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Energy substrate metabolism among habitually violent alcoholic offenders having antisocial personality disorder

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Abstract

A large proportion of violent offences in Western countries are attributable to antisocial personality disorder (APD). Several studies have shown abnormal lipid, carbohydrate and low cerebrospinal fluid (CSF) monoamine metabolite levels in habitually violent alcoholic offenders with APD, but it is not clear how these biochemical abnormalities are related to each other in this disorder. We aimed to study energy substrate metabolism among habitually violent offenders with APD. Insulin sensitivity (euglycemic insulin clamp), basal energy expenditure (indirect calorimetry), and CSF 5-hydroxyindoleacetic acid (5-HIAA) measurements were performed on 96 habitually violent antisocial male alcoholic offenders and on 40 normal male controls. Habitually violent, incarcerated offenders with APD had significantly lower non-oxidative glucose metabolism, basal glucagon, and free fatty acids when compared with normal controls, but glucose oxidation and CSF 5-HIAA did not differ markedly between these groups. The effect sizes for lower non-oxidative glucose metabolism among incarcerated and non-incarcerated APD subjects were 0.73 and 0.51, respectively, when compared with controls, indicating that this finding was not explained by incarceration. Habitually violent offenders with APD have markedly lower glucagon and non-oxidative glucose metabolism when compared with healthy controls, and these findings were more strongly associated with habitual violent offending than low CSF 5-HIAA levels, a well-established marker for impulsive violent behavior. Follow-up studies are needed to confirm if abnormal glucose and lipid metabolism can be used to predict violent offending over the course of the APD offender's life span.

Keywords: Antisocial personality disorder; Violence; Recidivism; Metabolism; Non-oxidative; Lipid; Glucose; Respiratory quotient; Serotonin

1. Introduction

A large proportion of violent offences in industrialized countries are attributable to antisocial personality disorder (APD) associated with early onset alcoholism (Cloninger, 1987). In Finland, for example, offenders with APD are responsible for up to 80% of the most

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severe habitual, impulsive violence (Tiihonen and Hakola, 1994; Eronen et al., 1996). In countries where more premeditated violence occurs, such as violence associated with organized crime, such figures can differ, but it is obvious that APD is the most important psychiatric diagnosis associated with severe violent crimes. A recent study showed that among 23,000 prisoners in Western countries about 47% had APD, although not all of them were habitually violent offenders (Fazel and Danesh, 2002). As a result, societies suffer from enormous financial losses due to conduct disorder and APD because of institutional and other costs (Brand and Price, 2000; Scott et al., 2001).

Low brain serotonin turnover as indicated by low CSF 5-HIAA (Virkkunen et al., 1989, 1996), low blood glucose nadir in the glucose tolerance test (Virkkunen et al., 1989), and low CSF MHPG (methoxy-hydroxy-phenylglycol) (Virkkunen et al., 1996) have been used as predictors of violent crimes among impulsive, habitually violent alcoholic offenders, who generally have APD. In addition, these offenders usually have early-onset alcoholism, known as type 2 alcoholism (Cloninger, 1987; Cloninger et al., 1981; Sigvardsson et al., 1996). Several studies suggest that habitually violent offenders often have low serum cholesterol levels (Virkkunen, 1979, 1983; Freedman et al., 1995; New et al., 1999; Buydens-Branchey et al., 2000; Golomb et al., 2000; Repo-Tiihonen et al., 2002), which suggests that they may also have alterations in their lipid metabolism. According to a recent large study of a community cohort (Golomb et al., 2000), low total cholesterol concentrations are associated with violence in the general population.

Brain imaging studies strongly suggest that impulsive aggressive behavior is associated with decreased glucose uptake in prefrontal cortex (Bufkin and Luttrell, 2005). Given that previous studies have indicated abnormalities in carbohydrate and lipid metabolism, as well as in brain glucose uptake among habitually violent offenders with APD, there is a need to clarify the underlying mechanisms behind abnormal glucose metabolism with standardized methods. We used the euglycemic insulin clamp method to study energy substrate metabolism among habitual violent offenders with APD and healthy control subjects.

2. Methods

2.1. Protocol

Written informed consent was obtained from all participants after the procedure had been fully explained, and procedures for appropriate protection of human rights were employed. The study was approved by the Ethical Committee of Helsinki University Central Hospital, Finland. Incarcerated subjects and the Ethical Committee had the option of contacting the Finnish prison representative.

2.2. Diagnostic and psychosocial assessment

All subjects, including controls, were assessed with the Structured Clinical Interview for DSM-III-R (SCID, axes I and II; American Psychiatric Association, 1987).

2.3. Subjects

We studied 69 habitually violent offenders who were consecutively admitted from prison to forensic psychiatric examination in a closed ward, and who fulfilled the DSM-III-R criteria for APD (P-APD) (Table 1). Two subjects were omitted because of their poor subsequent performance in intelligence test (WAIS IQ 60–70) and

Table 1
DSM-III-R lifetime diagnoses; P-APD are habitually violent male antisocial personality disorder offenders in prison; F-APDs are habitually violent male antisocial personality disorder offenders already free from prison; and Controls are age matched healthy males

	P-APD ($n=67$)	F-APD ($n=29$)	Controls ($n=40$)
AXIS I, substance dependence			
Alcohol	67	27	0
Sedative	8	6	0
Cannabis	8	4	0
Stimulant	5	3	0
Opioid or Cocaine	0	0	0
Polydrug	22	0	0
Other	6	4	0
AXIS I, nonsubstance			
Manic episode	3	0	0
Major depressive episode	24	3	0
Schizophrenia/schizo-phreniform	0	0	0
Brief reactive psychosis	6	0	0
Anxiety disorder	19	2	0
Alcohol hallucinosis	12	1	0
Drug use hallucinosis	3	1	0
AXIS II			
Cluster A disorder			
Paranoid	19	6	0
Other	2	2	0
Cluster B disorder			
Antisocial	67	29	0
Borderline	29	14	0
Other	2	1	0
Cluster C disorder			
Avoidant personality	11	3	0
Other	3	0	0
Personality disorder NOS	47	1	0