

# Hepatitis B transmission event in an English prison and the importance of immunization

Uma Viswanathan<sup>1</sup>, Amanda Beaumont<sup>1</sup>, Éamonn O'Moore<sup>2</sup>, Mary Ramsay<sup>3</sup>, Richard Tedder<sup>3</sup>, Samreen Ijaz<sup>3</sup>, Koye Balogun<sup>3</sup>, Patrick Kirwan<sup>3</sup>

<sup>1</sup>Public Health, NHS, Walsall WS2 7JL, UK

<sup>2</sup>Offender Health, Department of Health, London, UK

<sup>3</sup>Centre for Infections, Health Protection Agency, London, UK

Address correspondence to Patrick Kirwan, E-mail: kirwanpa@tcd.ie

## ABSTRACT

Immunization against hepatitis B virus (HBV) is recommended for all sentenced prisoners and all new entrants to prison in the UK. In November 2008, acute hepatitis B was confirmed serologically in a 27-year-old man (Case 1) who had been incarcerated since February 2007. The cell mate of Case 1, a 26-year-old man was an established HBV carrier. A home-made tattoo gun was confiscated from their prison cell. In the absence of other clearly identifiable risk behaviours, tattooing was deemed to be a possible route of HBV transmission. Transmission of hepatitis B in a prison setting is a real concern and this report highlights the importance of immunizing prisoners against hepatitis B and should encourage health professionals to communicate the benefits of immunization to inmates to increase vaccine uptake.

**Keywords** communicable diseases, epidemiology, prisons

## Introduction

Prisons were constructed to maximize public safety and not to minimize the transmission of disease or to effectively deliver health care. The risks of infectious disease transmission are higher in prisons than in the community<sup>1</sup> owing to a combination of factors including large dynamic populations living in close proximity in relatively overcrowded conditions; high degrees of social mixing during activities and engagement in high-risk behaviours<sup>2,3</sup> among a population with an elevated prevalence of infectious disease.<sup>4</sup> There are currently approximately 85 000 people in 140 prisons in England and Wales with an annual population turnover of approximately 200 000.<sup>5</sup>

In prison, hepatitis B virus (HBV) can be potentially transmitted through injecting drug use,<sup>6</sup> unprotected sexual intercourse and body piercing and tattooing.<sup>1</sup> An outbreak of acute symptomatic hepatitis B infection that affected eight male prisoners of HMP Glenochil (central Scotland) in 1993 alerted the authorities to random needle sharing among large numbers of injector inmates.<sup>6</sup> Prisons present a window of opportunity to provide health services and implement infectious disease preventative measures to a

population that otherwise may have poor or disrupted contact with health services.<sup>7</sup> The transient nature of prison populations means the benefits of hepatitis B vaccination extends beyond the prisoners themselves, and into the wider community.

Immunization against HBV is recommended for all sentenced prisoners and all new inmates entering prison in the UK.<sup>8</sup> Prison staff are also at risk of acquiring Hepatitis B and immunization is recommended for all prison service staff who are in regular contact with prisoners.<sup>8</sup>

In 1996, a HBV vaccination policy was implemented in England recommending that all new prisoners should be

Uma Viswanathan, Consultant in Public Health Medicine

Amanda Beaumont, Head of Infection Prevention and Control

Éamonn O'Moore, Consultant in Public Health (Health Protection)

Mary Ramsay, Consultant Epidemiologist

Richard Tedder, Consultant Medical Virologist

Samreen Ijaz, Clinical Scientist

Koye Balogun, Clinical Scientist

Patrick Kirwan, Scientific Co-ordinator

offered the hepatitis B vaccine.<sup>9</sup> A prison health performance and quality indicator for all prisons in England and Wales states that at least 80% of all prisoners should be immunized against Hepatitis B within 1 month of reception to prison.<sup>10</sup> In 2008, 41% of all prisoners in England and Wales were vaccinated against Hepatitis B within 1 month of reception (87 000 doses).<sup>11</sup> However, in the West Midlands the reported uptake of Hepatitis B for the same period was 19.7%. This report documents HBV transmission in a prison in the West Midlands where tattooing was a possible source of HBV infection. It summarizes the results of the subsequent investigation, which identified an additional case of HBV infection and underscores the need to strengthen harm reduction measures and implement hepatitis B immunization in prisons and correctional facilities.

## Case history

In November 2008, a 27-year-old man (Case 1) who had been incarcerated since February 2007 presented to the prison healthcare with jaundice and abnormal liver enzymes. Acute hepatitis B was confirmed serologically by the detection of levels of antibody to hepatitis B core antigen IgM sub-class (anti-HBc IgM)  $>200 \mu\text{g/ml}$ . An incident team consisting of the prison governor and healthcare team, the local Health Protection Unit (HPU) and the Primary Care Trust (PCT) was convened to investigate and manage the situation. The patient did not report any risk factors for infection during the 6 months preceding his illness.

The team decided to use a social network model of contact tracing to identify close contacts and determine risk factors for HBV infection, where the index case was asked to name people he spent a lot of time within the prison. This is in contradistinction to naming people he engaged in high-risk activities with as this information could be seen as stigmatizing and potentially incriminating in a prison environment.

Five contacts were identified by Case 1 and they were offered immunization against HBV and serologic testing for HBV infection. This demonstrated that three of the contacts were susceptible to HBV, one was immune, and the remaining contact, a 26-year-old man (Case 2) was also currently infected with HBV. Further serological testing confirmed his infection but showed that he was an established carrier whose serum contained hepatitis B e antigen and a high level of HBV DNA ( $>10^6$  IU/ml). The incident team was stepped up to an outbreak control team involving existing partners and the centre of infections was invited to support the management of the investigation.

In February 2008, Case 1 had moved from a local prison to a closed prison. The team established that Case 2 had been incarcerated in the same local prison as Case 1 since June 2007 and transferred to his current prison in June 2008. Cases 1 and 2 shared a cell in both prisons. Case 2 reported no history of symptoms compatible with acute hepatitis and was previously unaware of his chronic infection. A detailed interview of this case did not yield any further contacts. He reported no high-risk behaviour within prison, but disclosed a history of injecting drug use and multiple sexual partners before incarceration. Investigation of the HBV DNA from Cases 1 and 2 indicated that both were infected by genotype D viruses. Sequences of both hepatitis B surface antigen (HBsAg) and pre-core/core genes were identical at the nucleotide level making it very likely that transmission had occurred between the two inmates.

Both offenders denied having any sexual contact with each other. Tests for signs of drug use during the incarceration period were negative for both cases; these cell mates did not admit to having shared toothbrushes or razors.

However, a tattoo gun was confiscated by prison staff in the prison cell shared by both prisoners in September 2008. Case 1 had received two tattoos prior to incarceration. During a subsequent interview, he disclosed that he had planned to apply a tattoo, using the tattoo gun, on himself and his cellmate. In a further discussion, he admitted that he had used the tattoo gun on his cellmate but was unwilling to admit that he had used it on himself.

The tattoo gun was made from the motor of a stereo and two diabetic needles, which were obtained by Case 1 from an offender who had diabetes and who was located on the same prison wing. The investigating team came to the conclusion that Case 2 was the likely source of infection, and the tattoo gun was the probable route of transmission of HBV infection.

Both prisoners had refused hepatitis B immunization in both prisons when it was previously offered. Other preventative or harm reduction measures, such as condoms and disinfectant tablets, were available to inmates in this category C prison but uptake was low.

To prevent any further onward transmission, hepatitis B vaccine, with additional information about hepatitis B transmission, was offered to all inmates. The inmates infected with HBV were notified of their infection status and received a clinical assessment. The prison healthcare staff, PCT and the local HPU collaborated to implement strategies to improve the delivery of routine hepatitis B immunization at reception for all inmates and strengthen harm reduction measures in the category C prison. Since this investigation

began, vaccine uptake has improved in this prison establishment. Vaccine uptake for this prison was 68% in quarter 2 of 2009 (Prison Hepatitis B Vaccination Monitoring Programme). There was no formal immunization programme for prison staff at the time of the incident; however an immunization programme for staff was introduced in 2009 following the incident.

## Discussion

Transmission of hepatitis B in a prison setting is a real concern as evidenced by the transmission event cited in this case report. The report highlights the importance of immunizing prisoners against hepatitis B and should encourage health professionals to contemplate the way in which we communicate the benefits of immunization to inmates to increase vaccine uptake.

Circumstantial evidence has identified tattooing as a possible route of HBV transmission, although other transmission routes cannot be ruled out. Obtaining full disclosure of risk behaviours from prisoners is difficult as inmates may be apprehensive that they will be disciplined or closely monitored by the prison establishment. Uncertainty about honest disclosure of past illicit injecting drug use can confound interpretation of epidemiological data.<sup>12</sup> Case 2 had engaged in 'risky' behaviours prior to imprisonment, having multiple sex partners and injecting drug use, which are associated with HBV infection.<sup>13</sup> Besides the fact that both individuals denied injecting while in prison, no injecting equipment was found in their cell. In addition to this, Case 1 did not report a history of injecting drug usage even prior to his incarceration. Sex between men is also a risk factor for HBV infection<sup>14</sup> but both individuals denied such behaviour. In his initial interview, Case 1 was hesitant to disclose any risk behaviours. However, he later disclosed his intentions to tattoo himself and his cell mate, and finally admitted to tattooing his inmate but not himself. It is possible that Case 1 had tattooed himself but did not want to disclose this information. The tattoo gun was confiscated within the window period when transmission may have occurred. In addition to this, the tattooing equipment used, i.e. the diabetic needle, is hollow and may facilitate the transmission of hepatitis B. We therefore feel that tattooing is the likely transmission route. This suggests that tattooing activity in prison could have serious consequences, which merit further investigation.

Transmission of hepatitis B in prison has been previously documented and attributed to injecting drug use, needle sharing<sup>6,15</sup> and tattooing.<sup>1</sup> Tattoos and other percutaneous exposures (e.g. bites and abrasions) are common in

correctional facilities and have the potential to expose residents and correctional staff to blood and body fluids.<sup>16,17</sup> Tattooing in prison represents a unique combination of risk factors for blood-borne virus (BBV) transmission because it is illicitly performed by untrained operators with homemade, unsterile and frequently shared equipment. It also occurs in a setting where a high proportion of people are already infected with hepatitis C virus and other BBVs.<sup>4</sup> A study conducted in 1994 showed that 53% of prisoners in England and Wales had a tattoo and 11% of prisoners obtained their tattoos in prison.<sup>18</sup> Tattooing in prison is likely to be an important public health problem in England and Wales and the extent of tattooing in UK prisons and its consequences should be investigated.

The impact of the prison HBV immunization programmes extends benefits beyond prisoners to the wider community<sup>19</sup> and hence the Department of Health has commissioned the Health Protection Agency to monitor hepatitis B vaccine delivery in prisons. Prisons are recognized as important venues for delivering the hepatitis B vaccine to high-risk groups such as injecting drug users (IDUs).<sup>8</sup> Vaccine uptake has increased among IDUs from 50% in 2003 to 72% in 2008<sup>20</sup> and the incidence of acute cases of HBV has declined among IDUs with IDU accounting 37% of those with known risk exposures in 2003 compared with 10% in 2008.<sup>21</sup> Vaccine uptake was poor among new prison entrants in both the local and category C prison reported here and the category C prison was not participating in the Hepatitis B Vaccine Monitoring Programme at the time of the incident. This report demonstrates the significance of immunizing offenders and security staff against hepatitis B and it has shown that partnerships between prison health care, PCTs and HPUs can help to promote hepatitis B vaccine uptake in prison establishments.

Although both prisoners were offered the hepatitis B vaccine both refused, which emphasizes the need to raise awareness of BBVs among the prison population. The uptake of the hepatitis B vaccine at reception in both the local and closed prison was poor. We should therefore explore the way in which we offer immunization to prisoners. Offering immunization only on reception to prison may not be appropriate as individuals may be suffering stress and anxiety and are less able to process and retain new information. Prisoners may be less likely to refuse immunization if it is offered repeatedly after their reception to prison when they are more familiar with their environment. Targeted resources have been developed, by the British Liver Trust, the Department of Health and the Health Protection Agency, to raise awareness of BBVs among prisoners including a DVD (*Hepatitis C inside and out*) and health

promotion literature (*get out of jail BBV free and wise up to BBV's*) to inform prisoners of risks of transmission and harm minimization strategies in relation to BBVs.

The potential for infectious disease transmission in prisons has been well documented.<sup>22–24</sup> Infection control practices in prison have focused on increasing awareness of BBVs, access to condoms and disinfectant tablets.<sup>25</sup> Irrespective of the route of transmission, this report illustrates that inmates engage in tattooing activity with materials that may increase the risks of BBV transmission and therefore we need to investigate our approach to tackling tattooing in prisons.

Evidence suggests that the prison HBV vaccine programme has had a positive impact on vaccine uptake among IDUs. HBV immunization should be routinely offered to prisoners and the drive to increase vaccine coverage should not be the result of a HBV transmission event but rather an integral component of a prison's local immunization policy.

## Acknowledgements

We would like to thank Kate Clay, the prison healthcare manager, and her healthcare team for their help with this investigation.

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