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REGULAR ARTICLE

The developmental perspective of the chronic alcoholism: Who's holding the burden of proof?

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Abstract Chronic alcoholism is a public health issue, and several theoretical frameworks have been proposed to explain its nature. The developmental approach to chronic alcoholism has a double contour, with neurobiological theories counting on several aspects of the deleterious effects exerted from ethanol over neural structures. Psychological and neurobiological theories are not intrinsically contradictory to each other. The importance of early experiences and the potential sensory clues leading to ethanol-self administration are integral parts of the developmental neurobiology of an alcoholic. The developmental theories need to consider any further the accumulative and deleterious effects of ethanol during the nervous system maturation.

Introduction

Large debates have ever since pounded medical personnel with regard to a precise and universal definition of the chronic alcoholism. The long history of alcohol consumption and abuse required strongly such a definition, and a clear cut-off in between the normal, permissible, acceptable or even advisable use of alcoholic beverages, and the abuse of these [1]. The abuse of alcoholic beverages terminologically has been synonymously exchangeable with alcoholism, or with alcohol dependence.

When considering different perspectives and approaches with regard to alcohol abuse, an important distinction must be made between the *primary alcoholism*, and the *secondary alcoholism*. Primary alcoholism (PA) is defined as a chronic disorder or a behavioral disturbance, and in both cases is characterized from an abnormal, excessive, recurrent and chronic pattern of consumption of alcoholic beverages, to the point of interfering adversely with the health of the individual, with

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his or her interpersonal relations, or with the means of living. From the pharmacological point of view, PA is equivalent to the alcohol dependence, as an independent occurrence; whereas secondary alcoholism presents itself within the setting of a major psychiatric disorder, which very probably will be a depressive one. Right from 1979 Schuckit made a clear distinction between PA and secondary alcoholism (SA), albeit he found no substantial variation as far as regarding any gender difference in PA [2,3].

Because the issue is not a simple one, and controversies are usual, several other definitions and classifications are applicable. Cloninger distinguished two types of alcoholism, with type I affecting both sexes, requiring the presence of both genetic and environmental factors, and commencing later in life; whereas type II affects mainly sons of male alcoholics, beginning earlier and usually associated with criminal behavior [4,5]. Von Knorring has replicated the Cloninger findings, with similar criteria proposed for dividing two subgroups of alcoholics, through advancing his studies at the level of intracellular enzymology [6]. However, overlapping between types I/II and PA/SA of alcoholics have been suggested, complicating any further the way of our thinking for alcoholism as a dichotomized condition [7]. Much simpler seems, therefore, a straightforward medical definition of alcoholism as a primary, chronic disease with genetic, psychosocial and environmental factors influencing its development [8].

The theoretical bulk of this individualism in modeling alcohol behavior probably started with Bandura's analysis, who considered drinking as a simple tension reduction model adapted from abusing drinkers [9]. This is still a uniform view of a much nuanced phenomenon; in fact, alcoholics do have an individual pattern of drinking. Such a pattern might be or not related with some kind of predilection toward a specific beverage, which is another important fact to be taken into account [10]. Probably aiming at the consumption of a specific beverage, as a usual fact, at the end of the day will be translated to the total amount of consumed ethanol. This oversimplifying perspective might be satisfactory inside a motivational frame, which when detecting the imputed factors for abuse, puts those factors under the control of the neurochemical reactivity of the abuser toward the alcohol [11]. Little is left for the contrary position, namely the long-term modulation of such reactivity in view of the continuous synaptic/neural presence of alcohol, which might be crucial during developmental stages.

Hypothesis

We hypothesize that exposure and consumption of ethanol, whichever the reason and the setting, strongly influences nervous system development, especially when the consumption occurs repeatedly and early in life. Ethanol induces short and long-term neural changes, that will lead to the intrinsic necessity of continuous consumption and thereafter, of alcohol craving. Thus, the availability of ethanol will highly increase risks for a potential abuse. The latter can be modulated from cultural and genetic influences, but growing up under the effect of ethanol, cannot be simplified as a behavioral model. As a strong and active principle, it induces neural changes that might be experimentally reproduced and monitored. Rearing an ethanol-exposed proband will be an ideal medium for differentiating such a growth process from the growth an ethanol-naïve being. This will prove the necessity for controlling the ethanol availability, and the importance of early aversive-oriented therapeutic interventions.

There is a consistent amount of psychological theories related with the chronic alcoholism, alcohol abuse and dependence. The majority of those embrace the developmental perspective. A considerable overlap is however seen between neurobiological explanations, and psychological points of view. In fact, theories need not to be intrinsically contradictory to each other, although substantial differences will make those diverge to a great extent.

Probably the most consistent difference betwixt neurobiological theories, and psychological ones, relies on the *primum movens* of the entire addictive process. Very sound psychological theories account for *psychological propensities* of the individual, associated with a high risk for alcoholism [12]. Nevertheless, these theories circumvent the direct role of the ethanol itself at the extreme position; or include it within the 'environmental' setting, without granting him the etiological role that deserves.

Evaluation of hypothesis

Wide experimental studies have proved that alcohol exercises some effect upon neuronal membranes, mainly through interacting with the lipids. This so-called "lipid theory" of alcohol action has been not entirely removed, but supplemented with further molecular details, some of which suggest the inhibition of a neuronal transmitter receptor, an ATP-gated ion channel, by certain alcohols [13]. The 'lipid theory' approximates the effects of alcohol to other pharmacologically effective drugs such as barbiturates and anesthetics, the majority of which are liposoluble [14]. Albeit several modifications to this theory are available, alcohol is believed to excessively fluidify cellular membranes and to increase the quantity of membranous lipids embedded in a liquid phase when compared with other lipids pertaining to the gel phase bilayer; such a change alters the activity of membranous proteins [15]. Succinctly, effects of ethanol upon cellular membrane are a decrease in the gel-to-fluid transition temperature, an increase of the membrane fluidity and disorder, and a further increase of the membrane permeability [16]. It is clear however that the effects of alcohol on the cellular membrane are not uniformly exerted in the lipid bilayer, but rather highly differentiated accordingly with the distribution of cholesterol and phospholipids within those membranes [17,18]. Interestingly enough some sources suggest a protective role of zinc against ethanol toxicity through a rigidification of the membrane, thus offsetting the fluidifying effect of the ethanol [19].

The remote dilemma of the ethanol being a stimulant, or a depressant, has been conclusively resolved, although a biphasic effect is demonstrated, with lower doses considered as stimulating for the nervous system [20]. In fact, during the acute consumption alcohol exerts its depressive effect upon the neural cell acting as an agonist of GABA-A receptors, through inhibition of induced ionic currents and calcium NMDA-regulated influx [21]. Such a situation is reversed during