Etiology and Biological Treatment of Alcohol Addiction[1]

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For 99 percent of his existence man lived in stone-age cultures eating mainly meat. About 10,000 years ago the diet began to vary. Cultures like the Amerinds and Es-quimox have only recently changed their dietary habits. These population groups are subject to extremely high alcohol addiction rates.

Niacin. In a total meat diet there is as high as 250 mgm of niacin per day while the mixed or vegetarian diet is much lower. The present recommended daily allowance for niacin is only 20 mgm. A metabolic system which has evolved predominantly on a mostly meat diet, and which at present only receives 20 mgm of niacin daily, could be under duress. In 1980 a patient being treated for hyperlipidemia with 500 mgm of nicotinic acid a day (250 mgm time-release capsules twice daily) reported after 4 weeks of treatment that he had stopped drinking alcohol! After trying the niacin on ten more patients with success, the author searched biochemical publications to see if other researchers had discovered a possible mechanism of action.

History of niacin use**.** Late in the 1930's nicotinic acid was used to treat the recognized deficiency state called *pellagra* in doses of 500 mgm daily. Cases of pellagra were found in chronic alcoholics, but apparently the disease has frequently gone undetected because the skin lesions were absent or late in appearance.

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Ishii and Nishihara's research. Recent work discusses unsuspected and undiagnosed pellagra in terminally ill alcoholics. In 1981. Ishii and Nishihara[1] reported twenty alcoholic patients with pellagra; the pellagra was discovered only after autopsy. Autopsies revealed classical neuropathological findings of pellagra in brain sections of these patients.

Typically these alcoholics would enter the hospital confused, disoriented and agitated. Later diarrhea occurred which did not respond to any treatment and the patient expired from bronchopneumonia. This occurred despite treatment with antibiotics, vitamins Bl, B6, B12, and C and the use of antidiarrheal agents.

After reviewing these twenty patients, Ishii and Nishihara found four new patients with pellagra who had identical symptoms as the first twenty. These four people were treated with all of the previous medications, but niacin was added.

The four niacin-treated patients recovered. Typical pellagrin skin lesions had not appeared at any time on these last four patients, just as they had not appeared on the twenty patients who died and were autopsied.

Smith's research. Dr. Russell Smith carried on an early investigation of the niacin treatment for alcoholism in the 1960's.[2] Smith was inspired by Hoffer and Osmond who treated patients with schizophrenia, and alcoholics with schizophrenia, with very high doses of niacin (3-20 grams a day). The latter alcoholic-schizophrenic group had good success as a result of this niacin treatment.

Smith reported 500 such patients treated over a five year period using three or more grams of niacin daily. Smith had a 50-60% success rate. Smith's work was apparently ignored, perhaps because he could not offer a biochemical explanation for the mechanism

of action.

The biochemistry of action of niacin in the treatment of alcohol addiction. Acetaldehyde is the key to understanding the biochemistry of alcohol addiction. Lindros in 1982,[3] explained that acetaldehyde is the first intermediate step in the pathway to the oxidation of ethanol.

Alcohol is metabolized in two stages: (1) by the enzymes, alcohol dehydrogenase and aldehyde dehydrogenase. These enzymes require NAD (nicotinamide adenine dinucleotide) as a coenzyme. In alcoholics the first stage reaction is faster than in normal or control subjects. (2) The second stage involves metabolism of acetaldehyde to acetate. In alcoholics this reaction is decreased compared to normal. The net result is the accumulation of acetaldehyde and the elevation of acetaldehyde in the blood and (more importantly) in the brain tissues.

The reason for alcohol addiction in humans. Davis in 1970, showed that acetaldehyde condenses with dopamine in the brain to form morphine-like compounds. These substances bind to opiate receptors. This is the cause for addiction to alcohol in humans.

Unwin's[7] contributions. In the course of investigating the effects of acetaldehyde and alcohol on mice, Unwin, 1982, in England, noted that there was no observable difference between giving a 4.5 grams per kilogram dose of ethanol subcutaneously or a 0.3 ml of acetaldehyde per kilogram, subcutaneously. Both caused sedation for two hours with loss of muscular co-ordination.

Thus the active substance is the acetaldehyde. Alcohol is just a means for generating acetaldehyde. It is the acetaldehyde that then condenses with dopamine.

Eriksson's[5] study. In 1974 CJ. Eriksson showed that acetaldehyde levels in rats could be cut in half by using an increase of nicotinamide. The probable mechanism of action for niacin treatment of alcohol addiction in humans is that *niacin also reduces acetaldehyde levels in the brain.* This interrupts acetaldehyde and dopamine condensations to the morphine-like compounds, thus stopping the patient's addiction to alcohol.

McElfresh and McDonald's experiments.[6] The most recent work has been done by biochemical geneticists. In 1983, McElfresh and McDonald showed that fruit flies exposed to 10% alcohol in the air had reduced levels of nicotinamide adenine dinucleotide (NAD). NAD is the alcohol-exposed fruit-flies was reduced to 20% compared with the controls.

Both Eriksson's and the McElfresh-McDonald studies suggest that giving excess NAD in the form of niacin has an impact on lowering the acetaldehyde levels in organisms exposed to recurrent alcohol use.

Conclusion. It is concluded that at least 10% of the population suffers from a niacin deficiency that manifests itself in the disease state known as alcohol addiction. This group's minimum daily requirement of niacin appears to be about 125 mgm to 250 mgm.

Treatment of active alcohol addiction requires about 500 mgm of niacin per day.

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* DPN is an old term for NAD (nicotinamide adenine dinucleotide).