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ScienceDirect
Psychiatry Research 157 (2008) 283–287
PSYCHIATRY RESEARCH
www.elsevier.com/locate/psychres

Brief report

Premeditated aggression is associated with serum cholesterol in abstinent drug and alcohol dependent men

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Received 17 April 2006; received in revised form 22 August 2006; accepted 3 February 2007

Abstract

Relationships between aggressive subtypes and lipids were explored in 18 adult males undergoing treatment for substance dependence. A positive association was observed between a measure of premeditated aggression and total cholesterol. This was in contrast to an inverse association between lower cholesterol and higher impulsivity and anxiety.

Keywords: Aggression; Anxiety; Barratt Impulsivity Scale; Impulsive aggression; Lipids

1. Introduction

Previously, associations between low serum cholesterol and negative affect, impulsivity and antisocial personality have been reported (Pozzi et al., 2003; Vevera et al., 2003; Papakostas et al., 2004; Monteleone et al., 2005). The Cholesterol–Serotonin Hypothesis put forth by Engelberg et al. (1992) proposed that cholesterol, as an integral component of neural membranes, influences both membrane structure and function, particularly that of the serotonergic (5HT) receptors. This notion was supported by a series of studies manipulating the cholesterol content of laboratory chow. Of interest here, agonistic behaviors increased with cholesterol decrease (Kaplan et al., 1991, 1994, 1996, 1997). Some *in vitro* experiments support this hypothesis. When cholesterol is experimentally removed from neural membranes, a concentration-dependent decrease occurs in agonist binding to 5HT receptors (Pucadyil and Chattopadhyay, 2004).

Reduced serotonergic functioning has been repeatedly associated with psychopathology including mood disorders, behavioral control problems and personality disorders. Some evidence suggests these behavioral patterns also co-occur with low serum cholesterol (Linnoila and Virkkunen, 1992; Richards et al., 2000; Chen et al., 2001; Papakostas et al., 2004).

The low cholesterol/serotonin literature is, however, replete with equivocal results (Rao et al., 1991; Gray et al., 1993; Waldstein et al., 1993; Hillbrand and Spitz, 1999). Both low and high cholesterol levels confer risk for dysfunctional behavior patterns. High cholesterol has been associated with hostility, anger and aggressiveness contributing to increased risk of cardiovascular disease (Wilson et al., 2000; Niaura et al., 2002). Low cholesterol has been associated with violent suicide

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0165-1781/$ - see front matter © 2007 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.psychres.2007.02.006

attempts (Vevera et al., 2003), aggression (Gesch et al., 2002) and anxiety (Papakostas et al., 2004). Both low and high cholesterol levels have been linked to an increased tendency to experience negative affect and/or engage in aggressive behavior (Virkkunen, 1983; Muller et al., 1995; Hillbrand and Spitz, 1999). However, no study has investigated specific subtypes of aggressive behavior and their respective associations with cholesterol.

Aggressive behavior has traditionally been classified into two distinct subtypes (Dodge and Coie, 1987; Vitiello et al., 1990; Barratt et al., 1997): 1) an emotionally charged, uncontrolled type (impulsive, affective, or reactive) or 2) a planned, controlled, unemotional type (premeditated, or proactive). This distinction is supported by animal and human research concluding notable physiological differences between impulsive and premeditated aggressions (Siegel and Pott, 1988; Adamec, 1990; Raine et al., 1998; Weinshenker and Siegel, 2002).

Qualitative measures of aggression are necessary to identify the specific subtypes of aggression associated with low cholesterol. Perhaps this equivocal literature stems from inadvertent measurement of different types of aggression, operating under different physiological mechanisms. Thus, the utility of distinguishing aggressive behavior may prove to direct future research. Taking these issues into consideration, the present study explored the relationship between these two aggressive subtypes and cholesterol.

2. Methods

2.1. Participants

Consecutive admissions for the treatment of drug and alcohol dependence at a free, faith-based, male-only and non-profit treatment center were eligible for participation in this study. The treatment center screened for DSM-IV TR (American Psychiatric Association, 2000) Axis I psychotic disorders, mental retardation and chronic medical complications requiring on-going care and/or medication regiments. Individuals who fell into these categories were referred to appropriate treatment centers (i.e. MHMR, VA hospitals). Individuals were required to submit negative urine drug tests to gain admission. None of the participants were court ordered to complete treatment and were able to terminate treatment at any time.

Participants signed an informed consent form for psychological assessment at admission. Individual treatment plans were based in part on the results of each assessment (data from the psychological assessment will not be reported here).

2.2. Measures

Impulsive/Premeditated Aggression Scales (IPAS; Stanford et al., 2003a,b). This self-report instrument was developed to assess the impulsive and premeditated characteristics associated with an individual's aggressive acts. Participants with a history of aggressive behavior were asked to consider their aggressive acts over the last 6 months. Fifteen items focus on impulsive–aggressive (IA) characteristics and 15 items on premeditated aggressive (PM) characteristics. The original IPAS study on a sample of self-referred aggressive men (Stanford et al., 2003a,b) indicated that the IA and PM scales were internally reliable [alpha = 0.82 (PM), alpha = 0.77 (IA)] and were not correlated with one another ($r = -0.02$). The IA scale correlated significantly higher than the PM scale with measures of anger and anger control whereas the PM scale correlated significantly higher than the IA scale on measures of physical aggression, hostility, and antisocial behavior.

Beck Anxiety Inventory (BAI; Beck et al., 1988). The BAI describes common symptoms of anxiety. Higher scores indicate greater anxiety. The BAI shows high internal consistency ($\alpha = 0.92$) and retest reliability over a 1-week period was r (81) = 0.75.

Barratt Impulsiveness Scale (BIS-11) (Patton et al., 1995). The BIS-11 assesses general impulsiveness. Higher scores indicate greater impulsiveness. Published reliability coefficients for the BIS-11 (Cronbach's α) range from 0.79 to 0.83 (Patton et al., 1995).

We also administered the *Drug Abuse Screening Test* (DAST) (Skinner, 1982) and the *Alcohol Use Disorders Identification Test* (AUDIT) (Babor et al., 1992).

2.3. Blood draw

Following the initial assessment, all individuals were offered the opportunity to have their cholesterol measured. Interested individuals signed a consent form and were instructed to fast (12 h) before the blood draw. Blood samples (5 ml) were drawn by a trained individual on weekdays between 6:00 and 6:30 am. Samples were immediately delivered to the contract laboratory and analyzed for total cholesterol, high-density lipoprotein (HDL), and low-density lipoprotein (LDL) being calculated in the laboratory.

2.4. Statistical analyses

All analyses were conducted using SPSS (Version 11.0). The probability of Type I error was set at 0.05. All variables were log-transformed to normalize data