

PHYSIOLOGY

# Intoxicating Drink Cannot Be Scientifically Defined Now

## Studies of Effects of Alcohol Reveal Variables Which Make it Impossible to Give Legislators Exact Definition

By JANE STAFFORD

LEGISLATORS seeking a definition of an intoxicating beverage will find that science cannot give them one at present. Drunkenness is a gradually developing condition. It would be arbitrary to draw a line at any point and say here intoxication begins. For a tight-rope walker it might be one thing, for an automobile driver another and for a peaceful pedestrian still another.

Common sense and experience must be used to determine practically what alcoholic beverages should be designated as intoxicating.

These are the opinions of Dr. W. H. Howell, chairman of the National Research Council and formerly director of the Johns Hopkins School of Hygiene and Public Health.

The subject has been investigated extensively in various scientific laboratories. That is, studies have been made of the effects of alcohol on the body and on efficiency in performing various acts and tests. While much has been learned, none of the results can be used to determine exactly a limit for the alcoholic content of an intoxicating beverage.

This is because of the wide difference in the way different persons are affected by alcohol, the difference in the way they ordinarily consume the same amount, and the difference between taking alcohol under laboratory conditions and drinking it on social occasions.

### Measure Alcohol in Blood

While intoxication is a result of the effect of alcohol on the brain and the nervous system, there is no way to measure this directly in a living man, Prof. Walter R. Miles of Yale University has declared. Instead, Prof. Miles and other investigators have measured the amount of alcohol in the blood, believing that this value gives a fairly accurate picture of the amount in the nervous system at the same time.

When the concentration of alcohol in the blood reaches one-hundredth of one

per cent., the first effects of the alcohol may be observed in a "clearing of the head, freer breathing through the nasal passages and mild tingling of the mucous membrane of the mouth and throat."

At a concentration of five-hundredths of one per cent., the average person becomes intoxicated in the sense that he is a probable danger to himself and others. It is at this stage that he feels he is "sitting on top of the world," feels he can lick anybody in the county, takes social and personal liberties of all sorts as impulse prompts, is long-winded, and has difficulty in lighting a match.

When the concentration of alcohol in the blood reaches one-tenth of one per cent., there is no doubt at all that the drinker is intoxicated, Prof. Miles observed. At this stage he staggers noticeably, talks to himself, sings loudly, fumbles with his keys in unlocking his car and otherwise presents all the signs of a person "under the influence of liquor." A very strict definition of drunkenness is that of Dr. Howard A. Kelly, Emeritus professor of gynecology and obstetrics at Johns Hopkins University, who holds that any person who takes any quantity of alcohol of any dilution is intoxicated because alcohol is a toxic substance.

On the other hand, Dr. Raymond Pearl, director of the Institute for Biological Research, Johns Hopkins University, agrees with the idea of drunkenness said to be used by the London police,

"A man is drunk (in a police sense) if he is so under the influence of alcohol as to be a nuisance or a danger to himself or others."

A man driving an automobile may be such a danger for from two to four hours after drinking even moderate amounts of alcohol, scientific tests have shown.

"It is true that from two to four hours after very moderate doses of alcohol practically all individuals are affected

with general depression of neuro-muscular processes, lessened visual acuity, and lessened eye-hand coordinations," Dr. Francis G. Benedict of the Carnegie Institution Nutrition Laboratory pointed out. According to Dr. Benedict, "inflexible science" says to the modern automobile driver,

"Moderate user, keep off!" meaning keep off the roads. "For at least four hours after a dose of alcohol formerly considered 'permissible,' you, as a motor vehicle operator, may well be considered a 'menace to society.'"

However, one set of scientific experiments showed that after a man was accustomed to alcohol, his efficiency was increased rather than decreased immediately after taking a drink. This was true of his performance in various tests demanding a high degree of coordination between nerves and muscles. Yet even a person who had built up a tolerance for alcohol, as scientists call it, might not be safe driving a motor vehicle just after taking a drink.

### Effect on Brain

One eminent biochemist with a scientist's knowledge of alcohol's effect on the body and with a liking for a sociable drink, never takes one if he is going to drive his car. Neither will he allow his son to drive if he has been drinking.

The best means of finding how much alcohol is needed to intoxicate a man, according to one group of scientists, is by determining the amount of alcohol in the brain, on the theory that it is the effect of the alcohol (*Turn to Page 394*)



The Science Service radio address next week will be on the subject

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on the brain that produces intoxication. This is of much medico-legal value, but unfortunately does not help solve the problem of when a beverage is intoxicating, for such a test could only be made post-mortem.

Investigators of this problem, Prof. A. O. Gettler of New York University and A. Tiber, found that when the brain contained from 0.25 to 0.4 per cent. alcohol, the individual lost his sense of equilibrium and could be considered intoxicated. This finding resulted from a five-year study of over 6,000 human brains examined in the Chief Medical Examiner's Office of New York City, analysis of the histories of these cases, and experimental work on dogs.

The degree to which any person is affected does not depend on the amount of alcohol consumed but on the amount present in the brain at the time, this study showed.

Among investigators using the amount of alcohol in the blood as a test of intoxication is the English biochemist, Prof. E. E. Mellanby, who observed that when the concentration of alcohol in the blood reached 0.2 per cent. by volume, the drinker showed signs of intoxication. This would require drinking about four "large whiskies." In general, a condition of marked drunkenness exists when the alcohol in the blood reaches a concentration of between 0.1 and 0.2 per cent. From 0.6 to 0.7 per cent. or less may prove fatal and more than this almost invariably does. A man dead-drunk is not very far from real death.

Prof. Gettler, however, does not consider the concentration in the blood so

reliable an indication of drunkenness as the concentration of alcohol in the brain, and for living persons he considers the concentration in the spinal fluid most reliable. When this reaches 0.265 per cent. the person is intoxicated.

But if scientists can thus determine by various tests when a man is intoxicated, they still cannot determine accurately what strength of beverage will produce the effect, since this depends on how much and how fast he drinks and how quickly he absorbs and burns up the alcohol in the beverage. People vary so greatly in their response or resistance to alcohol that what may be an excessive amount to one person may be a mere "snifter" to another.

### "A Moderate Dose"

A pharmacologist, Dr. Harold T. Hyman, assistant professor at College of Physicians and Surgeons, Columbia University, has said that a moderate dose of alcohol may be from about two-thirds of an ounce to about one and one-third ounces. At that rate, from two to four glasses of 4 per cent. beer would be a moderate and presumably non-intoxicating dose. But Dr. Hyman admits that either of these amounts might be excessive or very slight, according to the individual drinker's tolerance for alcohol.

Earlier scientists seem to have allowed a slightly more generous amount for a moderate dose, however. In the last century, an English physician, Dr. Anstie, said that a "permissible amount" of alcohol would be about an ounce and a half of absolute alcohol per day. Since absolute alcohol is 100 per cent. alcohol, this would allow about four or five glasses of 4 per cent. beer.

Coming nearer to our own time, Prof. John J. Abel of Johns Hopkins University stated in 1903 that a permissible amount would be a pint of beer or half a pint of light wine a day. However, it is unlikely that either of these physicians were considering the permissible amount solely from the standpoint of permitting an amount just short of intoxication. Other considerations undoubtedly entered in.

"According to laboratory experience," stated Dr. Francis G. Benedict of the Carnegie Institution Nutrition Laboratory, "the equivalent of 20 to 30 cubic centimeters or one to one and one-half ounces of pure alcohol may be taken at one time by the average man, even on an empty stomach, without obvious signs of incipient intoxication. This is quite irrespective of whether the man is used to alcohol or not.

"If we consider the amount of liquid necessary to take into the stomach to furnish one and one-half ounces of pure alcohol in a diluted form, we find that it would require nearly two quarts of liquid. Although of course there are certain bacchanalian artists who can easily negotiate this volume, for the majority of individuals it would be physically impossible to hold enough liquid with a two per cent. content of alcohol to make a man a menace to society from the standpoint of obvious intoxication."

If the liquor were 4 per cent. instead of 2 per cent., only one quart need be consumed to reach the limit of one and one-half ounces of pure alcohol, and, presumably, intoxication. Since one quart of beer or other beverage is quite as much as the average person would take at one time, 4 per cent. would thus seem to be a safe, scientific limit of alcohol concentration in a non-intoxicant.

*Science News Letter, December 17, 1932*

#### MEDICINE

### Typhus Investigator Recovering From Disease

**D**R. W. G. WORKMAN, of the U. S. National Institute of Health, Washington, is now well on the way to recovery from the attack of typhus fever which he contracted during the course of investigations on the disease. Dr. Workman, third of the Institute's staff to suffer from the disease, is reported to have had a much milder attack than that from which his chief on the typhus investigations, Dr. R. E. Dyer, suffered in October of this year.

*Science News Letter, December 17, 1932*

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