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ORIGINAL ARTICLE

Thimerosal exposure and increased risk for diagnosed tic disorder in the United States: a case-control study

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ABSTRACT

A hypothesis testing, case-control study evaluated automated medical records for exposure to organic-Hg from Thimerosal-containing hepatitis B vaccines (TM-HepB) administered at specific intervals in the first six-months-of-life among cases diagnosed with a tic disorder (TD) or cerebral degeneration (CD) (an outcome not biologically plausibly linked to TM exposure) in comparison to controls; both cases and controls were continuously enrolled from birth (born from 1991–2000) within the Vaccine Safety Datalink (VSD) database. TD cases were significantly more likely than controls to have received increased organic-Hg from TM-HepB administered within the first month-of-life (odds ratio (OR)=1.59, $p<0.00001$), first two-months-of-life (OR=1.59, $p<0.00001$), and first six-months-of-life (OR=2.97, $p<0.00001$). Male TD cases were significantly more likely than male controls to have received increased organic-Hg from TM-HepB administered within the first month-of-life (OR =1.65, $p<0.0001$), first two-months-of-life (OR=1.64, $p<0.0001$), and first six months-of-life (OR=2.47, $p<0.05$), where as female TD were significantly more likely than female controls to have received increased organic-Hg from TM-HepB administered within the first six-months-of-life (OR=4.97, $p<0.05$). By contrast, CD cases were no more likely than controls to have received increased organic-Hg exposure from TM-HepB administered at any period studied within the first six-months-of-life. Although routine childhood vaccination is considered an important public health tool to combat infectious diseases, the present study associates increasing organic-Hg exposure from TM-HepB and the subsequent risk of a TD diagnosis.

KEY WORDS: ethylmercury, merthiolate, thiomersal, tic, tourette, vaccine

Introduction

Tic disorder (TD) is a neurodevelopmental disorder characterized by repetitive, involuntary movements and vocalizations called tics (Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition; DSM-5, 2013; Roessner *et al.,* 2011). TD includes Tourette's syndrome, which is characterized by vocal as well as motor tics. Symptoms of TD typically begin in childhood, with the average onset between 3 and 9 years of age. Males are affected approximately three to four times more often than females. TD is considered a chronic condition that lasts a lifetime (National Institute of Neurological Disorders and Stroke, 2012). Psychopathology and co-morbidity occur in approximately 80–90% of clinical cohorts (Hariz *et al.,* 2010). Two of the most common co-occurring psychiatric conditions are: (1) attention deficit/hyperactivity disorder (ADHD), occurring in about half the cases (Roessner *et al.,* 2011; Freeman 2007) and (2) obsessive–compulsive disorder (OCD), also occurring in about half the cases (Roessner *et al.,* 2011). Other common co-morbid conditions are depression, anxiety, and behavioral disorders (Hariz *et al.,* 2010). Also reported are social difficulties and ritualistic behaviors such as counting, repeating, ordering, and arranging. Along with the dramatic rise in neurodevelopmental disorders in general in the last two decades, there has also been an increase in TD (Boyle *et al.,* 2011; Cubo 2012). Although TD was once considered rare, today TD is considered the most common movement disorder, with 0.2–46.3% of schoolchildren experiencing tics during their lifetime (Cubo, 2012). To date, there is no consensus on the causes or contributing factors related to this increase. Many questions regarding the potential

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