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TR-02-97

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**TECHNICAL REPORT
1995**

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POLICE OCCUPATIONAL HEALTH REVIEW

Risk to police officers from biohazards encountered in police work

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SUMMARY. The risk of contracting infectious disease in the course of police work is reviewed. The specific focus is on Acquired Immune Deficiency Syndrome (AIDS), hepatitis and tuberculosis. A review of the relevant literature and an assessment of the biohazard risk specific to police work is provided. The risk of AIDS and hepatitis C is seen to be less than the risk of hepatitis B. For these blood borne diseases, universal precautions are recommended. The application of such precautions to policing is outlined. Immunisation against hepatitis B is recommended. Tuberculosis is seen as a possibly increasing risk. A programme of surveillance is recommended. A review of post-exposure management is provided.

Journal of Clinical Forensic Medicine (1995) 2, 111-116

The word biohazard refers to a hazard to health which is biological in nature. This may not be the best word to describe the biological health risks that police officers encounter in their daily work. If one interprets the term literally then the wrong doer with a weapon, or the suspect resisting arrest, could be termed a biohazard. In this review the word biohazard is used to refer to the health hazard of a police officer produced by a microorganism, or the product of a microorganism, encountered in the performance of duty.

The microorganism may be transmitted from a living person by a wide variety of mechanisms. The easiest form of transmission is by droplet, where an infectious agent is coughed, sneezed or breathed out by one individual, and the agent is inhaled by another. An example of such transmission is the common cold, the flu or, more significantly in terms of serious disease, tuberculosis.

A second common mechanism for the transmission of disease is through orofaecal contamination. In this case the microorganism gets on the hands of the infected person, possibly during activities of personal hygiene, and is transmitted to the hands of the recipient, either by direct contact or through an inanimate object, and thence to the mouth of the recipient. Diseases trans-

mitted by the orofaecal route may also be transmitted by contaminated water supplies and include hepatitis A, cholera and typhoid.

The third mechanism of disease transmission of interest to police officers is the transmission of blood borne pathogens. Blood borne pathogens are transmitted by contaminated blood. This area causes high levels of anxiety in the police community. Probably the most serious and contagious of these diseases is hepatitis B. Hepatitis C is also a cause for concern, but the disease that is causing most emotional distress is Acquired Immune Deficiency Syndrome (AIDS).

Articles, such as *Pathogenic microorganisms: law enforcement's silent enemies* with the subtitle 'Lethal Viruses, Silent Enemies',¹ appearing in journals of specialist fields appear designed to increase distress. This review will first consider Human Immunodeficiency Virus (HIV) and AIDS.

AIDS

AIDS is believed to be caused by HIV. There are a number of important features about this virus that are well known but not generally appreciated outside of the medical field. The most important feature of the disease is the fact that it is not very easy to acquire. The disease is not transmitted through touching, nor through shared toilets, it is not transmitted through shared water foun-

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tains or by insects. AIDS is not transmitted by droplet infection as defined above, nor is it transmitted by the orofaecal route, AIDS is transmitted through sexual intercourse and through blood. From the perspective of occupational risks in policing, the mechanism of interest is accidental contamination with blood.

The AIDS virus may have a very long incubation period. 10 years may pass before an individual infected with HIV becomes ill with AIDS. In practical terms, this means that many people will not know that they are infected. This is important information for the police officer exposed to blood in the course of duty because it underscores the need to treat **all** blood as if it were infected, regardless of the apparent state of health of the individual from whom the blood has come.

It is also important for a police officer to understand the length of time it takes for the blood test for HIV to become positive. It is not unknown for a police officer, after an encounter with a bleeding individual, to present themselves to the emergency room asking for an AIDS test.

It may take up to 9 months, after becoming infected by HIV, before the blood test becomes positive. A negative test under 9 months does not mean that the police officer has not become infected, and it is usual to require repeat testing every 3 months for 1 year before such reassurance can be given.

The virus itself, fortunately, is not very hardy and does not survive long outside the body. Having said this, however, it is important to understand that it can survive for significant periods of time in a dead body,² and therefore, presumably, in dead tissue. Therefore all human remains, either intact bodies or body parts, should be treated as infectious. This is important for police officers and, particularly, for forensic specialists.

Risks of infection

The actual risk of becoming HIV positive, if one is pricked with a needle that is contaminated with fresh blood, is less than 1%.^{3,4} This means that if a police officer sustains a needlestick injury, and if the needle is contaminated with HIV infected blood, then 99 times out of a 100 the police officer will not become infected. The risk of becoming infected by other means is even less. A police officer will not become infected from blood being splashed on intact skin. Infected blood that gets onto an open cut or wound might transmit infection but the risk is probably less than that from a needlestick. Certainly, of course, any open wounds, cracked broken skin or sores should be covered by waterproof dressings.

Saliva carries an even smaller risk of transmitting infection. Being spat upon by an AIDS infected individual is not likely to transmit HIV. The likelihood

increases if the person has blood in the mouth and spits saliva that contains blood, but even then the saliva would have to land on broken skin or in the eye or mouth and, in that case, the risk is still probably much lower than a needlestick. The same is true for a bite. The risk remains quite low but is dramatically increased if the infected person doing the biting has blood in the mouth.

It is important to keep the level of risk in perspective. The risk of getting AIDS in the workplace is low, but the fear of getting the disease can be paralyzing.⁵

What is the risk of coming into contact with AIDS infected blood in the course of police work? A recent study in Denver⁶ showed that a surprisingly high number of individuals whose blood came in contact with police officers were HIV positive. A similar result was obtained in a more recent study in London, UK.⁷ In the Denver study the percentage of HIV positive individuals was a higher percentage than the general population but it was still only 15.6%. In the UK study over a quarter of individuals were identified as belonging to higher risk groups. The overall risk of exposure to HIV infected blood in this study was 0.1 per 10 000 person days of work, or 1 per 100 000 person days of work. Clearly not a high exposure rate. What is more comforting was the finding that **none** of the officers exposed seroconverted to HIV positivity. That is in line with expectations based on the risks quoted above.

There are, however, reports of police officers said to have developed AIDS from their work. In May 1993 the Federal Bureau of Investigation (FBI)¹ reported that there had been 7 cases of police officers contracting AIDS through their work over 10 years. Firstly, this is a surprisingly small number of cases over a 10-year period in the entire US. Secondly, there was some controversy about whether these cases were all to be considered job related? Examining the cases one by one may be instructive. In one case, no details are provided. In one case, the officer was involved in a motorcycle accident and was transfused with tainted blood while in hospital. In one case an officer with open sores on his hands fingerprinted two prostitutes who were bleeding profusely. This seems to be a preventable accident. Approaches to prevention will be discussed. Two cases were needlestick injuries. One case involved the handling of blood soaked evidence with apparently ungloved hands. This may be avoided. The last case involved an officer becoming 'covered in blood' during a rescue attempt. In this last case there seems to have been no omission of practical protection. In summary, there seems to have been one case of unavoidable HIV conversion among all the police officers in the entire US over 10 years.

Even if the FBI only found a tenth of cases, the risk of getting HIV seems considerably lower than the risk,

to American police officers, of death from assault. Indeed, during 1991 7 officers were killed in the line of duty, 5 feloniously.⁸ This was in 1 year, as compared to the 7 possible cases of HIV, 5 of which may have been preventable, over 10 years.

Prevention

Since there is no cure for AIDS, and no vaccine applicable to the disease, the best defence a police officer has against this infection is prevention. In the context of occupational exposure in police work, there are a number of simple measures that must be adopted. Some of these are outlined elsewhere⁹ and will be summarised here.

Latex gloves should be worn, whenever possible, any time that contact with blood or blood contaminated evidence is foreseen. This is especially important if there are any skin breaks on the hands.

Any open sores or cuts that a police officer has sustained must be kept covered with an occlusive dressing while on duty. Needles should be handled with extreme care and needles, or syringes, must be transported in a sharps container that can effectively prevent the needle from penetrating through the container. Sharp edges must be avoided and sharp exhibits handled with extreme care, particularly when contaminated with fresh blood. Where possible, such exhibits should be picked up with instruments rather than hands.

Latex gloves and a barrier mask should be used if resuscitation attempts are undertaken and latex gloves must always be worn when rendering first aid. It is important to bear in mind, however, that the risk of becoming infected with HIV from resuscitation procedures is very remote.

There are also some traditional techniques in policing that must be avoided. 'Pat down' searches are dangerous to the police officer. There are numerous cases of police officers suffering needlestick injuries from this type of procedure. Also dangerous is searching containers, bags or even pockets by rummaging through them. All containers must be emptied onto a flat surface and their contents examined in plain view. Similarly, sweep searches under car seats and between the seat and the back of couches and chairs must not be performed. It is preferable to dismantle furniture rather than have police officers putting their hands blindly in places where needles and syringes may be hidden. Latex gloves do not protect from needlestick injury.

Eye protection and face masks may be appropriate in circumstances where the spatter of body fluid such as saliva or blood can reasonably be foreseen. There must be a system in place for the safe disposal of personal

protective equipment. There must be a facility for police officers to wash their hands. Prepackaged washing solutions for cleaning skin should be provided for patrol cars.

What should be done for a police officer who, in spite of all the best precautions, suffers a percutaneous exposure to HIV? Certainly the first step is to try to determine whether the source of the exposure is truly HIV positive. This is not always possible. Secondly, it is imperative that the police officer be educated about the true risks of infection. Many non medical personnel assume that the risk is much higher than it really is. Thirdly, the police officer must be informed of the need to retest for at least 6 months and possibly 9 months in order to ensure that the officer has not been infected. Steps must be taken to prevent potential infection of the officer's sexual partner for at least 6 months. Lastly, the question of prophylaxis with zidovudine must be discussed. In a recent review of management of occupational exposures¹⁰ it was concluded that prophylactic zidovudine should not be considered the standard of care. Nevertheless, in spite of the potential risks, this medication is increasingly used for post-exposure prophylaxis in North America.

In summary, the risk of contracting AIDS or HIV from police work is small. The effect of anxiety over the possibility may be very great. The risk does exist, and it is conceivable that situations can arise where the risk may be of sufficient magnitude that some anxiety is appropriate. The best way to reduce both the risk and the anxiety surrounding the risk, is to ensure that police officers are aware of work practices that carry some potential for risk and work practices that do not. In addition, techniques to minimise infection risk using modified techniques and personal protective equipment are important. Both education and appropriate equipment are essential.

HEPATITIS B

While hepatitis B does not seem to engender the same level of fear that AIDS does among police officers, it probably represents a greater risk than HIV. Hepatitis B is also a blood borne disease, it may be fatal, and it is much more contagious than HIV. The risk of contracting hepatitis B from contact with hepatitis B infected blood is dramatically higher than the risk of contracting HIV from HIV infected blood. There is more virus in the hepatitis infected blood and the virus is more hardy.^{11,12}

Hepatitis B virus (HBV) may be present in blood in concentrations of up to a million viral particles per ml

whereas HIV is usually found in concentrations of 10–15 viral particles per ml.^{11,12} Of course, it only takes one virus to cause infection but the probability of becoming infected is related to the concentration of virus in the infected blood.

The incubation period for hepatitis B is variable and ranges from a few weeks to several months. The disease itself may vary from a mild flu-like illness with asymptomatic mild elevations of transaminases, to a full blown hepatitis with severe systemic symptoms and obvious jaundice. Most patients will recover but some die, and about 5–10% may become chronic carriers of the disease.

While there are numerous case reports of occupationally acquired hepatitis among law enforcement personnel the quantitative risk is not dramatically high when compared to other occupations.^{13–16} Nevertheless, it is a real risk and must be seen as a possible occupational disease. The preventative approach to HIV infection that was outlined in the previous section applies equally well to the blood borne disease of hepatitis B. Given the fact that hepatitis B is so much more contagious than AIDS, and more likely to cause disease or death in the short-term, this disease ought to be an even more compelling reason for following universal precautions.

There is an additional protection against hepatitis B that is not present for AIDS. There is an effective vaccine against hepatitis B (HBV). All police officers, regardless of whether they are involved in forensic or general duty policing, should be vaccinated against hepatitis B. The lack of a hepatitis B vaccination programme, supported by the employer, is difficult to defend. Hepatitis B vaccination will save lives, reduce illness and significantly contribute to effective management of liability risk.

The need for a programme of testing after vaccination to ensure that the police officer has mounted an immune response and developed antibodies against the virus is less clear. The 'take rate' of currently available vaccines is very high. At this time it may be reasonable to verify only those police officers who fit into one or more of several subgroups shown to have a lower immune response rate,¹⁷ notably officers who are over 40 years, overweight or diabetic.

The approach to individuals who have suffered percutaneous exposure has been recently reviewed?¹⁰ Exposed police officers not known to be immune to HBV should be tested for antibody to hepatitis B surface antigen (HBsAg). An antibody titre of 10 mIU per ml confers immunity. Vaccinated persons exposed to HBV who have not been tested in the past 24 months should be tested for immunity. Vaccine recipients with low or undetectable titres of anti-HBsAg at the time of occu-

pational exposure either did not respond to the vaccine or suffered a waning of immunity over time. Regardless of which group the police officer fits into, the response is the same and should include the administration of HBV hyperimmune globulin as well as recombinant HBV vaccine. These may be administered simultaneously, but they should be injected at different sites with separate needles and syringes.¹⁰

In summary, the risk of contracting hepatitis B from police work is much higher than the risk of contracting HIV or AIDS. Compared to other occupations it is still not a very large risk. Nevertheless, numerous documented cases do exist of hepatitis B, occupational in origin, occurring in law enforcement personnel. Precautions and procedures outlined for HIV apply to the prevention of hepatitis B infection. In addition, there exists an effective vaccine against hepatitis B. A programme to ensure vaccination of police officers is considered to be necessary for all police forces.

HEPATITIS C

This disease accounts for the vast majority of what used to be called 'post transfusion hepatitis' or 'non-A non-B hepatitis'. The disease is correctly classified as blood borne in that transfusion of blood and blood products represents a major form of transmission. There are, however, millions of people infected with this virus who have no known parenteral exposure to blood or sexual exposure to known carriers.¹⁸ Indeed, while sexual transmission can occur it appears not to be a particularly efficient means of transmission? In Europe the groups most at risk seem to be drug addicts, haemophiliacs, haemodialysis patients and people with cirrhosis or hepatocellular carcinoma.¹⁹ The latter association undoubtedly reflects the virus' propensity to cause serious conditions including chronic hepatitis, cirrhosis and hepatocellular carcinoma.²⁰

Police officers are likely to encounter infected individuals with hepatitis C.²¹ The risk to police officers from blood and body fluid exposure may not be quite as high as the risk for hepatitis B. There are conflicting observations about the increased risk among health care workers,^{10,22,23} the observation that health care workers seem to have a similar prevalence as the general population²² suggests that the efficiency of the transmission in a health care environment may be low. Nevertheless, there is no doubt that hepatitis C can be transmitted through accidental needlestick injury. The risk is probably intermediate between the low risk of HIV transmission and the relatively high risk of hepatitis B transmission.¹⁸ Due to the high risk of long term sequelae, the conse-

quences are potentially severe. Given the high proportion of individuals who contract this disease with demonstrable risk factors, it will be impossible to develop protective protocol until more is known about all the mechanisms of transmissions. Nevertheless, since transmission by needlestick and bite is documented all the techniques described above, for prevention of HIV infection, are applicable in the prevention of this condition. It is not known whether immune globulin preparations, given post exposure, will reduce the risk of seroconversion.¹⁰ Similarly, while interferon α is useful in treatment, its role in post-exposure prophylaxis is uncertain at this time.¹⁰

TUBERCULOSIS

Unlike AIDS, tuberculosis (TB) has been around for a long time and there is reason to believe that the rate of occupationally acquired TB is rapidly increasing.²⁴ The long steady decline in the number of cases reported in Canada and the US lead the US Public Health Service to aim towards eliminating the disease by the year 2010. However, between the years 1985-91 there were 39000 more cases than would have been expected had that decline continued.²⁵ At least 15% of the reported cases were classified as multidrug resistant (MDR). Major outbreaks of multi-drug resistant-TB have affected prisons, homeless shelters, nursing homes and hospitals.

The former two groups are likely to come into contact with police. Intravenous drug users are also likely to come into contact with police, they are also at high-risk for HIV disease, and AIDS sufferers are 500 times more likely to get TB than the immune competent.²⁵ In Canada, TB is endemic among much of the aboriginal population. Police officers who work closely with aboriginal people, and particularly who work on reservations may be exposed.

TB is caused by mycobacterium tuberculosis, and is an infectious disease that most frequently, but not invariably, affects the lungs. Transmission is by droplet, primarily coughing. The bacterium is most likely to survive in the apex of the lungs because it thrives on a high oxygen level and this part of the lung has the highest concentration of oxygen.

Frequently the immune system stops the infection at that point. In this case the recipient does not become symptomatic but the TB skin test converts from negative to positive. The risk of reactivation is greatest in the first year after conversion of the skin test but can occur at anytime. The risk of reactivation can be dramatically reduced by treatment with isoniazid (INH), and most

people with a new, or newly discovered, positive TB skin test should be treated with INH daily for 6 months.

Reactivation TB is the commonest form of clinically important TB. Primary TB can also present as a major illness but this is less common. Since the clinical presentations of disease are beyond the scope of this text we will confine ourselves to noting that the usual presentation of reactivation TB is as fever, weight loss, night sweats and cough. It is the cough that transmits the disease to others and so the cycle is complete.

TB is usually treatable with medication. Even the multi-drug resistant strains can frequently be managed by second and third line drugs in immune competent patients. However, treatment will only be given when the condition is recognised. Recognition is much more likely when the physician is aware that this disease is a potential occupational hazard and when screening is carried out. For this reason, annual TB skin testing is recommended for police officers.

In summary, tuberculosis is a disease that was once thought to be under control. Recent evidence suggests that the disease may not be as fully controlled as previously thought. The population groups where TB is reappearing are groups that have an increased probability of encounters with police. In addition TB is, and has been, endemic among aboriginal peoples in Canada, so police officers who work with this segment of the population may also be at an increased risk of exposure. For these reasons, skin test screening for TB is recommended among police officers in order that prophylactic INH may be prescribed as required and vigilance is warranted in order that treatment may be instituted promptly where necessary.

FUTURE DIRECTIONS

Ten years ago the question of AIDS as an occupational risk in police work simply would not have arisen. Similarly, the idea of exposure to TB as a risk in police work would have been considered improbable. In neither case is it likely that today's biohazard risks could reasonably have been foreseen. It therefore seems pointless to speculate about what may arise in the future.

What we can predict is the continued development of vaccines and preventative measures. It will be necessary for police forces to remain abreast of such developments. For example, vaccine against hepatitis A has recently been released in Canada. While this is not a country where hepatitis A is endemic, there have been outbreaks of this disease. Police divers must sometimes search areas close to sewage outlets. It may be necessary to immunise these divers against hepatitis A.

It is unclear how long the protection derived from this immunisation lasts and, therefore, the appropriate frequency for revaccination is presently not clear. Similarly it is uncertain whether individuals vaccinated against hepatitis B require serologic testing to ensure that the vaccine has produced a protective level of antibody. Finally, it is clear that if a safe and effective vaccine against HIV is developed the police population would probably benefit from any such protection.

The Royal Canadian Mounted Police has initiated prospective monitoring of causes of sick leave. It will be possible, in the future, to determine whether there is any identifiable infectious disease, not previously recognised, which occurs among police personnel at a higher rate than in the general population.

References

- Bigbee D. Pathogenic microorganisms - law enforcements' silent enemies. *FBI Law Enforcement Bulletin* May, 1993; 1-5
- Douceron H, Desforges L, Gherardi R, Sobel A, Chariot P. *Forensic Science International* 1993; 60: 61-66
- Marcus R. CDC cooperative needlestick surveillance group: surveillance of health care workers exposed to blood from patients with immunodeficiency virus *N Engl J Med* 1988; 3 19: 1118
- Centres for disease control update - acquired immunodeficiency virus infection among health care workers. *Morbidity and Mortality Weekly Report* 1988; 37: 229-237
- Burgess A W, Jacobsen B S, Baker T, Thompson J B, Grant C. Workplace fear of Acquired Immunodeficiency Syndrome. *Journal of Emergency Nursing* 1992; 18(3): 233-238
- Hoffman R E, Henderson N, O'Keefe IS, Wood R. Occupational exposure to Human Immunodeficiency Virus (HIV) infected blood in Denver Colorado police officers. *Am J Epidemiol* 1994; 139 (9): 910-917
- Payne-James J J, Keys D W, Dean P J. Prevalence of HIV risk factors for individual examined in clinical forensic medicine. *Journal of Clinical Forensic Medicine* 1994; 1 (2): 93-96
- Missouri Law Enforcement and Assault Report 199 1. Missouri State Highway Patrol Statistical Analysis Center. Jefferson: 1991
- Brothers J. The OSHA bloodborne pathogen standard for law enforcement. *Law and Order*, March 1993; 43-47
- Gerberding J L. Management of occupational exposure to blood borne viruses. *N Engl J Med* 1995; 332 (7): 444-451
- Almeida J D. Individual morphological variations seen in Australian antigen positive sera. *Am J Dis Child* 1972; 123: 303-309
- Levy J A. Human Immunodeficiency Virus and the pathogenesis of AIDS. *Journal of the American Medical Association* 1989; 26 1: 2997-3006
- Evans M R, Henderson D K, Bennett J E. Potential for laboratory exposures to biohazardous agents found in blood. *Am J Pub Health* 1990; 80 (4) 423-427
- Bandaranayake D R, Salmond C E, Tobias M I. Occupational risk of hepatitis for police and customs personnel. *Am J Epidemiol* 1991; 134 (12): 1447-1453
- Welch J, Tilzey A J, Bertrand J, Bott E C, Banatvala J E. Risk to Metropolitan police officers from exposure to hepatitis B. *BMJ* 1988; 297: 6652-6653
- Morgan-Capner P, Hudson P. Hepatitis B in Lancashire police officers. *Epidemiol Infect* 1988; 100: 145-15 1
- Roome A J, Walsh S J, Cartter M J, Hadler J L. *Journal of the American Medical Association* 1993; 270 (24): 293 1-2934
- Sherlock S. *Disease-a-Month* 1994; XL (3): 119-195
- Degos F. Epidemiology of hepatitis C virus. *Europe Federation of European Microbiological Societies Microbiology Reviews* 1994; 14: 267-272
- Esumi M, Shikata T. Hepatitis C virus and liver disease. *Pathology International* 1994; 44: 8 5-95.
- Li L, Zhang X, Constantine N T, Smialek J E. Seroprevalence of parenterally transmitted viruses (HIV- 1, HBV, HCV, HTLV I/II) in forensic autopsy cases. *Journal of Forensic Sciences* 1993; 38 (5): 1075-1083
- Thomas D L, Factor S H, Kelen G D, Washington A S, Taylor E, Quinn T C. Viral hepatitis in health care personnel at the Johns Hopkins Hospital: the eroprevalence of and risk factors for hepatitis B virus and hepatitis C virus. *Arch Int Med* 1993; 153: 1705-1712
- Dana F, Becherer P R, Bacon B R. Hepatitis C virus: what recent studies can tell us. *Postgraduate Medicine* 1994; 95 (6): 121-130
- Bowden K M, McDiarmid M A. Occupationally acquired tuberculosis: what's known. *J Occup Med* 1994; 36 (3)
- Gostin L O. Overlapping epidemics TB and HIV. *PAACNOTES* 1993; 5 (3): 116-118