

Determination of Oxidation Type by Means of Tissue Electrolyte Ratios

Lawrence D. Wilson, M.D.¹

ABSTRACT

A method of determining oxidation types by means of hair tissue mineral ratios was evaluated by reviewing 55 patient files. Correlations were assessed between tissue calcium -to -potassium, sodium-to -magnesium, and sodium-to-potassium ratios, and nine signs and symptoms of oxidation type.

Overall, hair mineral ratios were found to be good predictors of signs and symptoms of oxidation type.

INTRODUCTION

In 1972, George Watson proposed that different individuals metabolize their food at different rates, and that deviations in the rate of oxidation can produce physical and mental illness. He typed people, using various tests, into 'fast', 'slow', and 'sub' oxidizers (1, 2).

Watson further claimed that fast and slow oxidizers require different kinds of foods and supplementary nutrients, in order to balance their chemistry. By assessing the chemistry, and then giving the appropriate foods and nutrients for each 'type', positive changes were observed in behavior and general health (1, 2). Watson used determinations of serum dissolved CO₂ and serum pH, odor tests, or a food preference questionnaire to determine fast and slow metabolic types. Research has been underway for the past decade to find simple, reliable methods to confirm Watson's work, and to improve upon his tests to precisely assess oxidation rate.

¹ Dr. Lawrence D. Wilson is a nutrition consultant in Scottsdale, Arizona. He worked previously as a researcher and writer for the U.S. Public Health Service, and presently specializes in the use of trace mineral analysis in nutritional medicine. This study is an evaluation of a method developed by Dr. Paul

C. Eck of Phoenix, Arizona, to determine oxidation types utilizing mineral ratios in a sample of hair analyzed by atomic absorption spectroscopy.

METHOD

A) CRITERIA FOR INCLUSION IN THE STUDY

To be included in the study, each case had to meet three sets of criteria:

- 1) proper hair sampling
- 2) proper laboratory technique
- 3) adequate information about signs and symptoms of oxidation types.

The criteria were the following:

1) **Hair Sampling**

- a) normal shampooing was allowed on the day of sampling.
- b) patients had to wash their hair four times after receiving a chemical permanent, before submitting a sample for analysis.
- c) hair creams, setting lotions, sprays, conditioners, etc. were allowed to be on the hair.
- d) hair was clipped from at least three sites from the back of the head and nape of the neck. The sample was cut as close as possible to the scalp, and any hair over one and one-half inches long was cut off the sample and discarded.
- e) clippings were combined until a half-gram sample was obtained.

2) Laboratory Technique

- a) all tests were performed at a laboratory which did *not* wash the hair prior to analysis.
- b) preparation of hair for analysis was by digestion of a 300 mg sample in 2.0 ml of a 3:1 solution of nitric/perchloric acid, heated to 300 C. overnight, and rehy-drated with 6.0 ml of 0.9% HCl solution

0.8 ml of this solution is then diluted to 4.0 ml with a 0.2% cesium chloride solution.

- c) analysis was performed on an atomic absorption instrument.
- d) calibration of the instrument was by Fisher A. A. Standards.
- e) quality control consisted of testing each batch of samples against:

- a check sample from the Fisher A. A. Standards
- an in-house control hair sample
- a National Bureau of Standards Control
- a blank solution of the acids used in digestion

3) Adequate Patient Information

At least four signs or symptoms of fast or slow oxidation had to be listed in the patient file, obtained at the time the sample was taken.

B) METHOD OF DETERMINATION OF OXIDATION TYPE FROM TISSUE MINERAL ANALYSIS

Two ratios are involved in Paul Eck's determination of oxidation type (3): calcium-to-potassium and sodium-to-magnesium.

Fast Oxidation is defined by Dr. Eck as a calcium-to-potassium ratio less than 4:1 and a sodium-to-magnesium ratio greater than 4.17:1.

For this study, two varieties of fast oxidizers were determined and analyzed — fast with a normal or elevated sodium-to-potassium ratio, and fast with a low sodium-to-potassium ratio. Dr. Eck found that the fast oxidizer with a low sodium-to-potassium ratio ($\text{Na/K} < 2.5:1$) behaves more like a slow oxidizer than a fast. It was decided to test this concept as part of the study.

Slow Oxidation is defined as a calcium-to-potassium ratio greater than or equal to 4:1 and a sodium-to-magnesium ratio less than or equal to 4.17:1.

Mixed Oxidation is a transition or unstable state which is defined as either a calcium-to-potassium ratio greater than 4:1 and a sodium-to-magnesium ratio greater than or equal to 4.17:1, or a calcium-to-potassium ratio less than or equal to 4:1 and a sodium-to-magnesium ratio less than 4.17:1.

These definitions are summarized in table 1.

TABLE 1. HAIR ANALYSIS RATIOS FOR FAST, SLOW AND MIXED OXIDATION

FAST OXIDATION WITH NORMAL OR ELEVATED NA/K RATIO: Calcium-to-potassium ratio LESS THAN 4:1, Sodium-to-magnesium ratio GREATER THAN 4.17:1, Sodium-to-potassium ratio GREATER THAN OR EQUAL TO 2.5:1.

FAST OXIDATION WITH LOW NA/K RATIO: Calcium-to-potassium ratio LESS THAN 4:1, Sodium-to-magnesium ratio GREATER THAN 4.17:1, Sodium-to-potassium ratio LESS THAN 2.5:1.

SLOW OXIDATION:

Calcium-to-potassium ratio GREATER THAN OR EQUAL TO 4:1, and Sodium-to-magnesium ratio LESS THAN OR EQUAL TO 4.17:1.

MIXED OXIDATION:

Calcium-to-potassium ratio GREATER THAN OR EQUAL TO 4:1, and Sodium-to-magnesium ratio GREATER THAN 4.17:1.

OR

Calcium-to-potassium ratio LESS THAN 4:1, and Sodium-to-magnesium ratio LESS THAN OR EQUAL TO 4.17:1.

C) DESIGN OF THE SIGN AND SYMPTOM CRITERIA FOR DETERMINING OXIDATION TYPE.

George Watson found that certain food preferences, signs and symptoms are associated with each oxidation type.

Since the blood and odor tests Watson used were not performed on the patients in this study, it was decided to use food preferences, signs and symptoms as a basis of comparison with the results of the tissue mineral analyses. The 52-question oxidation test which Watson published (1) had not been given to these patients, but patients had been questioned about food habits, cravings, food preferences, and a variety of physical and emotional symptoms.

Utilizing Watson's and Eck's research about oxidation types, nine indicators of oxidation type were chosen for this study: frequency of bowel movements oily or dry skin warmth of extremities food cravings blood pressure sweating typical moods energy level animal protein preference Following is the rationale for each of the above indicators:

1) *Frequency of Bowel Movements.* Increased metabolic activity is associated with increased peristaltic activity and hence more frequent bowel movements in the fast oxidizer. More than one bowel movement per day was considered an indicator of fast oxidation. One or fewer movements per day indicated slow oxidation.

2) *Dry or Oily Skin and Hair.* Increased metabolic activity is associated with increased activity of the sebaceous glands of the skin and scalp, which in turn is associated with oily skin and hair in the fast oxidizer. Patients were asked to subjectively rate themselves as having a tendency to oily or dry hair and skin.

3) *Blood circulation.* Increased rate of metabolism in the fast oxidizer is associated with enhanced blood circulation, and correlates with a tendency to warmer hands and feet, even in cold weather. Patients were asked if they experienced cold extremities.

4) *Food cravings.* Food cravings can express the body's desire to balance chemistry. Fast oxidizers tend to crave fats, butter and red meat, foods which slow the metabolic rate. The slow oxidizer often craves sweets to combat hypoglycemia, and salt to replace salt lost through underactive adrenal gland activity (low aldosterone).

5) *Blood Pressure.* Fast oxidation is associated with increased vascular (sympathetic) tone, and sodium retention due to elevated aldosterone levels. These frequently result in a blood pressure over 120/80. Slow oxidizers tend to have blood pressures of 120/80 or lower. This is due to weaker vascular tone, and/or low sodium levels which causes a reduced blood volume and blood pressure.

6) *Sweating.* Enhanced metabolic activity increases generation of heat in body tissues. This is associated with increased sweating in the fast oxidizer. Slow oxidizers generally sweat less. Patients were asked to rate themselves subjectively as to whether they sweat heavily or lightly.

7) *Mood.* In fast oxidation, all metabolic processes speed up, including mental functioning. This can result in a tendency to anxiety, nervousness, or jitteriness. Slower mental activity in the slow oxidizer, on the other hand, causes a tendency for sluggishness, lethargy, apathy and depression.

8) *Energy level.* Increased metabolic rate, within certain limits, is associated with higher energy levels, than is a slow metabolic rate. Fatigue and lethargy can be experienced by both types, but is more common in the slow oxidizer. Patients were asked to subjectively rate their energy level as high or low.

9) *Animal Protein Preference.* Fast oxidizers require more fat, and tend to prefer red meats to other meats, as they contain a

higher percentage of fat. Slow oxidizers tend to prefer chicken, fish, or vegetarian proteins because these low-fat sources of protein speed up and normalize the slow oxidizers' metabolic rate.

PROCEDURE

Ninety-seven patient charts were reviewed. A 'signs and symptoms' worksheet was filled out for each patient. The totals for the slow and fast symptoms categories were added up and expressed as a ratio of fast characteristics to

indicates fast metabolism. Less than 1/1 indicates slow metabolism.

Forty-two charts were discarded from the study because fewer than 4 signs or symptoms of oxidation type were listed for the patient.

Ratios of calcium-to-potassium, sodium-to-magnesium, and sodium-to-potassium were calculated for each hair analysis to determine fast, fast with low sodium-to-potassium ratio, slow, and mixed oxidation as defined in Table 1. The results of the hair analyses and the ratios of fast and slow symptoms for the 55 cases are listed in Table

HAIR ANALYSIS DATA EXPRESSED AS F = FAST, FI = FAST WITH LOW SODIUM/POTASSIUM RATIO, M = MIXED, S = SLOW.
 SIGNS AND SYMPTOMS DATA EXPRESSED AS A RATIO OF FAST/SLOW SYMPTOMS.

slow characteristics. A ratio greater than 1/1

2. All files are available for inspection.

TABLE 2. DATA FROM 55 PATIENTS

F	2/2	S	0/4	S	1/3
S	2/3	S	0/4	S	1/3
M	2/4	FI	2/3	FI	3/2
F	2/2	S	0/5	M	3/1
FI	3/2	S	0/4	S	1/3
S	0/5	s	2/2	S	1/4
FI	1/5	M	2/4	FI	1/3
S	1/3	S	2/4	S	1/5
S	2/7	S	1/4	S	0/4
s	2/3	S	1/3	s	1/3
s	1/4	M	4/1	s	1/3
s	2/5	M	0/4	s	2/3
s	1/6	FI	0/5	s	1/5
s	1/4	S	1/3	s	1/3
s	0/4	s	1/4	s	1/5
s	2/4	M	0/5	s	2/2
s	1/5	S	1/3	FI	1/5
F	3/2	S	2/3	M	3/3
				S	3/2

TOTALS

	SIGNS & SYMPTOMS	TISSUE ANALYSIS
FAST OXIDIZER	6	3
FAST WITH LOW NA/K RATIO		7
SLOW OXIDIZER	44	38
MIXED OXIDIZER	5 55	7
TOTALS		55

ANALYSIS OF THE DATA BY PERCENTAGES

1) OF THOSE WITH *FAST OXIDIZER TISSUE ANALYSES*:

- * 1 out of 3, or 33.3% demonstrated FAST OXIDIZER symptoms.
- * 2 out of 3, or 66.6% demonstrated AN EVEN MIXTURE OF SLOW AND FAST symptoms.
- * NONE demonstrated SLOW OXIDIZER symptoms.

2) OF THOSE WITH *FAST OXIDIZER ANALYSES WITH LOW NA/K RATIOS*:

- * 2 out of 7, or 28.6% demonstrated FAST OXIDIZER symptoms.
- * NONE demonstrated AN EVEN MIXTURE OF SYMPTOMS.
- * 5 out of 7, or 71.4% demonstrated SLOW OXIDIZER SYMPTOMS.

3) OF THOSE WITH *SLOW OXIDIZER TISSUE ANALYSES*:

- * 1 out of 38, or 2.6% demonstrated FAST OXIDIZER symptoms.
- * 2 out of 38, or 5.3% demonstrated AN EVEN MIXTURE OF FAST AND SLOW symptoms.
- * 35 out of 38, or 92.1% demonstrated SLOW OXIDIZER symptoms.

4) OF THOSE WITH *MIXED OXIDIZER TISSUE ANALYSES*:

- * 2 out of 7, or 28.6% demonstrated FAST OXIDIZER symptoms.
- * 1 out of 7, or 14.3% demonstrated AN EVEN MIXTURE OF FAST AND SLOW OXIDIZER SYMPTOMS.
- * 4 out of 7, or 57.1% demonstrated SLOW OXIDIZER Symptoms.

Correlation was then made to determine how much agreement existed between tissue mineral ratio indicators and

sign and symptom indicators of fast and slow oxidation. Results are summarized in Table 3.

TABLE 3. SUMMARY OF PERCENTAGE CORRELATIONS. HAIR ANALYSIS AS A PREDICTOR OF OXIDATION SIGNS AND SYMPTOMS.

HAIR ANALYSIS	CORRELATION WITH SIGNS AND SYMPTOMS			
	FAST	MIXED	SLOW	TOTAL
FAST	33.3%	66.7%	0	100%
FAST WITH LOW NA/K RATIO	28.6%	0	71.4%	100%
SLOW	2.6%	5.3%	92.1%	100%
MIXED	28.6%	14.3%	57.1%	100%

DISCUSSION

Slow oxidizer tissue mineral ratios were an excellent predictor of slow oxidizer signs and symptoms. Fast oxidizer mineral ratios with low sodium-to-potassium ratios were also a good predictor of slow oxidizer signs and symptoms.

Fast oxidizer mineral ratios correlated best with fast or a mixture of fast and slow signs and symptoms. Possibly, this mixed correlation is due to the presence in the study of individuals called 'temporary fast oxidizers' or 'slow under stress'. This is a group who show fast oxidizer mineral ratios but who don't show signs and symptoms typical of fast metabolism.

The physiological basis for temporary fast

oxidation has been elaborated (4). These individuals, on retesting their tissue mineral levels after several months of corrective therapy, change to mixed or slow oxidation. Further studies are necessary to confirm the concept of temporary fast oxidizers.

Mixed oxidation mineral ratios correlated best with slow oxidizer signs and symptoms. Most mixed oxidizer hair analyses resolve within 3 months of corrective therapy to slow or fast oxidation. The percentages of correlation between mixed oxidizer tests, and slow and fast oxidizer symptoms (57% and 28%), approximately match the ratio of slow to fast oxidizers in the general population (3-4:1). The correlation

of the unstable mixed oxidizer tests with slow and fast oxidizer symptoms probably reflects the direction in which the mixed oxidizer tissue tests will resolve.

CONCLUSION

Results of this study clearly support the notion that oxidation type may be determined by calculation of calcium-to-potassium, sodium-to-magnesium, and sodium-to-potassium ratios in an unwashed hair sample analyzed by atomic absorption spectroscopy. Future studies will evaluate the efficacy of nutritional therapy using hair mineral ratios as a basis for diet and supplement regimens.

REFERENCES

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Book Reviews

How To Live Longer And Feel Better

Linus Pauling, W. H. Freeman and Company, New York, 1986, 322 pages

In the field of medicine, Linus Pauling's new book, *How To Live Longer And Feel Better*, will be a classic. It is an excellent book. If our medical schools had kept pace with the advances in clinical nutrition, it would be compulsory for every medical student to study this book. But, they have not kept pace as they are still enslaved by the old nutrition, which was pretty good forty years ago, but has been fossilized since. Doctors are told about beri beri, pellagra and scurvy as old medical curiosities which they will never see, or recognize, in the United States or Canada. Doctors have no experience in using most vitamins even in small doses. Mega doses of vitamins shock them. Some even believe there is a vitamin called a "megavitamin." The one they do know about they use in mega doses without realizing it: Vitamin B-12 is given in 1 milligram doses — a dose 1000 times the estimated daily requirement.

Linus Pauling relates how he became interested in the use of nutrients in large doses, how this led to the name "Orthomolecular" and what it really means. He describes the controversies this generated. These must have puzzled him. When Ph.D. scientists debate, their discussions are more often based upon whether data is sound and whether conclusions from this data are reasonable. He has, however, become used to the high emotional level of debate between physicians, who often are at their best when they know the least. Many years ago, I was at a press conference with Linus in New York. He was being savaged by a few establishment medical reporters. Linus once retorted that it appeared to him no one had read his book on *Vitamin C and The Common Cold*, meaning had they read it their questions would have been more intelligent. He is delightfully forthright and honest in his assessment of his critics.

We need vitamins and other essential organic nutrients because life found it

profitable to discard chemical machinery needed to make these molecules. It is more economic to eat rather than to make them. If we had to make everything ourselves, we would probably be floating in the sea like bacteria and algae, or growing firmly rooted in the soil like plants. We progressed by using the energy saved to develop locomotion, intelligence and later, social communities.

There is a very useful section on toxicity and side effects of vitamins; they are non toxic. Pauling debunks the claims of toxicity which were plucked out of the stratosphere by some of our critics.

Orthomolecular medicine treats a large number of diseases more effectively than does standard medicine. The immune system is strengthened, the common cold strikes less often and less severely, influenza is less damaging. Cancer is treated much more effectively. A large number of diseases respond. I have a working rule which is that if a patient has been treated unsuccessfully by several physicians, that patient will have a much better chance of recovery with Orthomolecular treatment.

The section dealing with aging is comprehensive and accurate. Linus Pauling shows no evidence of deterioration even at age 85. One example may not be persuasive, but a large proportion of Orthomolecular physicians and nutritionists are still active and productive at ages 70 and over. Clearly, only writing about nutrition can not be helpful — they must be practicing what they preach. I agree with Pauling's recommendations and his conclusion that people who follow the example of Orthomolecular medicine will live longer and be healthier. We even have hard data for this conclusion. The huge Coronary Drug Project started in 1966 on 8500 men has proved that the group taking niacin lived, on average, two years longer. Had they remained on niacin the whole eighteen years instead of just the first nine years, they would have lived even longer. Ed Boyle followed 160 patients for ten years

on niacin; only 6 died — without niacin, 60 would have been expected to.

I urge every reader of this journal to buy a copy of this book for themselves and another copy for their favorite physician. A growing number of doctors are ready to begin using Orthomolecular medicine, but they do not know how to start. Give them the book, see them often, and each time you see them, ask if they have read it.

I particularly liked Pauling's sensitivity to the needs of patients. He writes in the great tradition of good clinicians like William Osier but in the modern view, that the best patients are the ones most informed. He provides a powerful message of hope.

We all owe Linus Pauling an enormous amount of gratitude, not only for coining a very useful new term, but also for fighting for so long to help develop this new medicine. Orthomolecular medicine will disappear when all medicine is Orthomolecular and the word becomes redundant.

A. Hoffer, M.D., Ph.D.

No Laughing Matter Joseph Heller & Speed Vogel General Pub. Co., Toronto, 1986.

With only four novels to his credit, it may seem strange to refer to Joseph Heller as a dean of American literature. Strange, perhaps, but not unfitting.

Since the mid-fifties release of his classic war novel *Catch-22*, Heller has gifted us with some of the wryest and blackest comedies in contemporary letters. Suffice to say that his books all warrant critical notices in the literary supplement of the *New York Times*.

This current offering, while correspondingly droll, is by nature much more poignant than its predecessors. Written in tandem with his venerable chum Speed Vogel, *No Laughing Matter* is the story of Heller's close encounter with mortality, as one afflicted by the rare and potentially fatal neurological disorder, Guillain-Barre Syndrome (GBS).

GBS is a disease affecting approximately 2 of every 100,000 men, women and children in North America. The onset of this illness is characterized by a general weakness, which over a period of a few days

and weeks, spreads through the victim's trunk, extremities and cranial muscles. In severe cases, death results from respiratory failure induced by total motor paralysis. In non-fatal cases, muscular discomfort, tingling or numbness will plague the sufferer, and he or she may experience varying degrees of sensory loss. Since the patient often remains totally incapacitated for several months, and usually requires respiratory assistance, he or she will frequently spend the bulk of their sick time hospitalized.

To date, the specific cause of GBS is unknown. Some neurologists suspect, however, that it may stem from a virus. An outbreak of the disorder was chronicled in the U.S. in 1976, among numerous persons who had recently been inoculated against the swine flu epidemic.

Unlike sickle cell anemia and some other diseases which tend to menace certain factions of the world population, GBS is frighteningly impartial. Heller writes: "(GBS) does not seem to discriminate as to age, sex, season, or geographical location. As with all things in life, both good and bad, it comes alike to the wicked and the just, to those who sacrifice and those who do not".

The tone of *No Laughing Matter* is as rare as the disease it concerns. Never has a bout with a potentially terminal disorder been treated with such levity. And seldom is a story about coping with sickness written by such an observant scribe and student of the human condition. With penetrating eloquence, Heller evokes the underlying despair of being imprisoned by chronic illness with only limited hope for a parole.

If laughter is truly the best medicine, perhaps the doctor to whom Heller should be most indebted is comedian Mel Brooks. For it was Brooks and a merry band of Heller's friends (Dustin Hoffman, for one), who frequently visited the writer both in and out of the hospital. This book captures many of the zany shenanigans perpetrated by this celebrated lot, and leads us to wonder if there might not be more to the concept of treating disease with humour and positivism than once thought.

The quintessential value of this book is that it offers hope to the victims and future victims of this dread disorder. In everyday language, Heller discusses the advances made in the diagnosis, treatment and prognosis of GBS. While scientists have yet to learn the exact cause of this malady — or marshalled a cure — respiratory therapy and other treatments have served to lower its mortality rate dramatically.

One glaring oversight of this book, particularly from an American perspective, is that it doesn't push to have the cost of this illness totally borne by government-funded medicare programs. Even with substantial private medical coverage, Heller's hospitalization/treatments cost him close to \$40,000 — an impossible expense for most persons. An attack of social conscience would not have been amiss here.

Some readers may find that the emphasis of this book weighs too heavily on Heller's camaraderie with showbiz luminaries. Others will cherish it for giving inside glimpses of the lives of Heller and a bevy of his friends. Bottom line? ... If you're looking for a feature length copy of *People* magazine — this might be it. If, on the other hand, you are looking for a medical text — your time and money can be better spent elsewhere.

G. Charles Brown

NO SUGAR ADDED or
Redesigning our Children's
Future

Nicholas Krilanovich
November Books, Santa Barbara,
CA,
1982, \$14.00 U.S.

The book, *NO SUGAR ADDED or Redesigning Our Children's Future* by Nicholas Krilanovich, provides many new ideas and a coherent, readable organization of the recent explosion of scientific knowledge relating to the interactions between the complex human body and the consumption of refined sugars. These new ideas and many hundreds of direct quotations from the scientific literature are woven into a story that reveals the basic nature of fructose, glucose, and sucrose throughout *all* of living chemistry. Thus, a convincing, multifactorial argument is made to the effect

that we now know too much about refined sugars not to be concerned, especially for our children — our children, who are being given a Head Start on adult diseases.

As shown in the book, the argument *must* be multifactorial, because the *interactions* are multifactorial. These interactions between the enormous complexity of human biochemistry and the intake of unnatural amounts of these basic chemicals produce broad but subtle, troublesome effects throughout much of the body. Persuasive evidence for this is organized into a connected pattern from an extensive array of associations, animal and human experiments, therapeutic trials and theories of mechanisms. However, this slow contribution to many broad problems will not be recognized by that part of the medical profession still encumbered by the old one-disease, one-cause, one-cure syndrome.

Besides that organization of this explosion of knowledge, some of the new ideas presented are: (1) the use of the product of the concentrations of glucose and insulin in the blood, not only for comparing the effects of various carbohydrates, but also for evaluating possible dangers; (2) the importance of fructose and glucose in all of living chemistry from the beginning combined with their importance throughout the human body; (3) the correlation between the increased incidence of Crohn's disease and the increased use of sugared soft drinks; (4) the use of many scientific reports which suggest linearity in the effects of the fructose and glucose, or the absence of a threshold; (5) the idea that, in view of all of the above, the simple but powerful fact that children are smaller than adults, combined with the fact that they consume nearly the same amount of refined sugars as adults do, together could explain why children are getting a head start on adult diseases; (6) the calculation of a suggested maximum safe daily intake of refined sugars for children of ages 0 to 10; (7) the presentation of enough evidence to justify asking the question, "Could a single binge of sugared soft drinks at an early critical moment in pregnancy increase the likelihood of birth defects?"; (8)

the summation of all this into a set of suggested Unifying Concepts.

This 300-page book uses 560 references from the scientific literature. Of these, more than 220 pertinent ones were published in the 1980's. The chapter titles (with a skeletal outline) are: 1. Introduction (We will try to resolve the controversy.) 2. Brief Background Information ("No element is more basic to life than carbon.") 3. The Special Nature of the Problem, a Preview (There has been much confusion in many areas.) 4. Evolution, or Why Sugar is Basic to Life (The vital carbon atoms of all living chemistry come from fructose and glucose, which photosynthesis makes from carbon dioxide.) 5. History and Sugar (While increasing our use of refined sugars over the decades, we could not possibly have known the importance of what we were doing.) 6. Sugar and the Human Body, Outside the Cells (Glucose is unique throughout our chemistry, for example "it is the most finely regulated circulating metabolic substrate in our bloodstream.") 7. Sugar and the Human Body, Inside the Cells (Fructose is unique in many ways, including many factors of cellular chemistry vital to our health.) 8. Sugar and the Human Body, at the Cell Surfaces (Glucose is special — "Glycosylation reactions may provide a unifying hypothesis to explain many of the sequelae of diabetes" and fructose is special — "We conclude that fructose seems to be responsible for the impaired insulin sensitivity induced by sucrose in humans") 9. Sugar, Disease, and the Entire Human Body (Almost a book in itself, its sections include: The Presence of Feedback Forces One to Consider the Total System, The Human Body has Many Interacting Feedback Loops, Crohn's Disease and Food Allergies, High Blood Pressure, Cholesterol, Addiction, Obesity, The Complications of Diabetes Form Total System Disease, What Can We Learn from Diabetes? Do high intakes of refined sugars contribute to total system disease?) 10. Our Most Vital Issue (The fact that children are getting a head start on adult diseases may well be due to their multi-faceted increased sensitivity to all of the above effects.) 11. Some of the Arguments in Defense of Refined Sugar (Many of those arguments are shown to have major flaws.) 12. Updates, Summaries, Conclusions, Im-

plications.

The author has a unique background with a B.S. degree in Chemistry (UCLA, 1944) plus many years of experience in system design. Thus, this book itself is a system. Its interlocking parts form a total which is far stronger than the sum of those parts.

Some of the recommendations: ". . . performs a valuable service . . . explains the basic biochemistry. . ." J. V. Wright, M.D., Washington. "Literate, articulate, scholarly . . ." A. Lazarus Ed. D., Santa Barbara, California. "A truly valuable addition to the literature on the effects of dietary sugar on human health . . . would recommend this book be read by not only the general public but also by the scientific community." S. Reiser, Ph.D. and J. Hallfrisch, Ph.D. of the USDA Carbohydrate Nutrition Laboratory, Maryland.

The Psychology of Schizophrenia John Cutting, M.D. Churchill Livingstone Press, New York, 1985, 457 pp.

In the 115 years since Hecker first described hebephrenia, considerable headway has been made in defining the entire spectrum of schizophrenic syndromes, and in developing rational therapies. *The Psychology of Schizophrenia* is yet another edition in the growing literary armamentarium aimed at deciphering the causes and treatments of this cryptic disease. And like most books on schizophrenia, it is both a blessing and a curse.

Dr. Cutting begins his book on a historical note, tracing the evolving conceptualizations of mental illness over the millenia. In doing so, he offers a fascinating glimpse of the genesis and maturation of psychological thought — from Hippocrates to Bleuler to Freud to Bateson to that of current theorists.

After a comprehensive overview of the sundry diagnostic criteria relating to schizophrenia, Cutting embarks on a discussion of the myriad etiological theories, such as those pertaining to psychotomimetic drugs, but more importantly, the dopamine hypothesis.

Cutting appears to embrace a genetic-organic causal theory:

The evidence that schizophrenia is largely inherited is overwhelming. It is probably the hardest fact there is about the condition. Attempts over the years to undermine it and substitute organic or psychological explanations for twin concordance rates are unconvincing.

(Many scientists would agree on this point.) Cutting also praises E. Fuller Torrey's neurophysiological views concerning winter births, brain viruses, and their relationship with "right hemispherical deficit in the acute stage". The author cites CT scan evidence and a discussion of attention deficit, memory impairment, language problems, and perceptual difficulties, on which to base his thesis. (He also places some emphasis on psychosocial forces as precipitating factors in schizophrenia.) *Schizophrenia in its typical form, is attributable to a disturbance in right hemisphere functions. This affects all psychological functions in a relatively specific manner and is responsible for the characteristic phenomena. The actual cause of the hemispheric imbalance is partly genetic and partly organic. Social factors play a prominent role in determining onset and outcome, because the hemisphere dysfunction makes a subject susceptible to social influences which a normal person is barely aware of.* What is sadly lacking in this seemingly thorough and duly footnoted work, is an intelligent, fair-minded appraisal of Orthomolecular theory. Remarkably, in the five cursory paragraphs assigned to "Nutritional disorders (including vitamin deficiency)", neither Dr. Hoffer nor Dr. Osmond is mentioned, despite the fact that they spearheaded the Orthomolecular movement.

Nor do we witness any reference to the connection between schizophrenia and pellagra, which "are so alike from a psychiatric point of view that they can only be distinguished by a therapeutic response to nicotinic acid or nicotinamide (collectively termed vitamin B3)"* In fact, Cutting insists that "Only B12 and folic acid have been linked with schizophrenia, and neither link is convincing".

What makes Dr. Cutting's dismissal of Orthomolecular theory so laughable (yes, laughable), is his referral to nicotinic acid as "vitamin B2". In his apparent ignorance of the difference between riboflavin and niacin, the author's castigation of this biochemical approach smacks heavily of myopia bias, and a sorry lack of research.

The Psychology of Schizophrenia may in future be regarded as a semi-authoritative text for historians and philosophers of mental health. Yet, if the author had devoted as much time to exploring Orthomolecular tenets as he did on Wittgensteinian precepts of the language of mental illness, his book might well have been worth its \$120. (Canadian) price tag.

G. Charles Brown

* A. Hoffer: "Natural History and Treatment of Thirteen Pairs of Identical Twins: Schizophrenic and Schizophrenic Spectrum Conditions"; *Journal Of Orthomolecular Psychiatry*, Vol. 5, No. 2, p. 101

(Also see:)

A. Hoffer: "Pellagra and Schizophrenia"; *Psychosomatics II*, 522-525, 1970