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Testosterone as a biological marker in psychopathy and alcoholism

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Abstract

The aim of the present study was to clarify the relationships between testosterone and alcohol abuse, alcohol dependence and specific personality characteristics and behaviors in a forensic psychiatric population. Serum levels of total testosterone (TT), free testosterone (FT-DPC) and sex hormone-binding globulin (SHBG) were determined in 61 male subjects undergoing forensic psychiatric examinations. All subjects had been detoxified from drugs and alcohol during previous incarceration in jail or hospital. TT and FT-DPC were found to be highly correlated ($r = 0.63$, $P < 0.0001$). High concentrations of TT and SHBG were consistently related to type II alcoholism, but not pure alcohol dependence. TT and SHBG were also related to antisocial personality disorder. Furthermore, TT and SHBG were related to socially deviant behavior, reflected in factor 2 in the Psychopathy Checklist (PCL-R). In a multiple regression, FT-DPC was also clearly associated with the psychopathy-related scales of the Karolinska Scales of Personality (KSP) when age and signs of hepatic damage were kept under control. © 1998 Elsevier Science Ireland Ltd.

Keywords: Total testosterone; Free testosterone; Sexual hormone-binding globulin; Type II alcoholism; Antisocial personality disorder; Karolinska Scales of Personality; Psychopathy Checklist

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1. Introduction

Despite the vast literature on biological actions of testosterone, relatively little is known about the behavioral effects of androgens in man (Rubinow and Schmidt, 1996). In a study of alcoholic, violent criminals, Virkkunen et al. (1994) found that a high free testosterone level in the CSF was the best biological discriminator of violent offenders from non-violent, non-criminal control subjects. Also other studies of criminal populations (Kreuz and Rose, 1972; Ehrenkrantz et al., 1974; Rada et al., 1976; Mattsson et al., 1980; Dabbs Jr. et al., 1987, 1988) and of aggressive alcoholics (Lindman et al., 1987; Bergman and Brismar, 1994) have demonstrated a positive relationship between plasma or saliva testosterone levels and violence.

The search for biological markers of traits and behaviors in psychiatry has several aims, such as to understand pathophysiological mechanisms underlying disorders and behaviors and to find predictors of treatment outcome and crime relapse (Nurnberger Jr., 1992). However, there are so far few follow-up studies that might verify the predictive power of biological markers. A long-term follow-up study of young delinquents (Alm et al., 1996a,b) showed that the calculated risk for late criminality was significantly augmented in subjects with low activity of platelet monoamine oxidase (MAO) and high levels of serum triiodothyronine (T3). These results are in accord with the Buchsbaum theory of a biochemical high risk paradigm (Buchsbaum et al., 1976), in which low platelet MAO activity is associated with psychopathy-related personality traits of impulsiveness, sensation-seeking and aggressiveness (von Knorring et al., 1984; Zuckerman, 1984; Schalling et al., 1987; Stålenheim and von Knorring, 1996a). Other studies have demonstrated a direct association between elevated levels of T3 and criminality (Levander et al., 1987; Stålenheim et al., 1996), post-traumatic stress disorders (Mason et al., 1994), and alcoholism (Sudha et al., 1995). Whether testosterone can serve as a biological marker in a way that is similar to platelet MAO activity and serum T3 has not yet been completely investigated.

The Karolinska Scales of Personality (KSP) (Schalling and Edman, 1993) provide a possibility to relate psychopathy to biological parameters (Schalling et al., 1987). Psychopathy is, however, more often assessed by means of the Psychopathy Checklist — Revised (PCL-R) (Hare et al., 1990). It defines a syndrome including affective, interpersonal and behavioral symptoms which has been described by Cleckley (1964) and Hare (1980). The PCL-R has been widely used for scientific and prospective purposes in criminal and forensic systems and is the strongest single predictor of criminal relapse (Hart and Hare, 1989; Hare et al., 1990). A diagnosis in the DSM system (American Psychiatric Association, 1987) corresponding to, but not consistent with, psychopathy is antisocial personality disorder which puts a strong emphasis on asocial behavior. It is mainly factor 2 of the PCL-R that is associated with criminality and a diagnosis of antisocial personality disorder within the DSM system.

The studies on testosterone mentioned above investigated subjects that were selected for violence. A review by Archer (1991) gives information about the influence of testosterone on human aggression in general. Archer summarizes evidence of a weak, but positive, relationship between testosterone levels and overall hostility inventory scores, and a slightly higher value for ratings of measures of direct and indirect forms of hostility. Archer finds problems in comparing studies of testosterone and aggression, because the hormonal measures vary between studies with measures of free and/or total testosterone in plasma versus in the CSF, and, furthermore, the definition and assessment methods of aggression vary. Only a few studies have measured free testosterone in men (Dabbs Jr. et al., 1987; Lindman et al., 1987; Virkkunen et al., 1994). They indicate that there is a positive relationship between free testosterone and aggression, except for one study of a large unselected sample (Christiansen and Knussman, 1987).

An alternative hypothesis has been put forward by Zuckerman (1991), namely that levels of testosterone in normal young men are related to sensation seeking, sexual experiences and sociability, but not to impulsivity or aggression (Daitz-

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