. These animals are tested before being brought on the farm but on being tested a few weeks later always reveal a certain percentage of positive or suspicious reactors, sometimes because before they came to us they had been vaccinated. These heifers showing reactions are not segregated and the same bull is used upon them as upon the Bang's free heifers. Within four to five months it is impossible to get a positive reactor.

The Fight Against Disease

At Malabar we are not in a position to take chances with brucellosis for a variety of reasons. (1) because we sell grade A milk in large quantities (2) we are constantly selling second-calf heifers which is a part of our business and we could not sell any but a tested Bang's free animal off the farm. (3) about thirty people a day drink the whole unpasteurized

milk from the dairy herd. Moreover we have a herd accredited as Bang's free by the State authorities. The only animals we have never been able to clear up and which we eventually disposed of were two heifers from an earlier registered Guernsey herd which we vaccinated as an experiment.

Using Practices That Work

I am aware that the above statement touches upon what has become perhaps the hottest controversy in the world of animal husbandry. I can only repeat that we practice what works and that the recent discoveries with relation to trace elements. antibiotics, benevolent bacteria and the moulds (all incidentally related to well-balanced and highly productive soils in the optimum sense) continue to bear out and to explain practices which we have long used because they work.

Research on Brucellosis

The University of Missouri is at present conducting intensive research under the direction of Dr. William Albrecht and A. W. Klemme with regard to brucellosis, using the same methods which we have employed for eleven years and they are achieving exactly the same results among a herd of cows all showing positive tests at the time the experiment was begun. In this case again there are many factors contributing to our belief in these universal laws and patterns which, if observed and practiced intelligently can greatly reduce sickness and infections of all sorts not only in plants and animals but in humans as well.

It is interesting to observe the degree in which medical science is turning away from curative medicine or the process of patching up people *after* they become ill, to preventive medicine which creates conditions under which infections or diseases arising from deficiencies are very greatly diminished. It is also curious that for many or indeed most of the answers, medical science is turning to the soils and the products of soil whether it be high proteins or trace elements or antibiotics or benevolent bacteria. In some cases science is merely explaining what good farmers and livestock men have known for generations and even centuries.

There have been many earlier clues to these patterns affecting nutrition and disease including the working of the well-made and well-operating septic tank, the disease free records of the farm wife's flock of chickens, the use of cow manure and urine for various disinfecting and curative purposes and the old mouldy bread poultice with its penicillin content. We have long known the relation of iodine deficiencies to thyroid disorders, goitre and cretinism and we now know that a deficiency of iodine not only deranges the direct functions of the thyroid gland but we know that in deranging that gland we lose the capacity to absorb and utilize proper amounts of calcium and phosphorous no matter how much of these elements we take into our bodies. We know the relation of fluorine in minute quantities to the building of good teeth and the prevention of decay and we have recently discovered the relationship between deficiencies in zinc and that dread disease leukemia. And the fact that deficiencies of copper or cobalt or manganese or all three can make breeding animals turn sterile. The list is large and the pattern intricate. A deficiency affecting one gland may derange that particular gland so that its failure to function properly upsets the whole of the endocrine system and makes it impossible for the body to absorb and utilize other necessary minerals although there is no deficiency of them in dietary terms.

The "Natural Pattern of Things"

It is my own opinion that during the past hundred years since the discoveries of Pasteur, medical and veterinary science has concentrated almost wholly upon bacteria and viruses and disinfectants and vaccinations and inoculations and that the vice of overspecialization has aggravated this process. It is certainly true in the past that for a time at least certain maladies or organic disorders were treated as communicable diseases when they were simply maladies arising from nutritional, minerals and vitamin deficiencies.

Perhaps all the time a much simpler and more accurate solution of many of these maladies and organic disorders has lain close at hand in the natural pattern of things. We are after all creatures of the sea and of the earth, still needing the minerals which exist in the sea, and, to protect us, those elements coming from the earth which are born of the universal law by which life still exists and continues upon the earth – the law of birth, growth, death, decay and rebirth. In this process the minerals, the moulds, the benevolent bacteria and many other factors play immense and vital roles which we have only just begun to discover.