



## Why is Alcohol-Induced Atrial Arrhythmias and Sudden Cardiac Death Difficult to Prevent and Treat: Potential Roles of Unrecognized Ionized Hypomagnesemia and Release of Ceramides and Platelet-Activating Factor

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### Introduction

Numerous epidemiological studies have suggested that ingestion of daily low concentrations of alcohol (e.g., 1-2 drinks) might be cardioprotective [1-3]. In contrast, high doses of ethanol are known to pose risks for atrial fibrillation (AF) and arrhythmias, supraventricular arrhythmias, angina, ischemic heart disease (IHD), hypertension, strokes and sudden cardiac death (SCD) [4-7]. Although numerous

errors in Mg metabolism poses serious risks for development of AF, hypertension, IHD, and SCD [22-37], whereas higher than normal Mg intake is found to be associated with decreased or ameliorated AF, myocardial infarctions, hypertension, strokes, and incidence of SCD [14,24-36]. It has been known for more than 40 years that chronic ingestion of alcoholic beverages results in body depletion of Mg [6,7].

### **Relationship of Mg to Cardiac Stability, Function, IHD and SCD: Importance of Ionized Mg**

Mg is co-factor for more than 500 enzymes, and is the second most abundant intracellular cation after potassium. It is vital in numerous physiological, cellular and biochemical reactions including carbohydrate, lipid, protein, DNA, and RNA metabolism, among other pathways [24,38]. Several epidemiologic studies in North America and Europe have shown that people consuming Western-type diets are low in Mg content (i.e., 30-65% of the RDA for Mg) [26,31-37,39]; most such diets in the USA show that 60-80% of Americans are consuming 185-235 mg/day of Mg [35,40]. In 1900, in contrast, most Americans were consuming 450-550 mg/day of Mg [35]. Low Mg content of drinking water, found in areas of soft-water and Mg-poor soil, is associated with high incidences of IHD, atherosclerosis, coronary vasospasm, hypertension, and SCD [23,26,31,34,41-47]. The myocardial level of Mg has consistently been observed to be lower in subjects dying from IHD and SCD in soft-water areas than those subjects living in hard-water areas [22-24,26,27,31,34,35]. More than 45 years ago, two of us demonstrated that  $Mg^{2+}$



alcohol-induced AF.

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