Behavioral Nutrition

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I am always surprised that so many of my colleagues are surprised that nutrition has something to do with behavior. This information has been known for thousands of years. Greenblatt (1963) concludes that low blood sugar labeled a modern disease is clearly rooted in antiquity with Esau the first recorded case. Thus in Genesis 25:29-33: And Jacob sod pottage: and Esau came from the field and he was faint. And Esau said to Jacob, Feed me, I pray thee, with that same red pottage; for I am faint: and Jacob said, Sell me this day thy birthright and Esau said, Behold, I am at the point to die: and what profit shall this birthright do to me? And he sold his birthright unto Jacob.

Then Jacob gave Esau bread and pottage of lentiles: and he did eat and drink and rose up and went his way: thus Esau despised his birthright. Shortly after insulin was isolated and became a treatment for diabetes mellitus, Dr. Searle Harris became aware that reactions produced by an overdose of insulin were very similar to spontaneous reactions he had observed in some of his patients suffering from severe anxiety who had not been given any insulin. He deduced that they too were suffering from a reaction to too much insulin produced in the body as a reaction to the consumption of sugar. He first outlined the concept of relative hypoglycemia or hyperinsulinemia and reported that modification of the diet removed the condition. The diet he recommended was a sugar-free, frequent-feeding diet. Recent nutritional research has again demonstrated that frequent feeding of small meals is generally healthier than one or two large meals per day.

Esau probably suffered from severe hypoglycemia and knew that a protein rich soup made from lentils (beans) would restore him to health. His feeling he would die was the motive which forced him to sell his birthright in order to live. This is an excellent account of the powerful drive in people, when they have hypoglycemia, to consume what will elevate their blood sugar levels.

The concept of the controlled experiments in nutrition is not very novel either. Many modern research workers would have us believe that controlled clinical experiments are very recent, going back perhaps two or three decades. Yet, in the Bible, the Book of Daniel 1: 3-16, we find the following account of what may have been one of the earliest recorded experiments.

Then the king (Nebuchadnezzar) commanded Ashpenaz, his chief eunuch, to bring some of the people of Israel, both of the royal family of the nobility, youths without blemish, handsome and skilful in all wisdom, endowed with knowledge, understanding, learning and competent to serve in the king's palace, and to teach them the letters and language of the Chaldeans.

The king assigned them a daily portion of the rich food which the king ate, and of

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the wine which he drank. They were to be educated for three years, and at the end of that time they were to stand before the king. Among these were Daniel...

But Daniel resolved that he would not defile himself with the king's food, or with the wine which he drank, and therefore he asked the chief of the eunuchs to allow him not to defile himself. And God gave Daniel favor and compassion in the sight of the chief of the eunuchs, and the chief of the eunuchs said to Daniel:

'I fear lest my lord the king, who appointed your food and your drink, should see that you were in poorer condition than the youths who are of your own age. So you would endanger my head with the king.' Then Daniel said to the Stewart... Test your servants for ten days. Let us be given pulse to eat and water to drink. Then let our appearance and the appearance of the youths who eat of the king's rich food be observed by you, and according to what you see deal with your servants.'

So he harkened to them in this matter, and tested them for ten days. At the end of ten days it was seen that they were in better appearance and fatter in flesh than all the youths who ate of the king's rich food. So the Stewart took away the rich food and the wine they were to drink and gave them pulse.

However, nutritional experimentation certainly has gone back much longer than that. Whenever an animal eats a new food and becomes sick, it will seldom eat that food again. This is an evolutionary safeguard. It is a clear cut example of a personal experiment which can be extremely convincing if the individual becomes sick enough.

Nor is fasting therapy a very novel idea even though its use in diagnosing and treating mentally ill patients is very recent. Moses fasted 40 days, Daniel fasted 21 days, Jesus fasted 40 days. Fasting is referred to 74 times in the Old and New Testaments.

Nor were ancient physicians ignorant ot the relationship of food to disease and to behavior. Hippocrates declared "It appears to me necessary to every physician to be skilled in nature, if he would wish to perform his duties, what man is in relation to the articles of food and drink. Whoever does not know what effect these things produce upon a man cannot know the consequences which result from them."

With all this clear evidence of the relationship of behavior to nutrition, why has modern medicine remained so ignorant? Perhaps because nutrition, no matter how fundamental, is not the only factor.

Man, in common with all biological beings, lives in two environments. The first is the psychosocial environment. This includes our relationships to our family, friends, the community, society at large, the way it is organized. It includes our experiences in living, our education and the way we have been programmed by life. The second environment is our biophysical environment. This includes the chemicals in which we live and which we consume. It includes physical factors such as gravity, light, altitude, air movements, sound and so on. Thus each individual must interact with the two environments which in him react on one another. It is a very complicated system.

An organism reacts to its environment by sensing certain aspects of it. A person is aware because of his being able to see, hear, touch, smell, taste, and in several other ways sample the environments. The sensory apparatus is equivalent to the input of a computer system. How the person interprets the sensations and responds is equivalent to the calculation component of the computer. The responses are determined by past experiences and education, these being equivalent to the program of the computer. The final response of the person which is motor (talking or action) is equivalent to the output of the computer. All these components of behavior must be considered when one wants to understand the relationship of man to the two main environments.

Often the best illustration of normal phenomena is to study extreme examples which fall into the range of abnormal behavior. For this reason schizophrenia, where perception is so frequently distorted, provides an excellent model for studying

aberrant behavior. This is not a recent idea. John Conolly (1830), whom I consider the founder of modern human perceptual psychiatry, defined insanity (the term schizophrenia was then unknown but his cases of insanity are today's schizophrenics) as a disease of perception combined with an inability to judge whether these changes were real or not. This is a fine working definition. I still have not run across another one that is better or more accurate. It is one that many psychiatrists use even though they are not aware of it, because they do talk about perceptual changes such as auditory hallucinations and thought disorders! These are the two main areas of change in the schizophrenias.

When our senses are disordered, when we suffer from either minor illusions or major hallucinations and if we respond to these changes as if they were real, then our behavior must be altered and it can become very violent. For example, you may recall that in Saskatchewan we had a very famous multiple murder. A young man called Hoffman nearly wiped out the Peterson family. He was a young schizophrenic who had been sick for many years; he had many perceptual changes. The most striking were a continual conflict in his mind between the instructions he was receiving from the devil and the benign instructions he received from his guardian angel. Eventually he took the advice of the devil and wiped out the family. He was having visual and auditory hallucinations to which he responded as if they were real and this accounted for his criminal behavior. As a result, we lost a number of our very good people and young Hoffman now languishes for the rest of his life in one of the prison mental hospitals in Canada.

Another example is a young man from our penitentiary in Prince Albert who developed multiple perceptual changes. He began to suspect that the guards had a plot to kill him because he could smell gas coming into his cell and therefore he began to stuff it with papers. The guards thought he was just difficult and took the papers out every time. He began to taste poison in his food. It was pretty clear to him that if he was going to save his life, he would have to get out of prison and just in the same way that Esau sold his birthright for some pea soup, this man broke out of prison to save his life. This was a direct response to his perceptual changes.

So it is very important to remember that there is an intricate relationship between man and two basic environments.

Changes in perception can therefore lead to behavior which is criminal because it breaks the law but, which, to the victim of these changes, is entirely appropriate. It is important to understand how these perceptual changes are produced. There are at least two main factors: (a) disorders of nutrition due to a need for certain vitamins, due to a need for some of the essential trace minerals and (b) idiosyncratic or allergic reactions to foods and to other chemicals found in our environment.

Perceptual Changes Due to Nutritional Disorders

This is a broad group of disorders caused by either vitamin deficiencies or dependencies. Most of us do not require large quantities of the vitamins. If you take any average population you can calculate the average needs and this will probably serve for 90 percent of that population. If a person with a normal or average need for vitamins is forced to consume food which does not provide it, he suffers from a deficiency disease. These are relatively rare today in Canada and the United States. It is also known, however, that a large number of people have requirements that are altogether different — they may be much larger or much smaller. If I, for. example, require 100 mg per day of niacin to remain well, even though I may consume the best diet in the world, I would certainly not get that much and I would suffer a degree of relative deficiency. These conditions are called dependencies because the error is in the person rather than in the diet. As an example, it has been shown by Dr. M. Victor et al. that alcoholics develop an excessive need for thiamine. You might say this is an induced dependency. If they are not given

megadoses of thiamine, they will develop a very serious, deadly disease called Wernicke-Korsakoff because of the extremely high death rate, and yet unless you take these patients and inject them with large quantities of thiamine, quantities which are probably forbidden in Alberta, many of them are doomed to die.

Two of the B vitamins are particularly important - vitamin B3 and vitamin B6- A diet deficient in vitamin B3 causes the disease pellagra but a deficiency of vitamin B6 can produce pellagra as well, as in the absence of vitamin B6 the body cannot convert the amino acid tryptophan into the coenzyme of vitamin B3, i.e. NAD. For those individuals whose need for vitamin B3 is great, even a good diet which contains enough vitamin B3 for the average person is not adequate and this person will develop pellagra. It is a B3 dependency disease. The problem is in the person, not in the diet, except that a diet deficient in B3 for a long period of time may produce a permanent dependency on that vitamin. Elsewhere, I have developed the argument that vitamin B3 dependency may produce a schizophrenic syndrome. I believe that a major fraction of all acute and subacute schizophrenics are vitamin B3 dependent as are a major fraction of children with learning and behavioral disorders.

Vitamin B6, pyridoxine, has only recently come in as a very important component of Orthomolecular therapy. In 1960, our research group discovered that most acute schizophrenics excreted in their urine a mauve staining factor when it was examined using paper chromatography. It had occurred to me that insomuch as LSD produced a model of schizophrenia psychologically (a schizophrenic syndrome) it might also produce a biochemical model. I turned the problem over to our biochemists who soon found this factor in the urine of a few alcoholics who had been treated with LSD (psychedelic therapy). Very soon after the same substance was found in schizophrenic patients, we coined the word malvarian to describe a condition characterized by the presence of this factor in the urine. A careful clinical examination showed that any human who excreted this factor resembled the schizophrenic syndrome more closely than any other psychiatric syndrome. There were, however, exceptions. Later, the substance was identified by D. Irvine et al. (1969) as being kryptopyrrole (KP for short). KP is a highly toxic chemical shown to change animal behavior. Dr. C. Pfeiffer and his colleagues (1972, 1974) found it complexes with pryidoxine and zinc and removes them from the body. A person with too much KP is apt to suffer from a double vitamin B6 and zinc deficiency.

In 1966, I published a little paper called "Malvaria and the Law." There I recorded the frequency with which KP was found in various groups of patients. In over 200 schizophrenics who had not been treated it was present in about 55 to 75 percent of the cases. In over 50 schizophrenics well, none had it. In over 200 who had been treated but were not well, the incidence was less, about 40 to 50 percent. In over 300 neuroses and all behavioral disorders about 20 percent; alcoholics, about 35 percent; retarded children who were physically normal, 55 percent; retarded children who were physically abnormal, none of them. In 250 physically ill people, it was present in 10 percent and out of those who were in good physical health and mentally normal we had a frequency of 5 percent. Between 1961 and 1965, we tested 740 subjects for malvaria. Of this large group of 740, 14 had been charged with a criminal offence, more serious than being drunk and disorderly. Of the 14,10 had malvaria, they had KP in their urine. They were the ones who were charged with serious crimes. A very high incidence in relation to the other statistics I have given you.

Perceptual Changes Due to Brain Allergy

The second major cause of perceptual changes are food allergies or idiosyncrasies. I have now seen a large number of chronic schizophrenics whose hallucinations are directly related to certain foods to which they are allergic. When they were treated by a four-day water fast they were free of all their perceptual changes and when they

consumed the food, milk or beef or corn or whatever they were allergic to, the hallucinations would return in a matter of hours. One young patient would hallucinate for 24 hours after one glass of milk. Milk was a common problem.

Abnormal Motor Behavior

There is an interesting relationship between abnormal behavior and nutrition. In children abnormal behavior takes the form of hyperactivity and rarely the form of too little motor activity. A hyperactive child is too distractible, too restless to learn, to respond to the usual positive and negative sanctions we all have been programmed by. Because they are unable to learn they grow into adulthood with a variety of learning deficits and a surprising proportion become our misfit delinquents and later a substantial proportion of our prison population.

For about 15 years, I have been treating these children primarily with optimum doses of vitamin B3 and with a sugar free diet. Over the past 8 years, I must have examined and treated over 400 children under age 14 with a variety of learning and behavioral disorders. From this clinical experience, including a single blind controlled cross over study, I have concluded that a large proportion of these children are vitamin B3 dependent. Furthermore, a proportion of this group, if not placed on adequate treatment, will develop a variety of schizophrenic syndromes before they are 25 years old. I was therefore particularly pleased when I discovered a paper written by G. Wald and a colleague in 1944 dealing with hyperactive behavior in rats. Prof. G. Wald later was awarded the Nobel Prize because of his work on vitamin A and vision. The hyperactive syndrome was then unknown. Dr. B. Spock who practiced between 1934 and 1946, in private conversation with me recently, could not recall seeing one case. The only description appeared in a paper dealing with subclinical pellagra where a group of children suffering from this condition were described almost in modern terms. They all promptly recovered when they were given vitamin B3.

Prof. Wald et al. measured the running of rats in an activity cage. His normal adult rats ran about 1.5 miles per day. When the animals were fed a diet low in calories they increased their running time to about 7 miles per day. It is not surprising that hungry animals will run more or be more active. A moving animal is much more apt to find food than a quiet animal. Eating and movement are always associated in grass-eating animals and catching food is always associated with activity. Hunger is a great spur for activity and humans are not excepted. But Wald did not stop with his simple experiment. He next fed his animals a diet containing an adequate amount of calories but deficient in the B vitamins. Those rats, deprived of B vitamins, also ran about seven miles per day. They also ran as if they were hungry, yet they had sufficient calories not to be hungry. The rats were somehow aware something was lacking. Is this not an excellent model of the hyperactive child? This child is driven by a need for better nutrition, by a need for the B vitamins, but is unaware of the root of the problem. Since he appears to be well fed (on large quantities of impoverished punk] foods) it appears unlikely to his parents this can be a problem. The hyperactive child appears to be responding the way evolution programmed him — to run when his diet is deficient.

Hyperactivity grows along with the afflicted individual and we have a large number of hyperactive jittery adolescents who cannot stand any inactivity, who must constantly be on the move and who relax only temporarily on toxic substances like hash, alcohol, and the common street drugs. Recently, a lawyer defending his client charged with murder said, "He is a hyperactive adult: a walking time bomb" and in fact he was.

The second major cause is hypoglycemia. Basically it is a condition where one responds to excessive consumption of junk (I define junk as anything that contains sugar or white flour) and to quantities of food additives. This produces a reaction in the body (we're not sure why) in which now and then there are major fluctuations in blood sugar. It is diagnosed by clinical history and by a

five-hour glucose tolerance test. It has an amazing effect on behavior when it is present. I first ran across this when I was interning at City Hospital in Saskatoon, 1949.1 was called as an emergency to a patient who was going into insulin coma. I didn't know what to do, and the nurse said you've got to give him sugar. That sounded sensible so I started to inject him with sugar and the ungrateful man within a minute after I had started to inject him with sugar, just hauled off and hit me. I continued to inject him with sugar and a minute later he was normal and just had the slightest recollection of what he had done. A perfect example of the irrational behavior of the person whose blood sugar is down.

At City Hospital we had a conference where a colleague, Dr. Thakur (1975) reported a case where a man had been in jail seven times over a ten-year period. In most cases he was thrown in jail because he liked to attack policemen. He was usually charged with disorderly conduct. He was **not** an alcoholic. When he was examined by Dr. Thakur he began to perspire profusely and suddenly he pulled out a two-pound jug full of sugar which he began to consume in large quantities. He told the doctor, 'This is the only thing that keeps me well." He was tested and it was found he had severe relative hypoglycemia. He was placed on a diet and over the next ten-year period he did not have any more difficulty.

I have another case of a man who had just sold his farm in Saskatchewan for $300,000 so he wasn't poor. His wife had died a few years before. He walked into a store in Saskatoon at 4 o'clock in the afternoon, having been given amphetamines by his doctor because he was too sleepy. He walked into this store and saw this nice blue scarf worth .20. He said to himself, "That would be marvelous for my wife." He had forgotten she had died. Now a criminal can take a $5.00 item and never get picked up, but these guys who pick up a .20 item, the detective happens to be right by their shoulder. He was arrested for theft. This was such a senseless act to his lawyer, that he was referred to me. I ran an afternoon glucose tolerance test and sure enough, by 4 o'clock in the afternoon his blood sugar was down to 40. This was the reason for his irrational act. When the evidence was presented to the judge, the case was dismissed. The courts in Saskatchewan are now beginning to examine and to accept some of this evidence.

In a recent book called **Megavitamin Therapy** by Adams and Murray, they described the conclusion of a Dr. Ralph Bolton who studied peasants in a remote mountain area in Peru. In this area their diet was low in protein, high in carbohydrates, primarily barley, oats. Their food supply was very erratic so they didn't even get very much of that. In this tribe, the group of people were extremely aggressive. He discovered they fight because they feel better when they are fighting. It makes them feel better because the adrenalin starts pouring and it drives up their blood suga r and at last their poor starved brain is getting some food. They are also very paranoid. They injure themselves, they assault themselves. They have a high incidence of stealing, rape, arson, divorce, homicide.

In one village of 1200 people, half the household heads were directly or indirectly involved with homicides. That is a 50 percent homicide rate. The usual rate is 50 per 100,000. When they were tested for blood sugar it was found to be low in one-half. To keep these people going they used to chew a lot of cola and they drank alcohol.

We find the same thing with our American Indians, Canadian Eskimos and Australian Aborigines.

Recently, it has been shown that the intake of carbohydrates has a direct effect upon a brain neurohormone called serotonin. It was found that by increasing sugar and decreasing protein one could elevate the serotonin levels; you could control your serotonin levels by the way that you ate. Now we can begin to understand how a heavy slug of alcohol and a piece of pie can change a nice quiet person into a restless brute.

Conclusion

I have discussed how perceptual changes

influence behavior and how hyperactivity follows diets which are deficient in B vitamins for that person or which contain excessive quantities of refined processed foods especially sugar. I have suggested that changes in perception and hyperactivity are sources of difficulty and may lead to undesirable and antisocial behavior. In the severe forms of perceptual dysfunction we have the schizophrenic syndrome. I recall reading a survey of England's criminals convicted of murder over a two-year period. About 90 percent were diagnosed as paranoid schizophrenics. My experience is similar. It also suggests that a large proportion of the penitentiary population also suffer from schizophrenia. The proportion may be growing since the community mental health system makes it harder for these sick people to get into mental hospitals and easier to get into jail.

In 1967, Dr. G. Green invited me to examine 12 very aggressive prisoners in the Prince Albert penitentiary. To my surprise nine of them were chronic paranoid schizophrenics with very high HOD scores. This group was very hostile and aggressive and was responsible for a lot of the aggression present in the prison. Some of them were so paranoid they were absolutely ferocious as a life saving measure. They were convinced everyone was out to get them.

When I asked Dr. Green why he had not committed them to the closest mental hospital for treatment, he laughed cynically. He had done so on a few occasions in the past and invariably found they were returned to the prison after a few days with the diagnosis that they were not mentally ill. They therefore remained in prison untreated, paranoid, difficult and with no hope of any improvement in them or in the difficulties they generated for others.

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