Temporary Insanity
Some Practical Considerations in a Legal Defense

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The concept of temporary insanity has been a troublesome one both for attorneys and mental health professionals. Both psychologists and psychiatrists have been greatly reluctant to attempt to provide data which would support such a concept which is predominantly a legal and not a medical one. A psychosis usually comes attached with a psychiatric diagnosis. Conditions which produce temporary periods of psychotic behavior do not. Consequently, both psychiatrists and psychologists are ill prepared or reluctant to attempt to make a judgment regarding temporary insanity usually because of the limited information available concerning the circumstances of the crime which was committed or the condition of the patient.

This is a serious omission in the functioning of those who work in the forensic area. It is the result of this author's experience in the penal system and in the evaluation for the courts of offenders who have been referred for competency that prompts this report. Patients so referred frequently claim amnesia for the episode in which the illegal act is committed. To separate the malingerers from those persons whose behavior is the result of disordered metabolism and from still others whose behavior occurred under the stimulus of alcohol or drugs constitutes a major problem. The court's limited familiarity with these issues is compounded by the fact that psychologists and psychiatrists tend to reject metabolic, in preference to psychodynamic explanations, more out of ignorance of metabolic issues unfortunately, rather than with good awareness of them.

There is today a resurgence of interest in the psychiatric symptoms associated with the hypoglycemic syndrome. The past twenty years has been a period of medical neglect of this concept, perhaps through the necessity of awaiting advances in the nutritional and metabolic aspects of it. That this condition has implications for forensics, however, was pointed out by Wilder thirty years ago in regard to functional hypoglycemia and by Adlersberg and Dolger nearly forty years ago in regard to insulin-induced hypoglycemia.

In a 1947 publication summarizing his research over the previous fifteen years, as well as reviewing research of others, Wilder closed by saying:

In concluding this chapter I wish to emphasize that we are probably standing at a beginning rather than at an end of a scientific approach to the problem of

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crime, and that many and careful investigations will be necessary in order to establish the proper place of this problem within the framework of criminology and correctional medicine. This review concerned carbohydrate metabolism as it had come to be understood following the discovery of insulin. It summarized research on criminal behavior produced by fluctuations in blood glucose levels produced by either exogenous or endogenous insulin. The recognition of hyperfunction of the pancreas was not recognized until prior multiple observations of insulin reactions had led to the recognition of a pattern of behaviors which had identifiable, if diverse, behavioral manifestations. Both the diversity and pattern of development of these behaviors has assumed well identified forms such that Seale Harris in 1924 was able to identify patterns of behavior which were characteristic of excess insulin intake but where no insulin had been administered. Although both hyper- as well as hypofunction of other endocrine organs had been observed, hyperfunction of the pancreas had not been identified until research on insulin provided the behavioral observations which led to an awareness of the consequences of hyperplasia of the pancreas and the benign and malignant tumors of the pancreas.

In the course of the next few years, it became increasingly obvious that not all symptoms of hyperinsulinism were the result of structural changes in the pancreas. Although the symptoms were suggestive of pancreatic pathology frequently no such problem could be identified and the concept of functional hyperinsulinism became a frequent topic of research. Wauchope (1933) stated that "hypoglycemia has become a familiar clinical syndrome. The order of its discovery was unusual, if not unique, in the history of medicine, for it was first recognized in the exhibition of a new therapy, and afterwards found to occur as a result of natural causes." In this 1933 review, Wauchope was able to identify (1) the diversity of symptoms produced, (2) the intrain-dividual consistency of the symptom pattern produced, (3) the blood sugar levels considered normal - 100 mg per cent, (4) the levels considered hypoglycemic - less than 90 mg per cent, (5) the production of symptoms by rapid drops in blood sugar, (6) the variability of symptoms at any given level of blood sugar, (7) the maximum normal level -180 mg per cent, (8) the effect of caffeine in counteracting excess insulin effects, and (9) the levels at which death frequently occurs -25 mg per cent.

Wauchope also noted that the symptoms were derived principally from disturbances in the nervous system and that the neurological manifestations might be analyzed according to the nerve group affected. Psychic disturbances were recognized as frequent, diverse, variable and bizarre. He noted that they might be "slight, like anxiety, depression, negativism, irritability, querulousness; or bizarre, for instance, excitability, desire to sing, shout or dance, maniacal behavior; or they may result in dullness and confusion of the understanding and lead to disorientation, slowness of thought, inclination to loiter and dawdle, to give random answers, compulsions, impulsive actions, wandering, fugues, homicide, suicide, amnesia, drowsiness, stupor, coma." The six stages of an attack were identified which roughly correspond to the degree of the fall in blood sugar. Wauchope notes that "the condition may be arrested, even without treatment, at any stage and the patient gradually recover. With the administration of sugar and the return of blood sugar to normal, all symptoms rapidly disappear; nothing is more dramatic in medicine than the swift recovery of the patient from convulsions, coma or hemiplegia, or from apparent intoxication to a completely normal state."

In this early report by Wauchope it was observed that patients sometimes "become maniacal," show periods of excitement, delirium, mania, obsessions and melancholia. Periods of confusional violence were described - "one man became unmanageable on several occasions; he threw things about, shouted 'I will murder you,' bit, fought, and almost threw himself over the bannister; another rushed out of the ward and upset a food wagon, and a third threatened a fellow patient with a knife. The transitory nature of the unnatural behavior is

an important point in the diagnosis." (Emphasis this author's).

Further medical research of the period 1930 to 1940 revealed, according to Conn, that 70 per cent of all cases of spontaneous hypoglycemia were (1) functional in nature, (2) controllable by diet, and (3) represent a disturbance in the nervous regulation of the blood sugar level (Conn, 1947).

It was the early results of clinical work with insulin which led to the identification of a wide variety of changes in behavior associated with the insulin-produced drop in blood sugar. With increased awareness of the endogenous hypoglycemias an even wider variety of physical sequellae were observed. Conn observed that "patients with functional hyperinsulinism respond well and promptly to low carbohydrate feeding. It seems difficult to explain how a diet low in carbohydrate can prevent postprandial hypoglycemia unless insulin activity is diminished by this procedure" (Conn, 1947). No awareness was evident at that time of the stress created by devitalized carbohydrates noted by McCarrison in 1921. The psychiatric and neurological concomitants of low blood sugar episodes were increasingly observed and a number of articles concerning disturbed emotionality were published (Greenwood, 1935; Jones, 1935; Kepler, 1937; Liberman, 1944; Liu and Chang-lsiao, 1925; Masters, 1935; Powell, 1934; Reed, 1937; Rynearson and Moersch, 1934; Vonderahe, 1936; Ziegler, 1930).

As interest in this area developed, reports of behavior which was violent, antisocial, and otherwise legally blameworthy accumulated. This behavior fell into three major categories. One, the behavior was claimed to have been conducted in "blackout" periods. Patients claimed no knowledge of the behavior during the episode and indeed the behavior exhibited was not characteristic. At times it was so unlike the person under normal circumstances that it was easy for the farnily and/or others to accept the irrationality of it. A second category is composed of those who have awareness but cannot accept their lack of control over themselves. It is as if they were simply observers of their own actions which they do not direct. A third category involves demonstrably poor judgment which the person himself does not understand, cannot explain and does not exhibit on later occasions.

Increased research on the nature of carbohydrate metabolism disclosed that glucose was the energy source for over 99 per cent of the brain's activity. This organ which constitutes approximately 2 per cent of the total body weight requires 25 per cent of the body's energy supply. A search for storage, conversion of energy from other bodily reserves and processes disclosed the brain's almost total dependence on blood glucose for normal function (Himwich et al., 1941). Putman stated "...we must consider the brain has the most rigid energy requirement of all the tissues of the body" (Himwich et al., 1941). Shorr feels that the work of Himwich and his collaborators is particularly noteworthy and that their demonstration that "no matter what the metabolic situation is in the organism, the brain oxidized nothing but carbohydrate and that..it did so independently of insulin, was a milestone as regards the metabolism of the brain....He was able to show that when true blood sugar is reduced to virtually zero per cent by insulin, no other food stuffs can serve as fuel for the brain....The brain itself has such small carbohydrate stores that it is uniquely dependent on a constant supply through the blood stream. When this fails to take place, the oxidation level is reduced so greatly that consciousness is not maintained" (Himwich et al., 1941). Himwich states that "the reason for the peculiar sensitivity of the brain to hypoglycemia lies in the fact the brain, even in diabetes, is the only organ which obtains its energy from the combustion of carbohydrate alone. It is well known that most of the organs of the body support their metabolism by the oxidation of both carbohydrate and fat. When, for any reason, the carbohydrate supply in the blood is decreased or interfered with, the various non-nervous tissues of the body continue to maintain their activities at the expense of energy obtained from the oxidation of fat. The brain, however, when deprived of carbohydrate can resort to no alternate foodstuff. Its metabolism must naturally slow down and cerebral function

will suffer....The newest portions of the brain, the cerebral hemispheres and parts of the cerebellum, metabolize at the highest rate and therefore are the first to suffer" (Himwich, 1944). Certainly it is reasonable to expect effects on all cerebral processes when the blood sugar approaches levels producing unconsciousness. A more recent explanation of the effects of the hypoglycemic experience has been described by Buckley (1969).

At the time of hypoglycemic episodes, giving the patient intravenous glucose to which he was most responsive, or food, would restore him to rationality (Wauchope, 1933). The drama of this response has been recounted many times. Episodes were observed in a wide variety of contexts by a number of physicians and with sufficient understanding that the behavior could be related to the person's condition sufficiently clearly that there is legal precedent for acceptance of lack of criminal responsibility (Bovill, 1973). Where the behavior resulted from demonstrable organic causes, such as diabetes, it is easier for juries to accept. However, in those which were "spontaneous" or "functional" or "reactive" (terms used to denote that there is no identifiable organic cause), the relationship of the behavior to physiological function was not so demonstrable and hence explanation of the mechanisms depended more on the sophistication and persuasiveness of defense attorneys so that the legal definition of what constituted insanity became an issue.

The notion of "temporary insanity" became an unpopular and not readily defensible concept. Indeed for many years this author refused, as many others still do, to accept the concept of temporary insanity. It was only through an improved understanding of metabolism that the dynamics became clear. Psychologists, psychiatrists and others have .been confused about this because the behavior exhibited is in the context of the person's life experience and life style. This gives an apparent uniqueness to it which seems to be better explained by psychodynamics than physiodynamics. If a person is irritable, the irritation will be most usually expressed towards those with whom the person is in daily contact, such as family members, fellow workers, and more rarely but occasionally, will be shown to strangers or others who accidentally intrude into the person's life space during the episode of irritability or irrationality (Adlersberg and Dolger, 1938). Where the irrational behavior is expressed is largely a function of the stability or lack of stability of the person's life. In the family context the "time limited" nature of the irrationality is better observed and understood. As Adlersberg and Dolger point out, "these cases could have become involved in legal difficulties were not their friends or families nearby to explain their actions on the basis of hypoglycemia. Such acts as destruction of property, assault, and sexual perversion are ordinarily subject to criminal law, and it is only because of the fact that patients commit them at home or among friends that they escape arrest" (Adlersberg and Dolger, 1938). Those who are not a part of the patient's life context are less willing to see the behavior as "temporary" or irrational and are inclined to make the kind of judgment a local psychiatrist made when he observed that "if the patient was sane when he had supper and sane when he had breakfast the following day, then he was sane during all intervening periods." The following clinical reports of hypoglycemic attacks indicate that like behavior may be produced without insulin.

Wilder finds "the central nervous system holds a special position among all organs of the body. Although containing fair amounts of glycogen, it is unable to mobilize these as the need arises to convert them to glucose like other organs. It is therefore completely dependent on the glucose supplied by the blood stream. If this supply is deficient..we can observe all degrees of diminished mental and nervous functions paralleling the level of blood sugar." He regards the medium attack as demonstrating the most marked mental and cerebrospinal symptoms such as aphasic disorders, disturbance of vision, psychotic reactions with subsequent amnesia. The striopallidary symptoms of a medium attack of hypoglycemia he finds particularly of special interest to the psychologist because they affect the apparatus of the vocal, mimic and

gesticulatory expressions and quite easily give the false impression of psychological phenomena while they are nothing more than motor manifestations. He also notes that "their (the hypoglycemic's) permanent conflicts with the police, etc. may be partly explained by the peculiar indiffer-ence...which so much reminds one of that displayed by the alcoholic." He also found "moral" changes in hypoglycemic episodes. Psychomotor unrest is described which may "increase up to a wild, maniacal impulse to talk, run, move or destroy....Homicidal and suicidal actions have repeatedly been observed." The fact that hypoglycemia is "the only condition that improves temporarily when the patient becomes mentally ex-cited"(Wilder, 1943; Duncan, 1935) further complicates an understanding of temporary insanity due to a low blood sugar episode.

Greenwood (1935) described a case reported by Heyn with acute mania which passed off with administration of glucose and another who after a delayed breakfast "became violently active, threw his arms about, jumped out of bed, made peculiar screams and noises and was quite maniacal...several hours later he was normal and retained no memory of these events." He reports studies by Harris, Tedstrom, and Wilder in which medical treatment of the hypoglycemia terminated cases of delirium requiring restraints, delusions of persecution and maniacal attacks. One of his patients was admitted after having violently attacked a sister and a nephew. "He had been having occasional nocturnal convulsive attacks for four years...several times he had made violent attacks....A high caloric diet with suf-ficient carbohydrate seemed to change the condition considerably, for on the following day, he was alert and well oriented but retained no memory of the hypoglycemic, periods. There was no recurrence of symptoms after placement on a high carbohydrate, high fat diet with frequent feedings, although he had been mentally unbalanced for the past two years."

Powell (1934) describes a case where the patient "began to act peculiarly, was very nervous, forgetful, and emotionally unstable... on first observation she was unable to sleep after midnight and would become as a frightened animal. With a facial expression of dumb fear she would pace the floor, tear her clothes, run away, become vulgar and profane, unmanageable, devoid of memory and reason and obsessed with the idea that her relatives and friends were attempting her bodily injury...frequent feedings produced a prompt convalescence." Powell concludes that "normal function of the brain depends on normal sugar concentration."

Masters (1935) reports a case of drug ad-diction hospitalized with findings which were "essentially negative physically. Discharged after one month, the patient was readmitted in three weeks showing emotional symptoms, especially temper tantrums. Violence of speech and action, attacks on nurses and threatened suicide were the most common manifestations....The psychotic attacks lasted from a few moments to several hours, the patient afterward claiming to remember nothing of them. Most of these episodes occurred from two and a half to three hours after meals." He reports that the mental symptoms rapidly abated with essentially only increases in caloric intake and, between meals, glucose.

Gittler (1962) reports that attacks "are episodic and repetitive. Although the tempo and severity of attacks may vary, the same patient will most often experience the same symptom complex....Recognition of the episodic nature of the patient's symptoms is of diagnostic importance....Episodes of disordered behavior...may actually have their genesis in spontaneous hypoglycemia, the excessive discharge of insulin from a functioning tumor (pancreatic adenoma) is frequently of sufficient magnitude to overwhelm the counter-regulatory defenses. Profound and prolonged hypoglycemia will result."

Liu and Chang (1925) suggested blood sugar determinations in hysterical attacks since they felt they were precipitated by low blood sugar.

Ziegler (1930) reports a case of a man who all his life had slept well until a year after the onset of an illness which could be relieved by food or coffee. He reports that "often in the second year of his illness, he would awaken in the morning to find his room

disarranged and concluded that he had had a nightmare....A month later he became 'delirious and maniacal' at 3 a.m. and was taken to the hospital where he was surprised to find himself in restraint the next morning. Since that time he has had such attacks nearly every night unless he ate at intervals during the night." During a hospitalization where food was refused after 5 p.m., he was "usually maniacal at night, but recovered from the attacks spontaneously by morning except for some confusion, lasting one or two hours. He had no memory whatsoever for any of the night attacks."

Harris (1936) stated that "evidence favoring the diagnosis of hyperinsulinism may sometimes be elicited in patients who complain of 'spells' of various kinds by interview."

Greenwood (1935) feels that many cases of hyperinsulinism are misdiagnosed and lead to psychiatric hospitalization. They may be identified by (1) a psychosis which is organic in nature, often violent and which affects the sensorium; "(2) psychotic manifestations which alternate with, normal behavior...; (3) low blood sugar during the psychotic period; (4) relief of symptoms when glucose is given; (5) a high glucose tolerance...; (6) a tendency for psychotic episodes to occur in the early morning, late at night, or occasionally just before mealtime."

Wilder (1940) summarized the results of a series of crimes and offenses committed in the state of induced or spontaneous hypoglycemia. He stated that "the existence of a direct relationship between subnormal blood sugar level and criminality will be surprising only to those who are unfamiliar with the manifestations of induced or spontaneous hypoglycemia." Of the two, spontaneous or functional hypoglycemia as a rule goes unrecognized and very often is not even suspected. The hypoglycemia produced by insulin is more readily recognized. That produced by oral hypoglycemics (Diabinase, Orinase, etc.) is perhaps as infrequently recognized as that produced spontaneously. Wilder's summaries of legal offenses committed under low blood sugar stimulus run the gamut of crimes including those considered violent and dangerous.

As Wilder (1943) notes, excitement is known to increase the blood sugar through mobilizing liver glycogen reserves. He also feels that when a patient "flies into a rage, a mild hypoglycemia might result which, in turn, influences his psyche again in the sense of increased irritability; thus...often leading to explosive or even criminal acts." Many psychopathic reactions were found to be preceded by 24 to 48 hour food abstinence. Wilder reports that he is impressed with the "many psychological features we have found in hypoglycemia which might result in crimes and transgressions: not only the impairment of judgment and concentration, but also the imperative hunger, the absolute negativism, the irritability, indifference, impairment of moral sense, etc."

The person who is truly cooperative with the forensic evaluation process and is truly perplexed by his own violence or otherwise inappropriate behavior is the one most likely to suffer. The episode for which he was arrested is usually time limited. He usually regains awareness in the excitement following the incident or shortly thereafter. He was not unconscious in the lay sense of the word since he was ambulatory and not in coma, and since he is capable of communication with "apparent rationality," he is usually regarded by the arresting officers as fully competent. He, in fact, may not be**.** During his period in jail, he may have a number of hypoglycemic episodes, very few of which are witnessed and, when witnessed, are regarded as manipulative, unless they assume a really bizarre form. Unless his condition is moderately severe, the reduction of stress resulting from hospitalization may lead to some temporary improvement in his condition as a result of the regular diet and most likely some sedating medication/ If his condition is the result of liver dysfunction, the high carbohydrate diet provided by jail and state hospitals may lead to an improvement in his condition which makes his credibility still less acceptable. During the evaluative process, he is regarded as competent to stand trial and he usually is. Few psychologists or psychiatrists are comfortable about making decisions regarding in-

sanity at the time of the crime and simply state that they cannot support an insanity defense or that they do not have enough information to support an insanity defense. The person's statement that he has no memory for the event is usually regarded as deceitful and evidence of malingering in which case he loses all sympathy and support of the evaluating staff if he is in the least uncooperative otherwise.

The truth of the matter is that he usually does not remember. If he had control of his faculties, he would most likely not have committed the crime, which usually shows poor motivation and no planning. Robberies, for example, may be committed for less money than the person has in his pocket; or, for trinkets. Rape is committed where seduction is more appropriate. Unless he has credible witnesses, the person himself is unlikely to believe that he committed the offense. One of my patients had been severely beaten by her husband one evening. The following morning he observed her bruises whereupon he asked how she received them. When she angrily told him, he refused to believe that he had beaten her and accused her of falling and wishing to blame him. Whereupon she retorted, "Well, if you won't believe me, will you believe the children?" He said that he would. She turned to the children and said, "Did your father beat me last night?" They reported - "Yes, Daddy, you did." If a patient does not have credible witnesses he is inclined to believe that he is being railroaded or framed or, as a last resort, that he is crazy. During my tenure as Chief Psychologist for a U. S. Penitentiary, I had many discussions with prisoners who would sincerely ask for evaluation of their sanity. After testing and describing the results to them as supporting sanity, they would disagree and say, "But, Doc, I've got to be crazy. I hate these places and I keep doing things to bring me back." Such persons are sometimes improved by the prison setting's high carbohydrate diet for the same reasons, and sometimes aggravated by it if their hypoglycemia is due to pancreatic adenoma or hyperplasia since the prison diet is likely to be high in sweets -the rewarding nature of which is poorly understood by prison authorities.

If alcohol is involved the chances of being convicted are even more likely since the part alcohol plays is even less well understood or accepted. The person may have been drinking for years without behaving bizarrely even though he may be showing bad judgment poor management of finances and evidence of multiple somatic complaints. On this particular occasion, he may have had one or two drinks on an empty stomach which provides sufficient stimulus for a wide swing to high and abrupt drop to low blood sugar which leaves a person with enough energy to do physically outrageous things which he has not the mental capacity to manage. Under such a stimulus a 40 year-old painting contractor, without warning, held up the business establishment of his friend on his way to a restaurant to have dinner. After literally shooting it out with his friend (fortunately without injury to either), he returned to his automobile and proceeded to the restaurant where he was quietly having dinner when arrested. Suspecting a hypoglycemic episode, when asked to evaluate him for the court, I asked for a glucose tolerance test which confirmed his poor control over carbohydrate metabolism. Although he had no previous offenses other than for drunkenness, he was found guilty and sentenced to 14 years in the state penitentiary in spite of a report which supported the concept of insanity at the time of the crime. I was never called to testify.

Wilder's reports (1940, 1943, 1947) identify the following offenses as having occurred during hypoglycemic episodes:

1. disorderly conduct
2. assault and battery
3. attempted suicide
4. homicide
5. cruelty to children and wives
6. embezzlement
7. petty larceny
8. vandalism
9. arson
10. slander
11. infanticide possibly - as well as a large variety of sexual offenses.

The fact that alcohol has been used prior

to events which led to criminal charges provides a further complicating issue. It is known that in some persons, alcohol precipitates hypoglycemic episodes which it does not produce in others. Observations of the phenomenon over a 25-year period are reported by Freinkel et al. (1965). Various explanations have been offered but a direct causal role for alcohol and a rationale had not been identified until 1962. Research indicated that the hypoglycemia induced in some (not all) patients by alcohol occurred at blood levels of alcohol that **were moderate** and **well below the prerequisite range for alcoholic coma or even severe intoxication.** The dangerously low levels of blood sugar induced by alcohol are believed to occur as a consequence of the exhaustion of liver glycogen reserves. The condition could be elicited in the experimental subjects with the identified alcohol hypoglycemia by an overnight fast. In normals, it was found to be produced by intravenous alcohol only after a minimum fast of two days. A three day fast in normals led to a rapid and profound hypoglycemic response in some of the normal subjects. Investigation of the phenomenon in diabetics disclosed that diabetics without food or insulin had significant reductions of blood sugar. This has particular significance for crimes committed by diabetics who frequently do not understand their condition even under optimal circumstances.

The above description of procedures provides an opportunity to discriminate between those whose response to alcohol is normal and those in whom it is pathological, as well as between those who are otherwise normal but in whom conditions were optimal for a bizarre response to alcohol ingestion. The hypoglycemic reactions which occur as a result of such conditions as alcoholic hypoglycemia or as a result of nutrient, depletion are truly committed as a result of pathology. This should remove responsibility of those persons for their conduct, at least until such time as the problem is medically identified. No person can be held morally, or should be held criminally responsible, at least until he can be forewarned that such behavior can occur as a result of his particular state of health. The diabetic, for example, can only be held responsible for his dietary lapses and subsequent disorganization after he is aware of being diabetic. In the past, the mere fact that the use of alcohol was revealed has been held to make such persons criminally responsible. The existence of metabolic illness which is demonstrable and indeed may be elicited by quite small amounts of alcohol insufficient to intoxicate is rarely taken into consideration because medicine has not concerned itself with issues that are career and character damaging, but only with those which are life threatening.

It is interesting to note that many of the episodes described in the literature of the 1925 to 1945 period occurred at blood sugar levels which are accepted as "within the normal range" today. What has been accepted as a normal level has declined in each decade in the identification of hypoglycemic episodes. Wauchope's lower level of normal was set in 1933 as 90 and he cited authorities "who agree that any reading below 0.090 per cent constitutes hypoglycemia." He reports that "Joslin found that readings taken before breakfast in normal individuals were most frequently 0.100 per cent." He summarized by saying - 'The following generalization is approximately correct: the normal fasting blood sugar is about 0.100 per cent; symptoms of hypoglycemia appear at about 0.080 per cent; they become severe at 0.050 or 0.045 per cent and death may occur with the level in the neighborhood of 0.025 per cent" (Wauchope,1933).

Hofeldt(1975) states "In the past, hypoglycemia has been defined biochemically as a blood glucose level of less than 40 mg/100 ml." In 1947, Wilder indicated that "If the blood sugar drops below 45 mg per cent, we can witness convulsions and coma which leads to death if the sugar continues to drop. This reaction is so regular that it is being used for standardization of insulin." Apparently, lower levels can be tolerated from endogenous rather than from exogenous causes. In that article Wilder described behavior at each level of blood glucose as follows:

60-70 mg per cent - "autonomic symptoms such as hunger, perspiration, tremor of the hands, flushing or pallor of the face, cold extremities, rise or drop in pulse or blood pressure, occasionally salivation, lacrymation, palpitation, headache, dizziness, etc., vacant facial expression. Mental changes are slight dullness, weakness of concentration, thinking requires effort, decision-making is difficult even about minor things, depression or anxiety may develop, irritability or opposition may occur" (Wilder, 1947).

50-60 mg per cent - "transitory, more or less outspoken, neurological signs of focal character such as double vision, vertigo, ataxia, disturbances of sensibility and speech, disorders of aphasic or dysarthric character. The speech may be slow, stuttering or blurred; there may be pallilalia (rhythmic repetition of words or syllables), or echolalia (automatic repetition of words spoken to the patient). We also find aphasia (loss of voice) or megaphonia (speaking with excessively loud voice), etc....pseudo-psychological phenomenon (sic) can be seen in the muscles used for facial expression, gesticulation, walking, etc....motor automatisms usually inhibited by the action of the brain cortex. In addition to these misleading pseudo-psychological signs, the psychological functions, of course, suffer deeper alterations: the thinking power is definitely affected, the patient notices moments of arrest of thought, concentration becomes almost impossible, higher mental functions such as abstraction and thinking in categories are severely impaired; there are interesting disorders of orientation in space, time and situation; the mental dullness increases to a dazed or unreal feeling, or to irresistible sleepiness; the lack of initiative increases to almost abulia (lack of will power) and inability to make any decisions" (Wilder, 1947).

0-50 mg per cent - "phenomena are intensified on the somatic side to convulsions, chorea, motor and sensory paralysis, etc., and on the psychic side to semi-stupor, sopor, stupor and coma or to atypical, more or less severe, psychotic pictures of various types: hysteria, delirium, amentia, manic, melancholic, schizophrenic syndromes, Kor sakoffs psychoses, fugues, etc! Amnesia usually follows not only severe but sometimes even very slight hypoglycemic states., as a rule, promptly reversible by an ″ intravenous injection of glucose....The effect is so miraculous that the needle is still in the ; patient's vein and a severe coma or psychosis has already been transformed into complete normalcy" (Wilder, 1947).

Differences in current levels of glucose considered significant and those considered meaningful earlier are important. This is an area which has not been adequately researched. Psychologists and psychiatrists tread in the area peopled by internists and biochemists too rarely. Yet, they are the only ones sufficiently sensitive to the mood, perception, intellectual and personality changes which occur. It is a fact that what is accepted as a blood sugar level sufficiently low to identify a person as hypoglycemic has gradually declined over the years. The excursions of the blood sugar which' are considered normal now are much broader than they were forty years ago. The current Merck Normal identifies the diagnostic lower limit as "40 mg/ml (venous) particularly if associated with symptoms" (Holvey, 1972). It is clear from earlier quotations that 40 mg/ml would have been considered as dangerously low. Since physicians are rarely in attendance during the tests with "50 per cent glucose solution available" it probably is. The symptoms are usually ignored by laboratory personnel who are too unsophisticated and too busy to identify symptoms. Patients are permitted to leave the lab at the termination of the test without food and are capable of anything during the recovery period, surely a fertile ground for malpractice.

It seems that currently in medical circles absolutely no significance is given to the psychological concomitants of the low blood sugar levels and psychologists and psychiatrists are off in the woods wandering about like "lost balls in the tall grass," doing the post hoc rationalizing which produces the interesting fictions that pass for psychodynamics. The result is that thousands of people are going to jail who have

no business there in spite of the reprehensible nature of their offenses, and who could be restored to a normal place in society without stigma or further incidents. Still others are being hospitalized with no treatment other than the chemical manipulation of their symptoms by tranquilizers with no attention to the underlying problem which usually grows insidiously worse.

The addition to the scene of the oral hypoglycemics to conditions which are readily responsive to diet has enriched medicine but offers only palliative solutions. They prevent the upward excursion of blood sugar to the high levels which produce the drastic counter-regulatory effects which are so threatening, uncomfortable and troublesome to others. However, in some they produce, if not properly administered or taken, some very bizarre behavior episodes. Patients are not properly trained to handle the oral hypoglycemics - another fertile area for malpractice suits.

The Practical Issues

The facts are that a condition exists from multiple causes which leads to loss of control of the homeostatic mechanisms of the body of which glucose regulation is one. Loss of control of glucose levels leads to widely varying levels of blood sugar which have important, socially significant and life threatening consequences. At the lower levels of blood sugar, humans are effectively decerebrated and are capable of nearly anything they have ever thought of or seen out of others in fiction or otherwise. Many of these acts are illegal, immoral, or fatal. Anyone of you who does not understand this process is capable, at an appropriate time and in appropriate circumstances, of committing the same crimes or offensive behaviors. There, but for the grace of God, go all of us.

Low blood sugar does produce episodes of temporary insanity. Infinitely more homicidal and suicidal attempts are made than ever appear before the bench. People do go to jail and prison having committed acts of which they have no awareness, convinced that they are being persecuted by wives or families. Since 70 per cent of hypoglycemic conditions are functional according to Conn (1947) (one of the persons who has devoted a lifetime to study in this area), there are usually no organic findings. Many times, in settings of reduced stress, the condition is self-rectifying or improved by institutional diet. Medicine does not consider glucose levels abnormal at which psychological aspects of the problem occur, since the consequences are almost wholly behavioral. When an efficient method of discriminating between the organic and functional hypoglycemias was identified by Whipple in 1951, the functional hypoglycemias were cast into no-man's land because they were felt to be largely neurotic anyhow or only occurred in neurotic people. Those patients who were cooperative with physicians were treated with minor tranquilizers. Those who were troublesome were referred to mental health personnel where proper diagnosis is even less likely, and given major tranquilizers. Neither of these is of any real value to a person whose condition is due to subclinical vitamin and mineral deficiencies resulting from malnourishment (not undernourishment). As Harris pointed out 41 years ago, the functional hypoglycemias are controllable by diet as are many of those which are organic. Conn (1970) concludes after his second 15-year review of the syndrome that "the most common types of hypoglycemia observed in both adults and children remain undefined."

How can defense attorneys who are usually most interested and perplexed by the contentions of their clients ensure that a proper consideration be given to their client's claim of amnesia for the episode in question? The simplest way is to follow the guidelines identified by Wilder in 1947. These are as Follows:

The first suspicion of hypoglycemia will arise when-

1. We hear that the criminal offense does not seem psychologically well motivated; or
2. When there is amnesia for either the whole incident or for single details; or
3. For the time prior to the incident.

4. We shall have it in mind if physical symptoms like (a) striking perspiration, (b) tremor, or (c) other symptom of hypoglycemia accompany or follow the incident; for example, deep sleep.
5. We shall always keep in mind this possibility if we are dealing with a diabetic, whether he receives insulin or not;
6. Or with a non-diabetic treated with insulin (or oral hypoglycemics - this author);
7. Or with a person known to suffer from a condition frequently accompanied by hypoglycemia; for example, a liver disease or an endocrine disorder.
8. We should think of hypoglycemia in undernourished as well as in abnormally fat individuals, or in cases which present a history of

a. chronic malnutrition
b. acute starvation
c. diarrheas, or
d. vomiting prior to the crime

(enumerations are this author's)

Wilder further sets out the methods of distinguishing the malingerers from those whose condition is real. This is as follows: "In order to ascertain whether our suspicion is correct, we can use a number of tests:

1. Fasting blood sugar at rest and after muscular exercise, if there is a history of exertion prior to the crime. However, the value obtained may be too high due to excitement in the first days of hospitalization or imprisonment.
2. Blood sugar curve at rest; this should be extended over five to six hours since there are cases who develop deep hypoglycemia only at this time. It is also important that a standard diet, neither too much nor too poor in carbohydrates, be given at least three days prior to the test (Conn).
3. Insulin blood sugar curve.
4. Reproduction of the mental state at the time of the crime by insulin or by starvation with careful psychiatric observation, especially for amnesia and, if necessary, identification of this behavior of the patient by witnesses of the crime; the conclusion of the experiment by the observation of this psychological effect of glucose ingestion or injection is most important.
5. We may follow all these experiments by electroencephalographic studies.
6. Should the delinquent develop any state of excitement or peculiar behavior while in jail or hospital, a blood sugar test should be made in this state, followed by observation of the effect of sugar.
7. Application of the same diet as the one the patient had in the days preceding the crime with simultaneous blood sugar tests and psychiatric observation might be necessary in certain cases.
8. A thorough internal, endocrinological and neurological examination should be mandatory.

Other procedures for identifying hypoglycemia as a cause of psychic disturbance are provided by Kepler and Moersch (1937), Landmann (1952), Conn (1947), and more recently by Hofeldt (1975).

Two British reports concern homicides resulting from hypoglycemic episodes. The first report concerns a physician's wife, who in 1973 killed a cyclist in a hit and run accident. Although she had no memory for the incident, it was established that she was the likely guilty party. Evaluation disclosed a severe hypoglycemia. Although charged with the crime, the evidence of the hypoglycemic condition was considered extenuating and the patient was discharged with a nominal fine and removal of automobile driver's license (Bovill, 1973).

An earlier report in 1943 concerned the homicide of a mother. This occurred after a 1941 glucose tolerance test had revealed a significantly below normal blood sugar. As a result of the earlier findings, multiple examinations were conducted including "1. insulin resistance curve; 2. colorimetric estimation of 17-ketosteroids in 24-hour specimen of urine; 3. Glucose Tolerance Test; 4. EEC at high, fasting and low blood sugar levels; 5. EEC during artificial lowering of blood sugar level with insulin and observations on mental state during this test (3 observations); 6. investigation of blood sugar levels after four pints of mild beer, and

reactions of the EEC, observation of mental state after this alcohol; 7. some tests of impairment of consciousness associated with the abnormal electrical potentials that appeared in the EEC during periods of voluntary deep breathing with low and high blood sugar levels" (Hill, Sargant, and Heppenstall, 1943). In all, 81 blood sugar estimations and 30 EEC records were taken. On the basis of the evidence of these tests, the authors concluded that "from a legal point of view, the accused knew what he was doing at the time when he killed his mother and knew that what he was doing was wrong, but we were of the opinion that his brain was functioning abnormally at the time, the abnormality being such as to impair his judgment and render him unable fully to appreciate the nature of the act. The judge explained the McNaughton rules to the jury and pointed out that all the medical evidence had shown that according to law the accused was guilty. After 100 minutes, the jury returned a verdict of 'Guilty but insane'" (Hill, Sargant and Heppenstall, 1943).

Without consideration of the above issues, no 30-day period of observation and evaluation is competently done. I know of no forensic unit in this country properly considering these issues and it is appropriate to consider those who are making such evaluations as incompetent if they do not consider them.

Too often determinations of competency and insanity at the time of the offense are based solely on psychiatric interviews or psychological tests conducted after apprehension. Details of the conditions surrounding the offense are not properly sought (or frequently not available). This leaves the evaluating teams particularly vulnerable to the dramatic artistry of the sociopath and too little inclined to believe the true statement of the hypoglycemic whose claim of no memory is regarded as deceitful. As a consequence, many of those who are guilty go free while those who are truly temporarily insane, go to prison.

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