

# ET COHOL --AND-- ACCIDENTS

A BRIEF  
AUTHORITATIVE  
DISCUSSION

GERBER

STUDENT AND COLLEGE SERVICE

Series B

Columbus, Ohio

# ALCOHOL AND ACCIDENTS

A Brief, Authoritative Discussion Based Upon  
A Ten-year Study of Violent Deaths  
In Cuyahoga County, Ohio

by  
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SCHOOL AND COLLEGE SERVICE  
Station B Columbus, Ohio

### ACKNOWLEDGMENT

This study would not have been possible without the enthusiastic cooperation and assistance of the professional and clerical members of my staff. To all of them, and especially to Miss Mary E. Cowan and Mrs. Leona Phalsgraff, I express my sincere appreciation.

Nor could this study have been made without the scientific procedure established by scientists here and abroad after years of exhaustive study and research. In the following pages proper credit is given such investigations.

S. R. G.  
August, 1947

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### SCHOOL AND COLLEGE SERVICE

STATION B

COLUMBUS, OHIO

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**To School Administrators  
and Group Leaders:**

We have published *Alcohol and Accidents* at the suggestion of educators and other group leaders who have wanted a scientific, unbiased discussion of the part alcohol plays in accidents. The findings reported here are based chiefly on official investigations of violent deaths resulting from automobile accidents.

**AUTHORITATIVE:** There is no guesswork in the statements made and the conclusions reached in this booklet which in a limited sense is a revision of Dr. Gerber's *Alcohol and Traffic*, published in 1937. As Coroner of Cuyahoga County, Ohio for the last ten years, Dr. Gerber has investigated 22,880 violent deaths in his county and in metropolitan Cleveland. This study is chiefly based on a specific investigation of 1835 cases, 938 of which were definitely tested for alcohol. His conclusions speak for themselves.

**PURPOSE:** This discussion shows that in connection with automobile traffic, alcohol is a deadly menace that must be curbed by personal education and by more intelligent, more scientific law enforcement. Chemical tests for intoxication are explained and justified. It is established that scientific proof of alcoholic intoxication is needed and is available. The so-called moderate drinker is shown to be our worst killer with an automobile.

**STYLE AND INTEREST:** Dr. Gerber is a scientist, not a propagandist, and his chief concern is to give a factual report. Fortunately, he has the ability to present facts in such readable form that young and old will "follow through" with him.

**HOW TO USE IT:** We have published *Alcohol and Accidents* in inexpensive form so that it may have wide circulation at negligible cost. It merits distribution for individual use in junior and senior high schools and in church classes and other groups interested in reducing our accident toll. *Alcohol and Accidents* deserves wide use and study in any intelligent safety campaign.

—The Publishers

## **Alcohol and Accidents**

### **A Personal Foreword**

Accurate chemical methods for the detection of alcohol have been of special interest to me. While I was on the staff of a hospital in an eastern city, in the early twenties, I was called to examine an automobile driver who had been involved in an accident. From my examination of the driver, I was certain that he was intoxicated as well as injured. At a later date I was called as a witness for the state in the prosecution of the driver.

On the witness stand I testified that my professional examination of the driver, correlated with my experience, had convinced me that he was in a state of alcoholic intoxication. Upon cross-examination, the defense attorneys beclouded and confused my testimony by eliciting the fact that the symptoms seen in a person under the influence of alcohol were sometimes similar to those caused by certain injuries, diseases, or drugs. At that time there was no supporting evidence which I could produce to prove my diagnosis of intoxication to be correct. In those days, many other physicians, as well as arresting officers, saw their testimony discredited by this lack of supporting evidence. It was recognized long ago that the odor of alcohol on the breath could not be used as a criterion in the diagnosis of intoxication. Moreover, psychological tests alone were not always practical.

### **Chemical Determination of Alcohol in Body Fluids**

At about this time, physiological chemistry was coming into practical usage. Physicians were learning to rely more and more upon laboratory tests as aids in the diagnosis of disease and as evidence of the progress of the

patient. Similarly, physicians were learning to rely upon laboratory tests for determining intoxication, with the result that they could testify in court without suffering embarrassment for lack of reliable evidence. The development of chemical tests for quantitative determination of alcohol content in body fluids has cleared up much of the confusion about alcoholic intoxication. Testimony regarding other manifestations of intoxication, backed up by the chemical report of the alcoholic concentration found in body fluids, is generally recognized as proof. Some states have written into their laws just what concentration shall be considered as prima facie evidence of intoxication. This procedure has lessened the confusion concerning an adequate legal definition of intoxication.

### Scientific Tests Help Police

Since my first unpleasant experience in court, whenever I have been given the opportunity to do so, I have attempted to promote the use of chemical tests for the determination of alcoholic intoxication. Ten years ago, when I first became coroner of Cuyahoga County, this work was still in its infancy. Originally, the alcohol determinations for the Cleveland Police Department were made in our laboratory. Now, the police department of Cleveland and some of the suburbs make their own determinations and have come to rely on this diagnostic aid.

That scientific tests for intoxication are coming into widespread use is evidenced by the notices of court decisions regularly received at our office. For example, we have just been informed (1947) that the District of Columbia Municipal Court of Appeals has ruled that urinalysis tests are proper evidence in cases of drunkenness and that the Colorado Supreme Court has ruled that blood tests for alcoholism can be conclusive evidence.

We could cite records from Cleveland and many other cities to show the effectiveness of such scientific evidence, but we shall take time in this brief discussion to refer only to the unusual record made at Columbus, Ohio during

1946. Out of 332 traffic cases in which alcohol was suspected, scientific tests resulted in the issuing of 303 police affidavits. Conviction resulted in 296 of these 303 cases. More surprising, perhaps, is the fact that 231 of these 296 pleaded guilty when confronted with scientific evidence.\*

Scientific evidence of alcoholic intoxication, supported by other evidence, is more and more meeting with favorable reception by the courts. Such evidence usually aids materially in securing conviction of intoxicated drivers. Or such evidence may secure a driver's acquittal if he is found sober and the pedestrian found intoxicated.

### A Sure Test for Intoxication

No one can deny that the widespread use of alcoholic beverages has greatly influenced our traffic problem, and that persons in varying degrees of intoxication have become a major cause of traffic accidents, regardless of whether they are drivers, passengers, or pedestrians. Ordinarily it is difficult, before he causes an accident, to determine from external appearance whether any person who has been drinking has had his faculties so impaired that he should be kept off the streets as a menace to safety. After a person has caused an accident, it has hitherto been difficult to prove legally that he was alcoholically intoxicated because, as I stated in describing my first court experience, there are many pathological conditions of the human body which may superficially suggest alcoholic intoxication but which actually are not. In other words, in many cases, because of similarity in symptoms, it has formerly been difficult to prove alcoholic intoxication. Statistics heretofore quoted on the influence of alcoholic beverages in traffic accidents have often been wrong because they were based on opinion or judgment rather than on scientific examination.

Today this basis of error may be avoided, for scientific standards and tests that determine the stages and degrees

\*From data supplied by Mr. D. Knight Finley, Secretary, the Safety Council of the Columbus Chamber of Commerce.

of intoxication have been established as the result of the painstaking experiment and observation of many scientists during the last twenty years. These laboratory facts have been assembled and their validity proved by the actual practice of many noted physicians and biochemists in this country and abroad. We can now state with certainty that by proper chemical examination of the body fluids of any individual, we can determine the percentage of alcohol present in the system and the corresponding degree of intoxication. All statistics which are now being released from the coroner's office of Cuyahoga County, Ohio, concerning the state of intoxication of victims of and participants in fatal traffic accidents, have been obtained by following scientific methods. Our conclusions and figures are being corroborated by similar investigations in other cities.

These facts now having been established, we can realize at once what a useful device we have at hand for scientifically examining all persons involved in all traffic accidents. Because we have the means of making tests and determining the presence of alcohol in the human system and the extent of drunkenness of persons involved, we must take full advantage of this new knowledge and apply it in all cases if we wish to cut down the effects of drunken driving. If this is done and the conclusions are accepted by the courts, with proper penalties inflicted upon all who are at fault, every driver will think many times before taking a chance. We have the means of cutting down the numbers of drunken drivers; let us then set up the machinery that will permit its use.

In this connection let me again repeat that this scientific test for alcoholic intoxication may work both ways, that it may contradict as well as corroborate other evidences of alcoholic intoxication. Hence the interest of the accused individual as well as the protection of society may be served by such a test. If one is not alcoholically intoxicated, the scientific test may remove much serious condemnation from any person involved in an accident.

### A Medico-Legal Problem

Alcohol intoxication becomes a social problem and therefore a medico-legal problem when an individual's normal condition is so altered by alcohol as to cause him to be a menace to himself or to others. In the United States the legal control of intoxication rests mainly with the local state and city courts. The attitudes and definitions of intoxication differ as established by precedent. In Ohio the attitude is held that:

"A man cannot be considered intoxicated within the meaning of the law of this state even though the odor of alcohol is on the breath, a flushed face and disposition to talk loudly and freely is shown, unless it is further shown that he had lost either control of his faculties or muscles of locomotion."

In other states, as in Pennsylvania for instance, the attitude is more severe. It is held that:

"Although a man may walk straight, attend to business and give no outward or visible sign of intoxication, yet, if he is so affected by alcohol as to be excited or not possess that clearness of intellect, which he would otherwise possess, he is suffering from acute alcoholism."

#### An Arizona Ruling

In *Hasten v. State*, 35, Ariz. 427, 280 Pac. 670, we defined "under the influence of liquor," such definition being:

"It is a truism that a person who is even to the slightest extent 'under the influence of liquor,' in the common and well-understood acceptance of the term, is to some degree at least less able, either mentally or physically or both, to exercise the clear judgment and steady hand necessary to handle as powerful a mechanism as a modern automobile with safety to himself and the public. With the increasing number and speed of automobiles on our



highways, and the appalling number of accidents resulting therefrom, it is not strange that the law-making power determined that any person, who of his own free will voluntarily lessened in the slightest degree his ability to handle such vehicles by the use of intoxicating liquor, should, while in such condition, be debarred from their use. The legislature has placed no limitation on the extent of the influence required, nor can we add to their language."

See, also, *Steffani v. State*, 45 Ariz. 210, 300 Pac. 615.

#### More Accurate Criteria and Legislation Needed

Obviously, there is needed in many states more adequate legislation for the determination of what constitutes intoxication. Indiana, New York, and Maine have taken forward steps in this respect. In these states a blood alcohol concentration of 0.15%, or more, constitutes prima facie evidence of intoxication.

We shall discuss this point later. Long ago, Professor Widmark, of the University of Lund, of Stockholm, Sweden, pointed out that the alcohol concentration in the body fluids is one of the most reliable of objective criteria of intoxication. His work has been admirably supported and supplemented by the objective clinical and experimental studies of many other well-known investigators in Europe and in this country. They have divided acute alcoholic intoxication into five stages, the clinical symptoms of which correspond roughly to five concentrations of alcohol in the blood.

### Five Stages of Intoxication

(Compare with Sketch, page 21)

The following descriptions of five stages of intoxication are adapted from statistics compiled by the National Safety Council Committee on Tests for Intoxication correlated and arranged by Dr. C. W. Muehlberger.

In the five stages of intoxication described in the

following paragraphs, note that there is an overlapping of the percentage figures representing the concentration of alcohol in the blood. By comparing the descriptions of these five stages with the sketch of the brain on page 21, one can see how difficult it is to say arbitrarily that a certain amount of alcohol will produce a certain reaction in any given individual within a given time. Yet we do find, within the range of concentration indicated for each stage, that the reactions described are generally true. Individuals vary from each other, and under differing conditions from themselves, in the amount of alcohol required to produce any specified concentration in the blood. But, as any physician or police officer knows, the indicated degrees of concentration and corresponding intoxication do occur with monotonous regularity. The first three stages are the most commonly observed. Later, beginning on page 26, under a slightly different grouping, we shall cite our statistical proof that the "moderate" drinker is a dangerous driver.

#### First Stage

(0.01% to 0.12% in blood)

This we may call the *subclinical* stage of "intoxication." By ordinary observation, usually the individual appears apparently normal; but special tests may show slight changes. He feels good and has increased self-confidence. He may talk fluently and carelessly. It has been found that about 30% of the people show visible evidence of "intoxication" at this stage.\*

#### Second Stage

(0.09% to 0.21% in blood)

We call this the stage of *apparent stimulation*. We find decreased inhibitions and increased emotional instability. There is some lack of co-ordination and a slowing up of re-

\*Note by author: The percentages of the number of persons showing visible evidence of "intoxication" are compiled from the literature of the various authorities on the subject and from my own observations.

sponse to stimuli. We also find memory and comprehension impaired and a loss of critical judgment. Upon the agreement of most authorities, 90% of the people with this concentration show definite signs of "intoxication."

#### Third Stage

(0.18% to 0.30% in blood)

Let us call this the stage of *confusion*. There is a disturbance of sensation and a lessening of the sense of pain. The gait becomes staggering and the speech is slurred. We also refer to this stage as one of acute intoxication. All authorities agree that with over 0.25% alcohol in the blood, 100% of the people may be diagnosed as intoxicated.

#### Fourth Stage

(0.27% to 0.39% in blood)

This is a stage of *stupor*. There is a marked decrease in response to stimuli and evidence of approaching paralysis. This is demonstrated by apathy, general inertia, and impaired consciousness.

#### Fifth Stage

(0.36% to 0.48% in blood)

Here we have the stage of *coma*, that is, complete unconsciousness. Reflexes are depressed and temperature is subnormal. In effect, we have anaesthesia with impaired circulation and stertorous (hoarse) breathing. In this stage death may occur.

It will be interesting to compare the alcohol in the blood concentration given for the above five stages with the percentages shown on the chart of the brain on page 21. Within these five stages there is some overlapping of percentages, and this overlapping is more marked on the chart of the brain. Note also that in our statistical grouping—Low, Middle, and High—on page 26, that our high and middle groups correspond closely in percentages of concentration to the first two stages listed here. As we have stated elsewhere, a 0.15% concentration of alcohol in the blood is usually accepted as evidence of intoxication.

### Findings of Other Authorities

A. O. Gettler,\* Pathological Chemist of the Medical Examiner's Office, of New York City, insists that the absolute criterion of intoxication is the concentration of alcohol in the brain. He and Freireich\*\* admit a parallel between alcohol concentration in the brain and in the spinal fluid. Other investigators, particularly Schweisheimer, Mellanby, Nicloux, Widmark, Ambard, Miles, Harger, and many others have found that the concentration of alcohol in the blood also closely parallels the symptomatology of alcoholic intoxication. Several of these men, especially Miles, Southgate, Carter, Bogen, Heise, and Halporn have demonstrated a relationship between the concentration of alcohol in the urine and that in the blood. For practical purposes spinal fluids cannot readily be obtained but blood alcohol concentrations can be accepted as almost equally significant. Failing that, urine alcohol determinations can be equally significant if viewed in the proper perspective. Recently, Harger has introduced a method of determining the concentration of alcohol in the breath which is found more closely to parallel the concentration of alcohol in the blood than does the concentration of alcohol in the urine.

Recently appointed commissions by Great Britain (1927) and by the United States Senate (1933) have carefully and thoroughly reviewed the question of intoxication and have both come to the same conclusions. They have suggested that blood alcohol concentrations of 0.15% and over to be accepted as indicative of intoxication.

### Alcohol in Small Amounts Dangerous

Alcohol is popularly, but erroneously, accepted as a stimulant by most people. It must be emphatically stressed that it acts, from first to last, as a narcotic drug on

\*Gettler, A. O., and Tiber, A., Arch. Path. and Lab. Med. 3, 218.

\*\*Gettler, A. O., and Freireich, A. W., Jour. Biol. Chem. 92.



the central nervous system. Its stimulant action is only apparent and is due to the inhibition or narcotization of the higher cortical centers in the brain, with the release of the lower emotional centers. For this reason, we believe that individuals with blood alcohol concentrations of less than 0.15% may also be considered as under the influence of liquor or intoxicated. This is important from this standpoint. An individual who has had only a little to drink feels somewhat "stimulated" and is confident of his ability to drive his car or walk across a street safely. Because of this blunting of the sensorium—(a) the brain and (b) the entire sensory apparatus, including sense organs and their nerve centers—usual caution may be lost. The driver or pedestrian may be a bit reckless and at a given crucial moment will be incapable of instant decision and critical judgment. Therefore, an accident may ensue.

It is well to stress the fact that even in small amounts alcohol is dangerous in relation to traffic. Safety in traffic, either for pedestrian or driver, of necessity depends upon quick decision and critical judgment. Some people apparently can perform certain kinds of habitual work with some effectiveness while more or less intoxicated and this very fact may lead to a false sense of security in regard to similar ability in traffic situations. In the sense that he may be less aware of his incapacity because of his false sense of security, the habitual user of liquor, although he uses only a small amount, may become a greater traffic menace than the person definitely intoxicated.

The most dangerous driver, or pedestrian, is the one who fools himself. Driving or dodging an automobile demands instant and correct reactions—reactions that alcohol definitely prohibits.

In connection with alcohol's effect upon automobile driving, it is interesting to recall a unique experiment made years ago.

## The Heise and Halporn Experiment

### (Action of Moderate Amounts of Alcohol)

We herewith quote regarding a practical experiment observed by Doctors Heise and Halporn at Uniontown, Pennsylvania.\*

"One of the difficulties in evaluating the symptoms of a person arrested for drunkenness is the lack of knowledge on the part of the physician of the normal behavior of the particular individual. In order to obtain some knowledge as to the psychologic changes caused by the ingestion of small amounts of alcohol, Dr. Alfred G. Dietze, of the University of Pittsburgh, prepared a series of tests. Five subjects taking from 1 to 5 ounces of whiskey, whose urinary alcohol later in no case exceeded 0.10 per cent,\*\* were able to pass almost perfect routine physical examinations, and were able to perform a carefully controlled test, measuring steadiness while performing a difficult task. The subjects, however, showed a marked lowering of intelligence, as elicited by special tests involving memory and the following of directions. In order to gain further information, a practical test was devised involving actual driving conditions. A car was rigged up so that shooting a gun would give the signal to apply the brakes, and this in turn would shoot another gun. The knowledge of the speed of the car and the distance apart of the bullet marks on the road furnished a means of measuring

\* "The Medico-Legal Aspect of Drunkenness," by Herman A. Heise, M.D., and Benjamin Halporn, M.D., Uniontown, Pa., a paper read before the Section on Medicine of The Medical Society of the State of Pennsylvania. Quoted with permission.

\*\* Publisher's note. Because Dr. Gerber's report is based upon investigation of fatal accidents, his references to alcohol incidence are based upon the alcohol concentration in the blood. In routine police investigations, however, intoxication is usually determined, for obvious reasons, by the alcohol concentration in the urine, a concentration of 0.15% being considered evidence of intoxication. Methods have now been developed for determining intoxication by analysis of the breath.

reaction time. Also a curved lane marked by corrugated packing boxes, whose configuration could be changed without notice, made quick decisions necessary and prevented the subject from anticipating the signal to stop. By spending several hours with each subject we were able to notice changes in the individual, and were also fortunate in being able to elicit the subjective symptoms.

"The details of these tests are too voluminous to be quoted here, but our subjects all mentioned dizziness, and two of them a sense of unreality as the most prominent subjective sensations. The most striking change was that of the intelligence, particularly the ability for self-criticism. All but one passed the routine examination for sobriety, but all suffered a moderate slowing of reaction time, and all made mistakes such as colliding with boxes and shooting the gun on the brake pedal at the wrong time. All revealed a change in personality, one going through the classical stages of being verbose, morose, lachrymose, bellicose, and finally comatose. Two failed to remember details of the events of the day.\*\*\*\*\*

"Examination of a test chart reveals definite slowing and greater variations in the reaction time tests after the alcohol is taken. At 30 miles an hour he normally travels about 16 feet before he can begin to apply his brakes. After taking alcohol, this distance gradually increases to about 22 feet. The driving test was ended abruptly when the road rose up in waves before the driver."

### The Menace of Moderate Drinking

During the ten years I have been Coroner of Cuyahoga County, which includes all of metropolitan Cleveland, I have investigated officially 22,880 deaths from violence and other causes and, therefore, have had ample opportunity to observe and study the part alcohol plays in such deaths.

All too frequently the daily papers headline the death of this father or that mother struck down by a drunken driver. Next day a child may be killed in the street or a young man may lose his life from reckless driving. Death by violence goes on constantly and alcohol plays a leading part in the slaughter.

My investigations, of course, do not include those who are permanently disabled and disfigured as a result of accidents, hence I leave to others comment regarding the economic and sociological aspects of the accident problem. Nor in this brief discussion shall I be greatly concerned about the chronic alcoholic and what makes him that way. I recognize that chronic alcoholism is a grave national health problem, but my study and experience convinces me that the so-called moderate drinker is a graver problem—at least as far as accidents are concerned.

Our experience in this office, as well as that of others, has proved that, exclusive of pedestrians, it is not the pathological chronic alcoholic who causes or is involved in the greatest number of accidents. Undoubtedly, it is the man, or woman, who has had only a few drinks who creates the most accidents. He assures everyone, including himself, that he is not drunk, and, with increased self-confidence, forsakes caution. Such a person, "under the influence of alcohol," has a slower reaction time. Evidence demonstrates that when he is at the wheel of a car, his foot is heavier on the gas and is slower to apply the brakes.

How this false self-confidence of the moderate drinker leads to accidents is clearly evident. On the other hand, the obviously intoxicated person may feel the need for caution or may be restrained by others from driving his car. If he does attempt to drive, he is, of course, a menace to himself and to others. Used either moderately or immoderately, alcohol makes one a poor driver.

### Startling Statistics

Nation-wide statistics from reliable insurance tables and statistics of the National Safety Council, indicate that there were about 33,000 people killed by motor vehicles in the United States in the year of 1946. For the past five years more people in the United States were killed in automobile accidents than were killed or died of wounds in the A. E. F. during the first World War. For the City of Cleveland alone in 1946, there were 17,754 traffic accidents. Of this number, 118 were killed and 3,111 suffered non-fatal injuries. The economic loss is incalculable in Cleveland or in the nation as a whole.

#### Vehicular Fatalities

*Yearly Comparison and Alcohol Incidence for Ten Year Period*

YEAR	NUMBER OF CASES			INCIDENCE OF ALCOHOL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
1937	274	76	350	60.7%	30.0%	54.7%
1938	178	56	234	57.3%	40.0%	53.5%
1939	175	49	224	57.4%	40.0%	54.3%
1940	152	39	191	55.7%	33.3%	53.8%
1941	187	68	255	63.0%	19.4%	51.8%
1942	183	42	225	65.0%	43.7%	62.5%
1943	134	45	179	45.0%	25.0%	41.0%
1944	132	45	177	47.0%	35.0%	44.0%
1945	138	29	167	55.0%	35.0%	52.0%
1946	174	39	213	55.0%	35.0%	52.0%

The chart above gives the ten-year vehicular fatality record for Cuyahoga County, Ohio. Remember that it does not include the hundreds of other accidents which did not cause death, but which did cause countless injuries and enormous loss of property. Remember also that similar destruction is constantly going on all over the United States.

Note also that, except for two years, alcohol was present in over fifty per cent of the cases tested. And that means something. It at least means that we are entirely too complacent about permitting drinking drivers to run loose on our highways. Good citizenship demands that we do our part to check this terrible slaughter.

### Alcohol and The Brain

In this brief treatment we shall not go into detail concerning the absorption and excretion of alcohol. The absorption, which is very rapid, takes place in the stomach and small intestine. The absorbed alcohol is carried by the blood to all parts of the body. After the first hour following ingestion, the alcohol is distributed fairly equally throughout the tissues of the body in proportion to the water content of these tissues. Although alcohol may be oxidized to some extent by all the tissues of the body, most of this oxidation takes place in the liver. This oxidation in the liver is the chief method of detoxification, that is, of eliminating the intoxicating or poisonous effects of alcohol. Most of the alcohol that is not oxidized, is excreted by the lungs and kidneys. But it is the effect of alcohol on the brain and spinal cord which causes the symptoms of intoxication.

The action of alcohol on the brain and other parts of the nervous system is that of a narcotic. As such, its chief effect is to slow down and depress the nervous system. To understand the relationship between this narcotic effect and human behavior, it is advisable to note the psychological basis of behavior patterns.

Many psychologists describe normal or civilized behavior as a learned or acquired modification or control of basic primitive impulses or action patterns. Most of this modification or control results from inhibition (restraint) of the lower centers of the nervous system by the upper centers. Alcohol's first effect is to narcotize (depress or dull) the inhibiting or restraining power of these upper brain centers.

Editorial comment. Throughout this booklet, emphasis is given to the connection between alcohol and accidents. No attempt is made to show how using beverage alcohol otherwise shortens life or impairs health. For a discussion of these topics and of related social and economic aspects of the alcohol problem, we refer you to *Alcohol Talks to Youth* and *Youth Questions Alcohol* described on page 2.

### The Frontal Lobe (See Sketch Page 21)

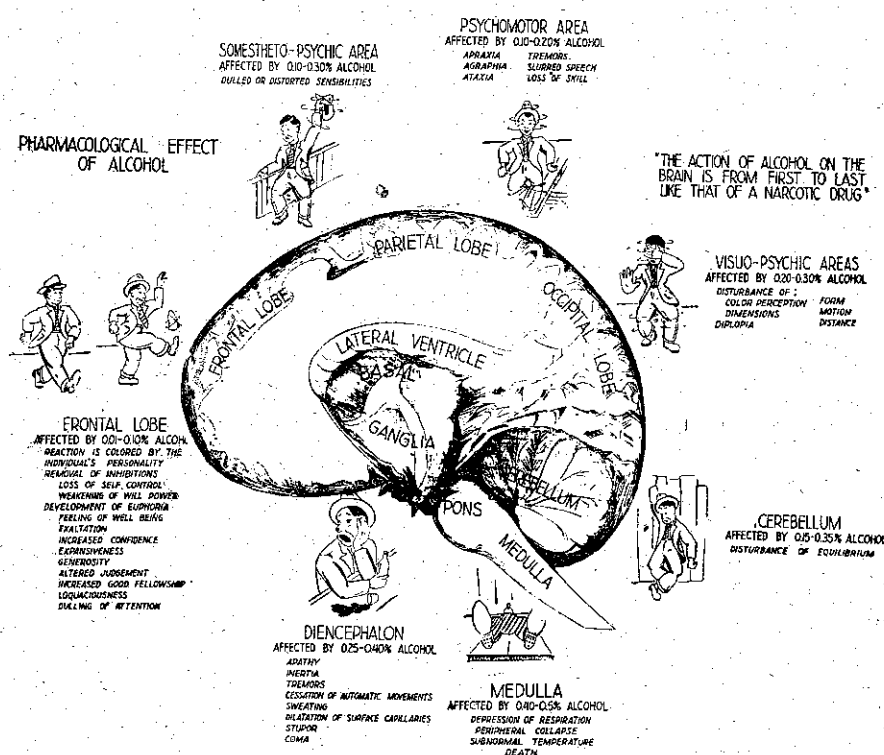
As the concentration of the alcohol in the blood mounts, it has increasing and varied effects on various brain centers. The first evidence of this effect is seen to a greater or less degree soon after the drinking of any alcoholic beverage; that is, when the alcoholic content of the blood is 0.01% to 0.10%. At this relatively low level of concentration, the frontal lobe of the brain is first affected. As a result, inhibitions are dulled and a general state of euphoria (a sense of buoyancy and well-being) is temporarily produced. It should be remembered, of course, that specific behavior reactions will be affected by the mood and personality of the individual.

Commonly observed at this stage, in the presence of pleasant company, is the tendency of the individual to become more self-confident, exalted, talkative, and more sociable. At the same time, however, it is seen that there is a loss of control of movements, impaired judgment, and a general dulling of the senses. It is this combination of self-confidence and impaired ability that makes even this moderate drinker very dangerous behind the wheel of an automobile or unsafe on a ladder in a home.

Psychological tests show that tasks such as the addition of a column of figures or reading a series of disconnected syllables, are performed less rapidly and less accurately when a person has taken even moderate amounts of alcohol, although the drinker, despite the actual inferiority of his work, usually thinks he is doing exceptionally well.

A practical, and at the same time dangerous manifestation of this condition, is to be found in the cases of many moderate drinkers. For, notwithstanding all scientific evidence they may have to the contrary, many steady or moderate drinkers are proud of their ability to "carry their liquor" and scoff at its effect upon their driving. Yet all scientific theories and tests, plus the actual statistics on the incidence of alcohol in traffic accidents, show that the person with a "few drinks" is a serious menace.

### Alcohol and the Brain



Drawing of the brain made by Mr. Thomas Laban.

Cartoons and data arranged by Dr. Reuben Straus, former pathologist of the Cuyahoga County Coroner's office at Cleveland, Ohio.

For detailed discussion of this drawing refer to pages 19, 20, 22, and 23.

### **The Parietal Lobe**

(See Sketch page 21)

As the concentration of alcohol in the blood reaches 0.10% to 0.20%, the psychomotor area of the parietal lobe is affected. This makes difficult the performance of purposeful movements, and reduces the power of muscular co-ordination. As a consequence, the inebriate frequently demonstrates a loss of skill, an inability to write legibly, and slurred speech.

As the alcohol concentration reaches 0.10% to 0.30%, the somestheto-psychic area (that area of the brain that records bodily sensations) is affected. One example of this effect is a dulling or distortion of the sense of touch.

### **The Occipital Lobe**

(See Sketch page 21)

If the concentration is increased to 0.20% to 0.30%, the visuo-psychic areas of the brain are affected. This produces double vision and disturbances of perception regarding color, form, motion, and distance.

### **The Cerebellum**

(See Sketch page 21)

The cerebellum is affected by concentrations of 0.15% to 0.35%. Inasmuch as the cerebellum is a portion of the brain concerned with muscular coordination and bodily balance, disturbances in this area will disrupt equilibrium.

### **The Diencephalon**

(See Sketch page 21)

In concentrations of 0.25% to 0.40% of alcohol, the diencephalon (mid-brain) is affected. This results in inertia, tremors, cessation of automatic movements, sweating, dilatation of surface capillaries, stupor, and coma.

### **The Medulla**

(See Sketch page 21)

With concentrations as high as 0.40% to 0.50% the medulla is affected. The resulting effects are depression of the respiration, peripheral vascular collapse, subnormal temperature, and, in some instances, death.

These last two stages resemble chloroform anaesthesia. This condition may last for several hours and end in death from failure of respiration. When this stage of anaesthesia is reached, it lasts much longer than that produced by either chloroform or ether.

## **Alcoholism**

Alcoholism is the effect produced by poisoning with ethyl alcohol. Alcoholism may be acute, subacute, or chronic. The various areas of the brain affected and the manifestations of the effects have been cited above but perhaps some of the discussion bears repetition and expanding.

### **Acute Alcoholism**

Acute alcoholism follows the ingestion of very large quantities of strong spirits in a very short time, and is not usual in occurrence. The patient becomes comatose, with the face congested and purplish, later becoming pallid. There is complete muscular relaxation, weak heart action, and collapse. Unless medical attention is administered, death may result from paralysis of the heart or organs of respiration, or both.

### **Subacute Alcoholism ("Drunkness")**

Subacute alcoholism is the commonly observed type of drunkness and produces varying manifestations in different individuals, and even in the same individuals at different times. Among the first effects of moderate amounts of alcohol are apparent exhilaration, loquaciousness, indistinctness and incoherence of speech, lessening of the sense of touch, and a loss of control over the muscles so that the person is unsteady on his feet and staggers when he walks. Dizziness and disturbance of sight and hearing may also appear and, finally deep lethargy and stupor ensue. On awakening, nausea, vomiting, headache and mild depression remind the sufferer of his indulgence in the beverages which have poisoned his system. In some individuals, the stage of hilarity does not appear. In such



individuals, quarrelsomeness and moroseness are manifested from the beginning.

#### **Chronic Alcoholism**

*Chronic* alcoholism presents many symptoms. Some persons, instead of becoming stuporous, pass into a condition of wild excitement and uncontrollable fury, which may result in acute alcoholic hallucinosis, during which some of the most revolting crimes may be committed. In others, convulsive seizures, or alcoholic epilepsy, follow the first stage, as the result of continuous, immoderate indulgence in alcoholic liquors over a period of years. Finally, disease with psychological manifestations often results.

#### **Symptoms May Be Confused**

At times alcoholic intoxication resembles symptoms attending certain grave disorders, such as cerebral hemorrhage, coma from epilepsy, fracture of the skull, or poisoning from barbiturates, morphine, or other drugs. Unfortunately, mistaken diagnoses of persons found unconscious not infrequently occur. The true state of affairs is often extremely difficult to recognize, and it is always wiser in doubtful cases to act as if more serious trouble existed. The fact that the breath smells of liquor is of little value, as interested individuals may have sought to aid one suffering from possible injury or illness by giving him some alcoholic beverage to drink. Then, too, a man who actually has been drinking alcohol, may also be suffering from one of the disorders mentioned. Chemical determination of the presence or absence of alcohol is of paramount importance in such cases.

#### **When Violent Death Occurs**

Here at the coroner's office it is our policy to test the blood, urine, and sometimes the spinal fluid, of all individuals over 15 years of age who die instantly or survive less than 12 hours following the onset of any violence that results in death. The purpose in following this procedure

is to have as court evidence the chemical determination of the presence or absence of alcohol. Inasmuch as about one-half of all such cases were tested by this procedure, we accomplished over a period of ten years adequate sampling and therefore feel that statistics compiled from our results should be impressive.

Over this ten-year period we have compiled accurate records of the information which it was necessary that we obtain in our routine examination of the facts concerning each accident. For vehicular accidents these facts included: the nature of the accident, the time at which it occurred (the hour of the day, the day of the week, and the month), the weather, lighting and road conditions, the age and sex of the individual, the existence of any physical defect which might be a contributing factor, the alcohol concentration in body fluids, and other information useful in determining the responsibility for the accident. The number of other accidents, however, such as those which occur in the home, in industry and in public places is also large.

As we have previously stated, 22,880 cases were officially investigated from 1937 through 1946 and 13,628 of these cases were brought to the morgue. About 45% of these cases represented violent deaths and it is interesting to note in this connection that, as part of our investigations, 7817 determinations for alcohol were performed in our laboratories.

Although, in this present discussion, our chief concern is with vehicular accidents, we have thought it not out of place to cite above the total figures concerned with our routine investigation of all fatalities. And our experience convinces us that alcohol plays too great a part in other violent deaths coming to our attention.

#### **Vehicular Accidents**

Death resulting from any accident in which a vehicle is involved is designated as a vehicular accident, regardless of whether the accident occurs on private property or

on a public highway. In contra-distinction, a traffic accident is one which originates on a traffic-way and therefore is a sub-classification of vehicular accidents.

From the factors most commonly recurring, our records show that the average vehicular fatality may be typified by a male pedestrian, over fifty years of age, a skilled laborer, who drops in at the neighborhood tavern for his social drinking on a Saturday night, or perhaps, on Sunday attends a party at which "liquor flows freely." Furthermore, from these averages we can state that such an individual is likely to be killed in the month of October, between the hours of 6:00 P.M. and midnight, in clear weather, with dry pavement, and with street lights of the average type.

### Alcohol Incidence

(See Chart page 27)

The constantly recurring factor of the influence of alcohol in vehicular accidents led to a thorough survey of the alcohol incidence. The study was conducted in two four-year periods. The first four-year period, from 1937 through 1940, is represented by 999 cases; the second period, from 1941 through 1944, by 836 cases. In addition similar studies were made for the years 1945 and 1946. To facilitate charting, the alcohol content found in the blood samples was arbitrarily divided into three categories:

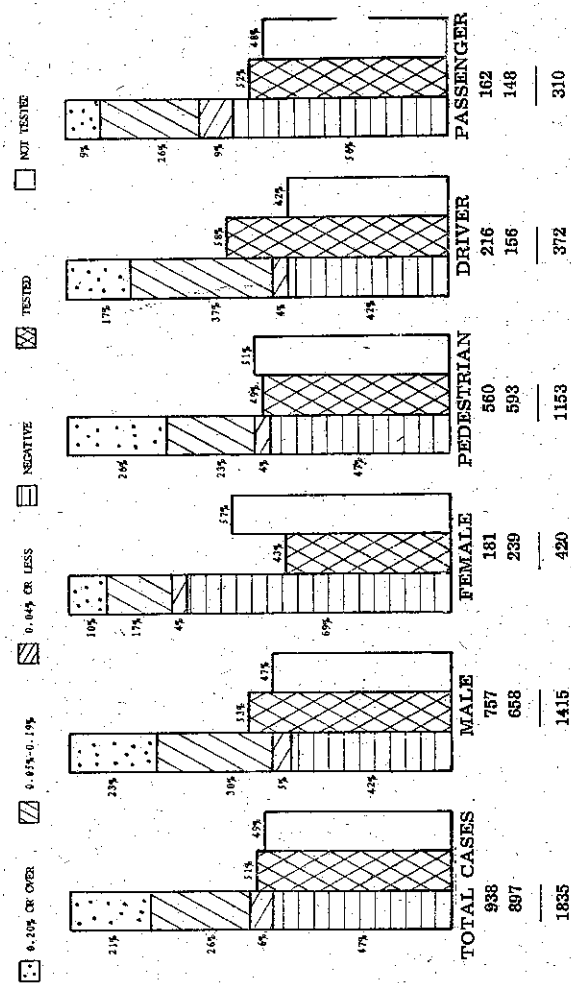
Low group—0.04% or less..... 40 mg./100 ml.

Middle group—0.05% to 0.19%..... 50 mg. to 190 mg./100 ml.

High group—0.20%..... 200 mg./100 ml. and over

The middle group represents a wide range, from concentrations causing little apparent effect—and, possibly, requiring finer psychological tests to determine the deviation from normal—up to that state of concentration (0.20%) at which nearly all authorities agree that 100% of individuals are intoxicated.

VEHICULAR FATALITIES 1937-1944  
CLASSIFICATION OF VICTIMS AND ALCOHOL INCIDENCE  
1835 Cases



TESTED  
NOT TESTED  
Total

To define "intoxication," the legislatures of some states, after extensive and due consideration, have written into their laws that a concentration of 0.15% or more of alcohol in blood is accepted as prima facie evidence of alcoholic intoxication.

In the eight-year study, represented by 1835 fatal cases, 938 were tested for the presence of alcohol. This means that slightly more than half (51%) of the cases were tested. When we consider that 10.6% of the total number of cases for the period were children under fifteen years of age, whom we do not test, it becomes apparent that nearly 57% of those individuals over fifteen years old who died as a result of vehicular accidents in Cuyahoga county during the years of 1937 through 1944, were examined for the presence of alcohol. As a corollary, we draw attention to the significance of the fact that in those vehicular accidents which caused the death of persons over fifteen, the injuries sustained were of such magnitude that in 57% of the instances the victim died instantly or within 12 hours.

### Drivers Who Kill

(See Chart, page 27)

Of the 1835 cases, 1415 (77%) were males and 420 (23%) were females. Of the 938 cases actually tested for alcohol incidence, 757 were males (81%) and 181 were females (19%). Of the males tested for alcohol, 58% showed positive results; of the females tested, 31% showed positive. Of the males tested, 23% had an alcohol content in the high group (see page 27) in contrast to 10% of the females. The greater number of positive cases is found in the middle group. *We must comment and repeat again and again that usually it is not the obviously intoxicated individual who is involved in the most serious accidents.* It is true, of course, that some individuals represented by the cases in this middle group survived a sufficient length of time so that the alcohol concentration was less at the time of death than it was at the time of the accident.

### Pedestrians, Drivers, and Passengers

(See Chart, page 27)

When the total cases are classified as pedestrians, drivers, and passengers, it is found that pedestrians represent 63% of all the deaths from vehicular accidents. This should not be too amazing since all persons are pedestrians some of the time. Drivers represent 21% of the total. In both categories the alcohol incidence is high—53% of the pedestrians and 58% of the driver fatalities tested were positive. We find, however, that the pedestrians with positive tests were quite evenly distributed between the high and middle groups. On the contrary, nearly two-thirds (63%) of the drivers with positive tests are found in the middle group. Passengers contributed one-sixth (16.8%) of the total cases. Alcohol incidence is lowest in this class with 44% positive. Only fatal cases come under our jurisdiction. We, therefore, do not have records concerning the alcohol incidence among the drivers who killed pedestrians or passengers but were not themselves killed.

When averaged for the ten-year period, the proportion of pedestrian fatalities (64%) to the total death from vehicular accidents is comparable to that of the eight-year study (63%). In 1944 the pedestrian fatalities were only 59% respectively, of the total vehicular deaths. In 1945 and 1946, these fatalities increased to 72% and 67% respectively. In 1945 there were ten less deaths from vehicular accidents than in 1944, but fifteen more pedestrians were killed in 1945 than in 1944. Reasons for these variations were sought. We noted that in 1944, when the pedestrian fatalities dropped to 59%, there was also a decrease in the alcohol incidence as compared to the eight-year period. In 1944 the alcohol incidence was 38% of the cases tested while the average for the eight years was 53%. Then in 1945 and 1946, when there were proportionately more pedestrian fatalities than in the eight-year average, there was also an increase in the alcohol incidence, again approximating the average for the eight-year

period, being 50% in 1945 and 51% in 1946. It was also noted that there is a greater proportion of positive cases in the high group. In other words, heavy drinkers seem more likely to get killed.

Although there were more pre-school and school-age children killed in 1944 than in either of the two successive years, in that year the proportion of pedestrians among these fatalities is the lowest in the period.

#### Pre-war and Wartime Record

One might have anticipated that there would have been a decrease in driver fatalities and an increase in passenger deaths during the war years with restricted driving and ride-sharing. Although the variations are too slight to emphasize, it seems worthy of mention that there was an increase in the proportion of driver fatalities to the total during the war years over the pre-war period. At the same time, there was a decrease in the number of passenger deaths. The driver alcohol incidence remained high and in 1945, being 63%, exceeded the average of 58%; in 1946 it was 59%. As in the eight-year study, it was seen that a major proportion of the drivers with positive tests were in the middle group. *One must conclude that these figures support our statement concerning the frequency with which the moderate drinker is involved in accidents.*

#### Alcohol In Home Accidents

In a study of the home accidents which occurred in the years of 1943 through 1946, it was seen that there was an increase in the actual number as well as the proportion of total fatalities brought to the coroner's office. In 1943, these accidents contributed 14.7% of the deaths due to violence; while in 1945, this proportion was increased to 19.3%. Home accidents accounted for more sudden deaths of children under four years of age than any other cause. Falls resulted in more fatalities than any other type of home accident. It is a well-known fact that carelessness

plays a major role in all home accidents, but it is also noteworthy that the alcohol incidence is high. The presence of alcohol was demonstrated in 50.5% of the cases tested during this four-year period. The highest alcohol incidence is found in those cases where death resulted from falls—72.6% of the cases tested being positive.

#### Alcohol In Industrial and Other Accidents

Industrial accidents contributed fewer deaths in 1945 and 1946 than in the two preceding years. In 1946, this mode of death accounted for only 8.4% of the violent deaths as contrasted with 11.3% in 1944. As in home accident fatalities, falls were of major importance. Of the cases tested and found positive in 1946, three-fourths were in the middle group.

The category of other accidents include those which occurred in a public place—railroad accidents and those fatalities from accidents so out of the ordinary that they do not readily fall into the other classifications.

The majority of fatalities from these "Other Accidents" result from falls and drowning. Again, it should be noted that falls cause more deaths than any other type of accident in this category and also that the alcohol incidence is high, 62% of the cases tested being positive. For this whole category, the distribution of positive cases is fairly evenly divided between the high and middle groups.

#### Conclusion

(By the publishers)

There are no headlines in the factual, unprejudiced report presented by Dr. Gerber in the preceding pages. Yet there is quiet, insistent, and convincing emphasis upon the hazards of moderate drinking in relation to accidents.

In this discussion, guesswork is out. When Dr. Gerber speaks of 22,880 investigations, when he refers to 13,628 cases brought to the morgue, and when he states that his office has performed 7817 determinations for alcohol in

connection with those cases, we get the feeling that he knows whereof he speaks. His words carry weight.

Except by implication, Dr. Gerber has made no recommendations for eliminating or cutting down the waste and slaughter caused by the use of beverage alcohol. As coroner and physician, he points to his findings as clear evidence of the need for more adequate legislation regarding intoxication and for a clearer understanding of how alcohol contributes to the accident toll.

Timely, indeed, is Dr. Gerber's brief but effective indictment of the moderate drinker as our most dangerous driver of an automobile. In these days of loose talk about "moderation," it is good to hear an experienced scientist say, "Let's look at the record." And the record is bad.

To many of us, in school and out, this brief analysis of one phase of the alcohol problem will come as a reminder that good citizenship requires that we do our part in making conditions better. We should learn how alcohol affects health and length of life, what it costs us socially and economically, and how its increasing use as a beverage may affect us individually and as a nation.

As good citizens, we should get better acquainted with the alcohol problem as it is faced daily by police officers and by officials like Dr. Gerber. We should recognize stark reality—that use of beverage alcohol is a national menace to life and property. In addition, we should give wholehearted support to local and national movements designed to curb or eliminate this menace.

Read and reread this booklet, and give copies to your friends. It explains a problem in citizenship that you and your friends must solve.