Chapter 9

Infectious Diseases

The Role of the Forensic Physician

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1. Introduction

Infections have plagued doctors for centuries, in both the diagnosis of the specific diseases and the identification and subsequent management of the causative agents. There is a constant need for information as new organisms emerge, existing ones develop resistance to current drugs or vaccines, and changes in epidemiology and prevalence occur. In the 21st century, obtaining this information has never been more important. Population migration and the relatively low cost of flying means that unfamiliar infectious diseases may be brought into industrialized countries. An example of this was an outbreak of severe acute respiratory syndrome (SARS), which was first recognized in 2003. Despite modern technology and a huge input of money, it took months for the agent to be identified, a diagnostic test to be produced, and a strategy for disease reporting and isolation to be established. There is no doubt that other new and fascinating diseases will continue to emerge.

For the forensic physician, dealing with infections presents two main problems. The first problem is managing detainees or police personnel who have contracted a disease and may be infectious or unwell. The second problem is handling assault victims, including police officers, who have potentially been exposed to an infectious disease. The latter can be distressing for those involved, compounded, in part, from an inconsistency of management guidelines, if indeed they exist.

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With the advent of human rights legislation, increasing pressure is being placed on doctors regarding consent and confidentiality of the detainee. Therefore, it is prudent to preempt such situations before the consultation begins by obtaining either written or verbal consent from the detainee to allow certain pieces of information to be disclosed. If the detainee does not agree, then the doctor must decide whether withholding relevant details will endanger the lives or health of those working within custody or others with whom they may have had close contact (whether or not deliberate). Consent and confidentiality issues are discussed in detail in Chapter 2.

Adopting a universal approach with all detainees will decrease the risk to staff of acquiring such diseases and will help to stop unnecessary overreaction and unjustified disclosure of sensitive information. For violent or sexual assault victims, a more open-minded approach is needed (*see* also Chapter 3). If the assailant is known, then it may be possible to make an informed assessment of the risk of certain diseases by ascertaining his or her lifestyle. However, if the assailant is unknown, then it is wise to assume the worst. This chapter highlights the most common infections encountered by the forensic physician. It dispels "urban myths" and provides a sensible approach for achieving effective management.

2. *Universal Precautions*

The risk of exposure to infections, particularly blood-borne viruses (BBVs), can be minimized by adopting measures that are considered good practice in the United Kingdom, the United States, and Australia *(1–3)*.

Forensic physicians or other health care professionals should wash their hands before and after contact with each detainee or victim. Police officers should be encouraged to wash their hands after exposure to body fluids or excreta. All staff should wear gloves when exposure to body fluids, mucous membranes, or nonintact skin is likely. Gloves should also be worn when cleaning up body fluids or handling clinical waste, including contaminated laundry. Single-use gloves should only be used and must conform to the requirements of European Standard 455 or equivalent *(1–3)*. A synthetic alternative conforming to the same standards should also be available for those who are allergic to latex.

All staff should cover any fresh wounds (<24 hours old), open skin lesions, or breaks in exposed skin with a waterproof dressing. Gloves cannot prevent percutaneous injury but may reduce the chance of acquiring a blood-borne viral infection by limiting the volume of blood inoculated. Gloves should only be worn when taking blood, providing this does not reduce manual dexterity and therefore increase the risk of accidental percutaneous injury.

Ideally, a designated person should be allocated to ensure that the clinical room is kept clean and that Sharps containers and clinical waste bags are removed regularly. Clinical waste must be disposed of in hazard bags and should never be overfilled. After use, the clinical waste should be double-bagged and sealed with hazard tape. The bags should be placed in a designated waste disposal (preferably outside the building) and removed by a professional company.

When cells are contaminated with body fluids, a professional cleaning company should be called to attend as soon as possible. Until such time, the cell should be deemed "out of action."

2.1. Sharps Awareness

There is a legal requirement in the United Kingdom under the Environmental Protection Act (1990) and the Control of Substances Hazardous to Health Regulations 1994 to dispose of sharps in an approved container. In the United States, the Division of Health Care Quality Promotion on the Centers for Disease Control and Prevention (CDC) Web site provides similar guidance. In custody, where Sharps containers are transported off site, they must be of an approved type. In the United Kingdom, such a requirement is contained within the Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996. These measures help to minimize the risk of accidental injury. Further precautions include wearing gloves when handling Sharps and never bending, breaking, or resheathing needles before disposal. Sharps bins should never be overfilled, left on the floor, or placed above the eye level of the smallest member of staff.

2.2. Contaminated Bedding

Any bedding that is visibly stained with body fluids should be handled with gloves. There are only three acceptable ways of dealing with contaminated bedding:

1. Laundering with a detergent at a minimum temperature of 71°C (160° F) or at a lower temperature (22–50°C) with water containing detergent and 50–150 ppm of chlorine bleach.
2. Dry cleaning at elevated temperatures/dry cleaning at cold temperatures followed by steam pressing.
3. Incineration.

It is not considered acceptable practice for detainees to share bedding.

2.3. Other Measures

It is not necessary for staff to wear masks or protective eyewear in the custodial setting because the risk of infection is low. However, single-use eye-

wash should be available in the clinical room or contained in other first aid kits located within the police station in case of accidental exposure. Contact lenses should be removed before eye washing.

3. Formulation of Guidelines

An example of good practice is contained within the UK Health Department's 1998 document *(1)* which states: "that it is the responsibility of Health Authorities, Health Boards and NHS Trusts to create their own local guidelines to prevent the spread of BBVs in the health care setting." Such guidelines may not exist in other work places. If this is the case, then they should be formulated as soon as possible. Forensic physicians working for the Metropolitan Police in London can refer to the "Good Practice Guidelines" *(4)*. It is also prudent to prearrange a system of referral with the nearest hospital that has an accident and emergency department, a genitourinary department, and access to a specialist. The latter may be a consultant in virology, microbiology, infectious diseases, or genitourinary medicine. Similar guidance in the United States can be found in the *Guideline for Infection Control in Health Care Personnel (5)*.

Most exposures to staff usually result from a failure to follow accepted practice; however, accidents can happen no matter how much care is taken. All forensic physicians and other health care professionals working in custody should understand what constitutes a risk. This involves taking a detailed history of the incident, including the type of exposure, the body fluids involved, and when the incident occurred.

This information can help to allay unnecessary anxiety from the outset and ensures that the victim is referred, if appropriate, to the designated hospital at the earliest opportunity. Knowledge of precise treatment protocols is not required, but it is helpful to be able to explain to the victim what to expect. For example, he or she will be asked to provide a voluntary baseline blood sample for storage and numerous follow-up samples for testing depending on the nature of the exposure. This is especially relevant for hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Occasionally, it may be necessary for samples to be obtained as long as 6 mo after the incident.

Sexual assault victims should ideally be referred to specialist centers, if available. A police station should be used only as a last resort because the environment is often hostile and there is no ready access to the necessary treatment and ongoing management (*see* Chapter 3).

4. Routes of Transmission

Organisms may use more than one route of transmission. For ease of understanding, the infections discussed in this chapter are classified accord-

ing to their primary route (i.e., transmission through blood and body fluids, through contact with lesions or organisms, through the respiratory route, or through the fecal–oral route).

5. Transmission Through Blood and Body Fluids

The BBVs that present the most cross-infection hazard to staff or victims are those associated with persistent viral replication and viremia. These include HBV, HCV, hepatitis D virus (HDV), and HIV.

In general, risks of transmission of BBVs arise from the possible exposure to blood or other body fluids. The degree of risk varies with the virus concerned and is discussed under the relevant sections. Figure 1 illustrates the immediate management after a percutaneous injury, mucocutaneous exposure, or exposure through contamination of fresh cuts or breaks in the skin.

5.1. Hepatitis B

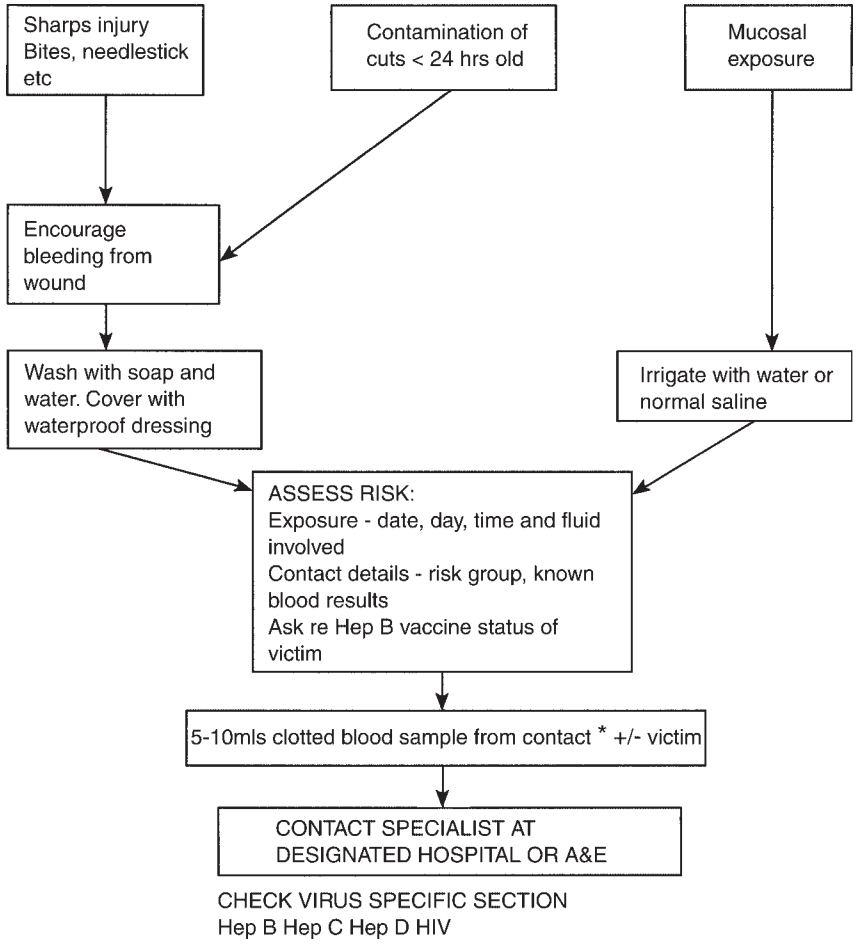
5.1.1. Epidemiology and Prevalence

HBV is endemic throughout the world, with populations showing a varying degree of prevalence. Approximately two thousand million people have been infected with HBV, with more than 350 million having chronic infection. Worldwide, HBV kills about 1 million people each year. With the development of a safe and effective vaccine in 1982, the World Health Organization (WHO) recommended that HBV vaccine should be incorporated into national immunization programs by 1995 in those countries with a chronic infection rate of 8% or higher, and into all countries by 1997. Although 135 countries had achieved this goal by the end of 2001, the poorest countries—often the ones with the highest prevalence—have been unable to afford it. In particular these include China, the Indian subcontinent, and Sub-Saharan Africa.

People in the early stages of infection or with chronic carrier status (defined by persistence of hepatitis B surface antigen [HBsAg] beyond 6 mo) can transmit infection. In the United Kindgom, the overall prevalence of chronic HBV is approx 0.2–0.3% *(6,7)*. A detailed breakdown is shown in Table 1.

5.1.2. Symptoms and Complications

The incubation period is approx 6 weeks to 6 months. As the name suggests, the virus primarily affects the liver. Typical symptoms include malaise, anorexia, nausea, mild fever, and abdominal discomfort and may last from 2 days to 3 weeks before the insidious onset of jaundice. Joint pain and skin rashes may also occur as a result of immune complex formation. Infections in the newborn are usually asymptomatic.



*In the United Kingdom, written consent from the contact must be sent with the sample, countersigned by the health care practitioner and, preferably, an independent police officer.

Fig. 1. Immediate management following occupational exposure to blood-borne viruses.

The majority of patients with acute HBV make a full recovery and develop immunity. After acute infection, approx 1 in 300 patients develop liver failure, which may result in death.

Chronic infection develops in approx 90% of neonates, approx 50% of children, and between 5 and 10% of adults. Neonates and children are usually

Table 1
Prevalence of Chronic Hepatitis B

• Blood-doning population	<1%
• Intravenous drug users	10–15%
• Homosexual/bisexuals	10–15%
• Institutionalized patients	no data available
• People from high-risk endemic areas (e.g., China and the Far East)	up to 30% of the population are carriers, and 75% have evidence of past infection; 5–10% are carriers (in Africa)

Table 2
Significance of Markers

Name	Infectivity	Immunity	Risk after needlestick
HBsAg	Yes	No	Only marker = 10–20%
HBeAg	Yes	No	With HBsAg = 30–40%
HBeA	Yes	Yes	With HBsAg = <10%
HBCA	No	Yes	0%
HBSA	No	Yes	0%

HBsAg, hepatitis B surface antigen; HbeAg, hepatitis B e antigen; HbeA, hepatitis B e antibody; HBCA, hepatitis B core antibody; HBSA, hepatitis B surface antibody.

asymptomatic. Adults may have only mild symptoms or may also be asymptomatic. Approximately 15–25% of chronically infected individuals (depending on age of acquisition) will develop cirrhosis over a number of years. This may also result in liver failure or other serious complications, including hepatocellular carcinoma, though the latter is rare. The overall mortality rate of HBV is estimated at less than 5%.

5.1.3. Period of Infectivity

A person is deemed infectious if HBsAg is detected in the blood. In the acute phase of the illness, this can be as long as 6 months. By definition, if HBsAg persists after this time, then the person is deemed a carrier. Carriers are usually infectious for life. The degree of infectivity depends on the stage of disease and the markers present Table 2.

5.1.4. Routes of Transmission

The major routes include parenteral (e.g., needlestick injuries, bites, unscreened blood transfusions, tattooing, acupuncture, and dental procedures where equipment is inadequately sterilized), mucous membrane exposure (including mouth, eyes, and genital mucous membranes), and contamination of broken skin (especially when <24 hours old).

5.1.5. At-Risk Groups

HBV is an occupational hazard for anyone who may come into contact with blood or bloodstained body fluids through the routes described. Saliva alone may transmit HBV. The saliva of some people infected with HBV contains HBV–DNA concentrations 1/1000–1/10,000 of that found in their serum *(8)*. This is especially relevant for penetrating bite wounds. Infection after exposure to other body fluids (e.g., bile, urine, feces, and cerebrospinal fluid) has never been demonstrated unless the fluids are contaminated with blood.

Intravenous drug users who share needles or other equipment are also at risk. HBV can also be transmitted through unprotected sexual contact, whether homosexual or heterosexual. The risk is increased if blood is involved. Sexual assault victims should be included in this category.

Evidence has shown that the virus may also be spread among members of a family through close household contact, such as through kissing and sharing toothbrushes, razors, bath towels, etc. *(9–11)*. This route of transmission probably applies to institutionalized patients, but there are no available data.

Studies of prisoners in western countries have shown a higher prevalence of antibodies to HBV and other BBVs than the general population *(12–14)*; the most commonly reported risk factor is intravenous drug use. However, the real frequency of transmission of BBVs in British prisons is unknown owing to the difficulty in compiling reliable data.

HBV can be transmitted vertically from mother to baby during the perinatal period. Approximately 80% of babies born to mothers who have either acute or chronic HBV become infected, and most will develop chronic HBV. This has been limited by the administration of HBV vaccine to the neonate. In industrialized countries, all prenatal mothers are screened for HBV. Vaccine is given to the neonate ideally within the first 12 hours of birth and at least two more doses are given at designated intervals. The WHO recommends this as a matter of course for all women in countries where prevalence is high. However, the practicalities of administering a vaccine that has to be stored at the correct temperature in places with limited access to medical care means that there is a significant failure of vaccine uptake and response.

5.1.6. Disease Prevention

In industrialized countries, HBV vaccination is recommended for those who are deemed at risk of acquiring the disease. They include the following:

1. Through occupational exposure.
2. Homosexual/bisexual men.
3. Intravenous drug users.
4. Sexual partners of people with acute or chronic HBV.
5. Family members of people with acute or chronic HBV.
6. Newborn babies whose mothers are infected with HBV. If the mother is HBsAg positive, then hepatitis B-specific immunoglobulin (HBIG) should be given at the same time as the first dose of vaccine.
7. Institutionalized patients and prisoners.

Ideally, HBV vaccine should be administered before exposure to the virus. The routine schedule consists of three doses of the vaccine given at 0, 1, and 6 months. Antibody levels should be checked 8–12 weeks after the last dose. If titers are greater than10 miU/mL, then an adequate response has been achieved. In the United Kingdom, this is considered to provide protection for 5–10 years. In the United States, if an initial adequate response has been achieved, then no further doses of vaccine are considered necessary.

Vaccine administration after exposure varies according to the timing of the incident, the degree of risk involved, and whether the individual has already been partly or fully vaccinated. An accelerated schedule when the third dose is given 2 months after the first dose with a booster 1 year later is used to prevent postnatal transmission. Where risks are greatest, it may be necessary to use a rapid schedule. The doses are given at 0, 7, and 21–28 days after presentation, again with a booster dose at 6–12 months. This schedule is currently only licensed with Engerix B.

HBIG may also be used either alone or in conjunction with vaccine. The exact dose given is age dependent but must be administered by deep intramuscular injection in a different site from the vaccine. In an adult, this is usually into the gluteus muscle.

HBIG is given in conjunction with the first dose of vaccine to individuals who are deemed at high risk of acquiring disease and the incident occurred within 72 hours of presentation. It is also used for neonates born to mothers who are HBeAg-positive.

Between 5 and 10% of adults fail to respond to the routine schedule of vaccine. A further full course of vaccine should be tried before deeming the patients as “nonresponders.” Such individuals involved in a high-risk exposure should be given two doses of HBIG administered 1 mo apart. Ideally, the first dose should be given within 48 hours after exposure and no later than 2 weeks after exposure.

Other measures include minimizing the risk of exposure by adopting the safe working practices outlined in Subheading 2. Any potential exposures should be dealt with as soon as possible. In industrialized countries blood, blood products, and organs are routinely screened for HBV.

Intravenous drug users should be encouraged to be vaccinated and to avoid sharing needles or any other drug paraphernalia (*see* Subheading 6.9.2.).

5.1.7. Management in Custody

For staff or victims in contact with disease, it is wise to have a procedure in place for immediate management and risk evaluation. An example is shown in Fig. 1. Although forensic physicians are not expected to administer treatment, it is often helpful to inform persons concerned what to expect. Tables 3 and 4 outline treatment protocols as used in the United Kingdom.

Detainees with disease can usually be managed in custody. If the detainee is bleeding, then the cell should be deemed out of action after the detainee has left until it can be professionally cleaned. Contaminated bedding should be dealt with as described in Subheading 2.2. If the detainee has chronic HBV and is on an antiviral agent (e.g., Lamivudine), then the treatment course should be continued, if possible.

5.2. Hepatitis C

5.2.1. Epidemiology and Prevalence

HCV is endemic in most parts of the world. Approximately 3% (200 million) of the world's population is infected with HCV *(15)*. For many countries, no reliable prevalence data exist.

Seroprevalence studies conducted among blood donors have shown that the highest prevalence exists in Egypt (17–26%). This has been ascribed to contaminated needles used in the treatment of schistosomiasis conducted between the 1950s and the 1980s *(16)*.

Intermediate prevalence (1–5%) exists in Eastern Europe, the Mediterranean, the Middle East, the Indian subcontinent, and parts of Africa and Asia. In Western Europe, most of Central America, Australia, and limited regions in Africa, including South Africa, the prevalence is low (0.2–0.5%). Previously, America was included in the low prevalence group, but a report published in 2003 *(17)* indicated that almost 4 million Americans (i.e., 1.8% of the population) have antibody to HCV, representing either ongoing or previous infection. It also states that HCV accounts for approx 15% of acute viral hepatitis in America.

The lowest prevalence (0.01–0.1%) has been found in the United Kingdom and Scandinavia. However, within any country, there are certain groups

Table 3
Management After High-Risk Exposure
Contact in High-Risk Group or HBsAg-Positive Person With High-Risk Exposure

Vaccination status	HBSIG	Hepatitis B vaccine	Follow-up	Notes
Not vaccinated	• Yes if >3 d after exposure • No if <3 d	Yes Yes	AS via GP RDS via GP	 Advise GP of timing
Vaccinated nonresponder	• Yes if within 3 d	No	Repeat HBSIG	Consider trying newer at 1 mo vaccines at later stage
Course completed. Levels <10 miU/mL	• No	Yes if primary course <3 yr ago	No	
Course completed within 3 yr Levels not checked[a] or course completed >73 yr, *see* Incomplete Course	• No	Yes	GP to check results of baseline blood test	If baseline antibodies >10 miU/mL advise RDS
Incomplete course (1 or 2 doses)	• Yes if within 3 d • No if <3 d.	Yes Yes	GP to check results of baseline blood test	>10 miU/mL advise RS <10 miU/mL advise RDS

[a] If < 3 yr, *see*

GP, Family doctor; HBsAg, hepatitis B surface antigen; AS, accelerated schedule; RDS, rapid schedule; HBSIG, hepatitis B-specific immunoglobulin.

Table 4
Management After Low-Risk Exposure
Contact Is in Low-Risk Group or Known To Be HBsAg Negative and Has Had a Low-Risk Exposure

Vaccination status	HBSIG	Vaccine	Follow-up	Notes
Not vaccinated	No	Yes	RS via GP	
Vaccinated nonresponder	No	No		Consider using newer vaccines
Course completed	No	Yes if not checked or <3 yr since first course		
Incomplete course	No	Yes	GP to check results of baseline test	>10 IU complete RS

GP, Family doctor; HBsAg, hepatitis B surface antigen; HBSIG, hepatitis B-specific immunoglobulin; RS, routine schedule; IU, international unit.

Table 5
Prevalence of Hepatitis C

• General blood-doning population	0.06%
• Organ donors	0.72%
• Hemophiliacs	100%[a]
• Intravenous drug users	46–90%
• Homosexual/bisexuals	< 5%

[a]Statistics applies to all who received blood products before the mid-1980s.

that have a higher chance of carrying HCV. These United Kingdom figures are given in Table 5.

5.2.2. Symptoms and Complications

After an incubation period of 6–8 weeks, the acute phase of the disease lasts approx 2–3 years. Unlike hepatitis A (HAV) or HBV, the patient is usually asymptomatic; therefore, the disease is often missed unless the individual has reported a specific exposure and is being monitored. Other cases are found by chance, when raised liver enzymes are found on a routine blood test.

A "silent phase" follows the acute phase when the virus lies dormant and the liver enzymes are usually normal. This period lasts approx 10–15 years. Reactivation may then occur. Subsequent viral replication damages the hepatocytes, and liver enzymes rise to moderate or high levels.

Eighty percent of individuals who are HCV antibody-positive are infectious, regardless of the levels of their liver enzymes. Approximately 80% of people develop chronic infection, one-fifth of whom progress to cirrhosis. There is a much stronger association with hepatocellular carcinoma than with HBV. An estimated 1.25–2.5% of patients with HCV-related cirrhosis develop liver cancer *(18)*. Less than 2% of chronic cases resolve spontaneously.

5.2.3. Routes of Transmission

Approximately 75% of cases are parenteral (e.g., needle-stick, etc.) *(19)*. Transmission through the sexual route is not common and only appears to be significant if there is repeated exposure with one or more people infected with HCV. Mother-to-baby transmission is considered to be uncommon but has been reported *(20)*. Theoretically, household spread is also possible through sharing contaminated toothbrushes or razors.

Because the disease is often silent, there is a need to raise awareness among the general population on how to avoid infection and to encourage high-risk groups to be tested. Health care professionals should also be educated to avoid occupationally acquired infection. An example of good practice

is contained within the document *Hepatitis C Strategy for England*, issued by the UK Department of Health in 2002 *(18)*.

5.2.4. Risks From Exposure to an HCV RNA-Positive Person

Blood or blood-stained body fluids need to be involved for a risk to occur. Saliva alone is not deemed to be a risk. The risk from a single needlestick incident is 1.8% (range 0–7%). Contact through a contaminated cut is estimated at 1%. For penetrating bite injuries, there are no data, but it is only considered a risk if blood is involved. Blood or blood-stained body fluids have to be involved in transmission through mucous membrane exposure. This may account for the lower-than-expected prevalence among the gay population.

5.2.5. Management in Custody

5.2.5.1. Staff/Victims in Contact With Disease

Follow the immediate management flow chart, making sure all available information is obtained. Inform the designated hospital and/or specialist as soon as possible. If the contact is known and is believed to be immunocompromised and he or she has consented to provide a blood sample, it is important to tell the specialist, because the antibody tests may be spuriously negative. In this instance, a different test should be used (polymerase chain reaction [PCR], which detects viral RNA).

The staff member/victim will be asked to provide a baseline sample of blood with further samples at 4–6 weeks and again at 12 weeks. If tests are negative at 12 weeks but the risk was deemed high, then follow-up may continue for up to 24 weeks. If any of the follow-up samples is positive, then the original baseline sample will be tested to ascertain whether the infection was acquired through the particular exposure.

It is important to emphasize the need for prompt initial attendance and continued monitoring, because treatment is now available. A combination of Ribavirin (antiviral agent and interferon a-2b) *(18)* or the newer pegylated interferons *(15)* may be used. This treatment is most effective when it is started early in the course of infection.

5.2.5.2. Detainees With Disease

Unless they are severely ill, detainees can be managed in custody. Special precautions are only required if they are bleeding. Custody staff should wear gloves if contact with blood is likely. Contaminated bedding should be handled appropriately, and the cell cleaned professionally after use.

5.3. Hepatitis D (Δ Agent)

This defective transmissible virus was discovered in 1977 and requires HBV for its own replication. It has a worldwide distribution in association with HBV, with approx 15 million people infected. The prevalence of HDV is higher in southern Italy, the Middle East, and parts of Africa and South America, occurring in more than 20% of HBV carriers who are asymptomatic and more than 60% of those with chronic HBV-related liver disease. Despite the high prevalence of HBV in China and South East Asia, HDV in these countries is rare.

HDV is associated with acute (coinfection) and chronic hepatitis (superinfection) and can exacerbate pre-existing liver damage caused by HBV. The routes of transmission and at-risk groups are the same as for HBV. Staff/victims in contact with a putative exposure and detainees with disease should be managed as for HBV. Interferon-α (e.g., Roferon) can be used to treat patients with chronic HBV and HDV *(21)*, although it would not be practical to continue this treatment in the custodial setting.

5.4. Human Immunodeficiency Virus

5.4.1. Epidemiology and Prevalence

HIV was first identified in 1983, 2 years after the first reports were made to the CDC in Atlanta, GA, of an increased incidence of two unusual diseases (Kaposi's sarcoma and *pneumocystis carinii* pneumonia) occurring among the gay population in San Francisco. The scale of the virus gradually emerged over the years and by the end of 2002, there were an estimated 42 million people throughout the world living with HIV or acquired immunodeficiency syndrome (AIDS). More than 80% of the world's population lives in Africa and India. A report by The Joint United Nations Programme on HIV/AIDS and the WHO in 2002 stated that one in five adults in Lesotho, Malawi, Mozambique, Swaziland, Zambia, and Zimbabwe has HIV or AIDS. There is also expected to be a sharp rise in cases of HIV in China, Papua New Guinea, and other countries in Asia and the Pacific during the next few years.

In the United Kingdom, by the end of 2002, the cumulative data reported that there were 54,261 individuals with HIV, AIDS (including deaths from AIDS) reported, though this is likely to be an underestimate *(22)*.

From these data, the group still considered at greatest risk of acquiring HIV in the United Kingdom is homosexual/bisexual men, with 28,835 of the cumulative total falling into this category. Among intravenous drug users, the

overall estimated prevalence is 1%, but in London the figure is higher at 3.7% *(6,23)*. In the 1980s, up to 90% of users in Edinburgh and Dundee were reported to be HIV positive, but the majority have now died. Individuals arriving from Africa or the Indian subcontinent must also be deemed a risk group because 80% of the world's total cases occur in these areas. The predominant mode of transmission is through unprotected heterosexual intercourse.

The incidence of mother-to-baby transmission has been estimated at 15% in Europe and approx 45% in Africa. The transmission rates among African women are believed to be much higher owing to a combination of more women with end-stage disease with a higher viral load and concomitant placental infection, which renders it more permeable to the virus *(24,25)*. The use of antiretroviral therapy during pregnancy, together with the advice to avoid breastfeeding, has proven efficacious in reducing both vertical and horizontal transmission among HIV-positive women in the western world. For those in third-world countries, the reality is stark. Access to treatment is limited, and there is no realistic substitute for breast milk, which provides a valuable source of antibodies to other life-threatening infections. Patients receiving blood transfusions, organs, or blood products where screening is not routinely carried out must also be included.

5.4.2. Incubation Period and Phases of Infection

The incubation is estimated at 2 weeks to 6 months after exposure. This depends, to some extent, on the ability of current laboratory tests to detect HIV antibodies or viral antigen. The development of PCR for viral RNA has improved sensitivity.

During the acute phase of the infection, approx 50% experience a seroconversion "flu-like" illness. The individual is infectious at this time, because viral antigen (p24) is present in the blood. As antibodies start to form, the viral antigen disappears and the individual enters the latent phase. He or she is noninfectious and remains well for a variable period of time (7–15 years). Development of AIDS marks the terminal phase of disease. Viral antigen reemerges, and the individual is once again infectious. The onset of AIDS has been considerably delayed with the use of antiretroviral treatment.

5.4.3. Routes of Transmission

Parenteral transmission included needlestick injuries, bites, unscreened blood transfusions, tattooing, acupuncture, and dental procedures where equipment is inadequately sterilized. Risk of transmission is increased with deep penetrating injuries with hollow bore needles that are visibly bloodstained,

especially when the device has previously been in the source patient's (contact) artery or vein.

Other routes include mucous membrane exposure (eyes, mouth, and genital mucous membranes) and contamination of broken skin.

The higher the viral load in the contact, the greater the risk of transmission. This is more likely at the terminal stage of infection. HIV is transmitted mainly through blood or other body fluids that are visibly blood stained, with the exception of semen, vaginal fluid, and breast milk. Saliva alone is most unlikely to transmit infection. Therefore, people who have sustained penetrating bite injuries can be reassured that they are not at risk, providing the contact was not bleeding from the mouth at the time.

5.4.4. Risk of Seroconversion

The risk from a single percutaneous exposure from a hollow bore needle is low, and a single mucocutaneous exposure is even less likely to result in infection.

The risk from sexual exposure varies, although it appears that there is a greater risk with receptive anal intercourse compared with receptive vaginal intercourse *(26)*.

5.4.5. Body Fluids Containing HIV

High-risk fluids include blood, semen, vaginal fluid, and breast milk. There is little or no risk from saliva, urine, vomit, or feces unless they are visibly bloodstained. Other fluids that constitute a theoretical risk include cerebrospinal, peritoneal, pleural, synovial, or pericardial fluid.

5.4.6. Management in Custody of Staff/Victims in Contact With Disease

Management in custody of staff/victims in contact with disease includes following the immediate management flow chart (Fig. 1) and contacting the designated hospital/specialist with details of the exposure. Where possible, obtain a blood sample from the contact. Regarding HBV and HCV blood samples in the United Kingdom, they can only be taken with informed consent. There is no need for the forensic physician to go into details about the meaning of the test, but the contact should be encouraged to attend the genitourinary department (or similar) of the designated hospital to discuss the test results. Should the contact refuse to provide a blood sample, then any information about his or her lifestyle, ethnic origin, state of health, etc., may be useful for the specialist to decide whether postexposure prophylaxis (PEP) should be given to the victim. Where only saliva is involved in a penetrating

bite injury, there is every justification to reassure the victim that he or she is not at risk. If in doubt, then always refer.

In the United Kingdom, the current recommended regime for PEP is Combivir (300 mg of Zidovudine twice daily plus 150 mg of Lamivudine twice daily) and a protease inhibitor (1250 mg of Nelfanivir twice daily) given for 4 weeks *(27)*. It is only given after a significant exposure to a high-risk fluid or any that is visibly bloodstained and the contact is known or is highly likely to be HIV positive. Ideally, treatment should be started within an hour after exposure, although it will be considered for up to 2 weeks. It is usually given for 4 weeks, unless the contact is subsequently identified as HIV negative or the "victim" develops tolerance or toxicity occurs. Weekly examinations of the "victim" should occur during treatment to improve adherence, monitor drug toxicity, and deal with other concerns.

Other useful information that may influence the decision whether to treat with the standard regimen or use alternative drugs includes interaction with other medications that the "victim" may be taking (e.g., phenytoin or antibiotics) or if the contact has been on antiretroviral therapy or if the "victim" is pregnant. During the second or third trimester, only Combivir would be used, because there is limited experience with protease inhibitors. No data exist regarding the efficacy of PEP beyond occupational exposure *(27)*.

PEP is not considered for exposure to low- or no-risk fluids through any route or where the source is unknown (e.g., a discarded needle). Despite the appropriate use and timing of PEP, there have been reports of failure *(28,29)*.

5.4.7. Management in Custody of Detainees With HIV

Unless they are severely ill, detainees can be kept in custody. Every effort should be made to continue any treatment they may be receiving. Apply universal precautions when dealing with the detainee, and ensure that contaminated cells and/or bedding are managed appropriately.

6. Transmission Through Contact With Lesions or Organisms

6.1.* Varicella *(Chicken Pox)

6.1.1. Epidemiology and Prevalence

Cases of this highly infectious disease occur throughout the year but are more frequent in winter and early spring. This seasonal endemicity is blurring with global warming. In the United Kingdom, the highest prevalence occurs in the 4- to 10-years age group. Ninety percent of the population over the age of 40 is immune *(30)*. A similar prevalence has been reported in other parts of Western Europe and the United States. In South East Asia, *Varicella* is mainly

a disease of adulthood *(31)*. Therefore, people born in these countries who have moved to the United Kingdom are more likely to be susceptible to chicken pox.

There is a strong correlation between a history of chicken pox and serological immunity (97–99%). Most adults born and living in industrialized countries with an uncertain or negative history of chicken pox are also seropositive (70–90%). In March 1995, a live-attenuated vaccine was licensed for use in the United States and a policy for vaccinating children and susceptible health care personnel was introduced. In summer 2002, in the United Kingdom, GlaxoSmithKline launched a live-attenuated vaccine called Varilrix. In December 2003, the UK Department of Health, following advice from the Joint Committee on Vaccination and Immunisation recommended that the vaccine be given for nonimmune health care workers who are likely to have direct contact with individuals with chicken pox. Any health care worker with no previous history of chicken pox should be screened for immunity, and if no antibodies are found, then they should receive two doses of vaccine 4–8 weeks apart. The vaccine is not currently recommended for children and should not be given during pregnancy.

6.1.2. Incubation Period and Symptoms

Following an incubation period of 10–21 days (this may be shorter in the immunocompromised), there is usually a prodromal "flu-like" illness before the onset of the rash. This coryzal phase is more likely in adults. The lesions typically appear in crops, rapidly progressing from red papules through vesicles to open sores that crust over and separate by 10 days. The distribution of the rash is centripetal (i.e., more over the trunk and face than on the limbs). This is the converse of small pox. In adults, the disease is often more severe, with lesions involving the scalp and mucous membranes of the oropharynx.

6.1.3. Complications

In children, the disease is often mild, unless they are immunocompromised, so they are unlikely to experience complications. In adults (defined as 15 yr or older), the picture is rather different *(32)*. Secondary bacterial infection is common but rarely serious. There is an increased likelihood of permanent scarring. Hemorrhagic chicken pox typically occurs on the second or third day of the rash. Usually, this is limited to bleeding into the skin, but life-threatening melena, epistaxis, or hematuria can occur.

Varicella pneumonia ranges from patchy lung consolidation to overt pneumonitis and occurs in 1 in 400 cases *(33)*. It can occur in previously healthy individuals (particularly adults), but the risk is increased in those who smoke.

Immunocompromised people are at the greatest risk of developing this complication. It runs a fulminating course and is the most common cause of *Varicella*-associated death. Fibrosis and permanent respiratory impairment may occur in those who survive. Any suspicion of lung involvement is an indication for immediate treatment, and any detainee or staff member should be sent to hospital. Involvement of the central nervous system includes several conditions, including meningitis, Guillain-Barre, and encephalitis. The latter is more common in the immunocompromised and can be fatal.

6.1.4. Period of Infectivity

This is taken as 3 days before the first lesions appear to the end of new vesicle formation and the last vesicle has crusted over. This typically is 5–7 days after onset but may last up to 14 days.

6.1.5. Routes of Transmission

The primary route is through direct contact with open lesions of chicken pox. However, it is also spread through aerosol or droplets from the respiratory tract. Chicken pox may also be acquired through contact with open lesions of shingles (*Varicella zoster*), but this is less likely because shingles is less infectious than chicken pox.

6.1.6. At-Risk Groups

Nonimmune individuals are at risk of acquiring disease. Approximately 10% of the adult population born in the United Kingdom and less than 5% of adults in the United States fall into this category. Therefore, it is more likely that if chicken pox is encountered in the custodial setting, it will involve people born outside the United Kingdom (particularly South East Asia) or individuals who are immunocompromised and have lost immunity. Nonimmune pregnant women are at risk of developing complications.

Pneumonia can occur in up to 10% of pregnant women with chicken pox, and the severity is increased in later gestation *(34)*. They can also transmit infection to the unborn baby *(35)*. If infection is acquired in the first 20 weeks, there is a less than 3% chance of it leading to congenital *Varicella* syndrome. Infection in the last trimester can lead to neonatal *Varicella*, unless more than 7 days elapse between onset of maternal rash and delivery when antibodies have time to cross the placenta leading to either mild or inapparent infection in the newborn. In this situation, *Varicella* immunoglobulin (VZIG) should be administered to the baby as soon as possible after birth *(36)*.

6.1.7. Management in Custody

Staff with chicken pox should stay off work until the end of the infective period (approx 7–14 days). Those in contact with disease who are known to be nonimmune or who have no history of disease should contact the designated occupational health physician.

Detainees with the disease should not be kept in custody if at all possible (especially pregnant women). If this is unavoidable, then nonimmune or immunocompromised staff should avoid entering the cell or having close contact with the detainee.

Nonimmune, immunocompromised, or pregnant individuals exposed to chickenpox should seek expert medical advice regarding the administration of VZIG. Aciclovir (or similar antiviral agent) should be given as soon as possible to people who are immunocompromised with chicken pox. It should also be considered for anyone over 15 years old because they are more likely to develop complications.

Anyone suspected of severe complications should be sent straight to the hospital.

6.2. Herpes Zoster *(Shingles)*

6.2.1. Epidemiology

After chicken pox, the virus lies dormant in the dorsal root or cranial nerve ganglia but may re-emerge and typically involves one dermatome *(37)*. The site of involvement depends on the sensory ganglion initially involved. Shingles is more common in individuals over the age of 50 years, except in the immunocompromised, when attacks can occur at an earlier age. The latter are also more susceptible to secondary attacks and involvement of more than one dermatome. Bilateral *zoster* is even rarer but is not associated with a higher mortality.

In the United Kingdom, there is an estimated incidence of 1.2–3.4 per 1000-person years *(38)*.

6.2.2. Symptoms

There may be a prodromal period of paraesthesia and burning or shooting pains in the involved segment. This is usually followed by the appearance of a band of vesicles. Rarely, the vesicles fail to appear and only pain is experienced. This is known as *zoster sine herpete*. In individuals who are immuno-

compromised, disease may be prolonged and dissemination may occur but is rarely fatal.

Shingles in pregnancy is usually mild. The fetus is only affected if viremia occurs before maternal antibody has had time to cross the placenta.

6.2.3. Complications

The most common complication of shingles is postherpetic neuralgia, occurring in approx 10% of cases. It is defined as pain lasting more than 120 days from rash onset *(39)*. It is more frequent in people over 50 years and can lead to depression. It is rare in children, including those who are immunocompromised. Infection of the brain includes encephalitis, involvement of motor neurones leading to ptosis, paralysis of the hand, facial palsy, or contralateral hemiparesis. Involvement of the oculomotor division of the trigeminal ganglion can cause serious eye problems, including corneal scarring.

6.2.4. Period of Infectivity

Shingles is far less infectious than chicken pox and is only considered to be infectious up to 3 days after lesions appear.

6.2.5. Routes of Transmission

Shingles is only infectious after prolonged contact with lesions. Unlike chickenpox, airborne transmission is not a risk.

6.2.6. At-Risk Groups

Individuals who are immunocompromised may reactivate the dormant virus and develop shingles. People who have not had primary *Varicella* are at risk of developing chickenpox after prolonged direct contact with shingles. Despite popular belief, it is untrue that people who are immunocompetent who have had chicken pox develop shingles when in contact with either chicken pox or shingles. Such occurrences are merely coincidental, unless immunity is lowered.

6.2.7. Management in Custody

Staff with shingles should stay off work until the lesions are healed, unless they can be covered. Staff who have had chickenpox are immune (including pregnant women) and are therefore not at risk. If they are nonimmune (usually accepted as those without a history of chicken pox), they should avoid prolonged contact with detainees with shingles. Pregnant nonimmune women should avoid contact altogether.

Detainees with the disease may be kept in custody, and any exposed lesions should be covered. It is well documented that prompt treatment attenuates the

severity of the disease, reduces the duration of viral shedding, hastens lesion healing, and reduces the severity and duration of pain. It also reduces the likelihood of developing postherpetic neuralgia *(40)*. Prompt treatment with Famciclovir (e.g., 500 mg three times a day for 7 days) should be initiated if the onset is 3 d ays or less. It should also be considered after this time if the detainee is over age 50 years. Pregnant detainees with shingles can be reassured that there is minimal risk for both the mother and the unborn child. Expert advice should be given before initiating treatment for the mother.

6.3. Scabies

6.3.1. Epidemiology

This tiny parasitic mite (*Sarcoptes scabiei*) has infested humans for more than 2500 years. Experts estimate that in excess of 300 million cases occur worldwide each year. The female mite burrows into the skin, especially around the hands, feet, and male genitalia, in approx 2.5 min. Eggs are laid and hatch into larvae that travel to the skin surface as newly developed mites.

6.3.2. Symptoms

The mite causes intense itching, which is often worse at night and is aggravated by heat and moisture. The irritation spreads outside the original point of infection resulting from an allergic reaction to mite feces. This irritation may persist for approx 2 weeks after treatment but can be alleviated by antihistamines.

Crusted scabies is a far more severe form of the disease. Large areas of the body may be involved. The crusts hide thousands of live mites and eggs, making them difficult to treat. This so-called Norwegian scabies is more common in the elderly or the immunocompromised, especially those with HIV.

6.3.4. Incubation Period

After a primary exposure, it takes approx 2–6 weeks before the onset of itching. However, further exposures reduce the incubation time to approx 1–4 days.

6.3.5. Period of Infectivity

Without treatment, the period of infectivity is assumed to be indefinite. With treatment, the person should be considered infectious until the mites and eggs are destroyed, usually 7–10 days. Crusted scabies is highly infectious.

6.3.6. Management in Custody

Because transmission is through direct skin-to-skin contact with an infected individual, gloves should be worn when dealing with individuals suspected of

infestation. Usually prolonged contact is needed, unless the person has crusted scabies, where transmission occurs more easily. The risk of transmission is much greater in households were repeated or prolonged contact is likely.

Because mites can survive in bedding or clothing for up to 24 hour, gloves should also be worn when handling these items. Bedding should be treated using one of the methods in Subheading 2.2. Professional cleaning of the cell is only warranted in cases of crusted scabies.

6.3.7. Treatment

The preferred treatment for scabies is either permethrin cream (5%) or aqueous Malathion (0.5%) *(41)*. Either treatment has to be applied to the whole body and should be left on for at least 8 hours in the case of permethrin and 24 hours for Malathion before washing off. Lindane is no longer considered the treatment of choice, because there may be complications in pregnancy *(42)*.

Treatment in custody may not be practical but should be considered when the detainee is believed to have Norwegian scabies.

6.4. Head Lice

6.4.1. General Information

Like scabies, head lice occur worldwide and are found in the hair close to the scalp. The eggs, or nits, cling to the hair and are difficult to remove, but they are not harmful. If you see nits, then you can be sure that lice are also present. The latter are best seen when the hair is wet. The lice bite the scalp and suck blood, causing intense irritation and itching.

6.4.2. Route of Transmission

Head lice can only be passed from direct hair-to-hair contact.

6.4.3. Management in Custody

It is only necessary to wear gloves when examining the head for whatever reason. The cell does not need to be cleaned after use, because the lice live on or near skin. Bedding may be contaminated with shed skin, so should be handled with gloves and laundered or incinerated.

The presence of live lice is an indication for treatment by either physical removal with a comb or the application of an insecticide. The latter may be more practical in custody. Treatment using 0.5% aqueous Malathion should be applied to dry hair and washed off after 12 hours. The hair should then be shampooed as normal.

6.5. Crabs or Body Lice

6.5.1. General Information

Crabs or body lice are more commonly found in the pubic, axillary, chest, and leg hair. However, eyelashes and eyebrows may also be involved. They are associated with people who do not bath or change clothes regularly. The person usually complains of intense itching or irritation.

6.5.2. Routes of Transmission

The main route is from person to person by direct contact, but eggs can stick to fibers, so clothing and bedding should be handled with care (*see* Subheading 6.5.3.).

6.5.3 Management in Custody

Staff should always wear gloves if they are likely to come into contact with any hirsute body part. Clothing or bedding should be handled with gloves and either laundered or incinerated.

Treatment of a detainee in custody is good in theory but probably impractical because the whole body has to be treated.

6.6. Fleas

6.6.1. General Information

Fleas lay eggs on floors, carpets, and bedding. In the United Kingdom, most flea bites come from cats or dogs. The eggs and larvae fleas can survive for months and are reactivated in response to animal or human activity. Because animal fleas jump off humans after biting, most detainees with flea bites will not have fleas, unless they are human fleas.

6.6.2. Management in Custody

Treatment is only necessary if fleas are seen. After use, the cell should be vacuumed and cleaned with a proprietary insecticide. Any bedding should be removed wearing gloves, bagged, and either laundered or incinerated.

6.7. Bedbugs

6.7.1. General Information

Bedbugs live and lay eggs on walls, floors, furniture, and bedding. If you look carefully, fecal tracks may be seen on hard surfaces. If they are present

for long enough, they emit a distinct odor. Bedbugs are rarely found on the person but may be brought in on clothing or other personal effects.

6.7.2. Symptoms

Bedbugs bite at night and can cause sleep disturbance.

6.7.3. Management in Custody

The detainee does not need to be treated, but the cell should deemed out of use until it can be vacuumed and professionally cleaned with an insecticide solution. Any bedding or clothing should be handled with gloves and disposed of as appropriate.

6.8. *Methicillin-Resistant* Staphylococcus aureus

6.8.1. Epidemiology

Staphylococcus aureus is commonly carried on the skin or in the nose of healthy people. Approximately 25–30% of the population is colonized with the bacteria but remain well *(43)*. From time to time, the bacteria cause minor skin infections that usually do not require antibiotic treatment. However, more serious problems can occur (e.g., infection of surgical wounds, drug injection sites, osteomyelitis, pneumonia, or septicemia). During the last 50 years, the bacteria have become increasingly resistant to penicillin-based antibiotics *(44)*, and in the last 20 years, they have become resistant to an increasing number of alternative antibiotics. These multiresistant bacteria are known as methicillin-resistant *S. aureus* (MRSA).

MRSA is prevalent worldwide. Like nonresistant staphylococci, it may remain undetected as a reservoir in colonized individuals but can also produce clinical disease. It is more common in individuals who are elderly, debilitated, or immunocompromised or those with open wounds. Clusters of skin infections with MRSA have been reported among injecting drug users (IDUs) since 1981 in America *(45,46)*, and more recently, similar strains have been found in the United Kingdom in IDUs in the community *(47)*. This may have particular relevance for the forensic physician when dealing with IDUs sores. People who are immunocompetent rarely get MRSA and should not be considered at risk.

6.8.2. Route of Transmission

The bacteria are usually spread via the hands of staff after contact with colonized or infected detainees or devices, items (e.g., bedding, towels, and soiled dressings), or environmental surfaces that have been contaminated with MRSA-containing body fluids.

6.8.3. Management in Custody

With either known or suspected cases (consider all abscesses/ulcers of IDUs as infectious), standard precautions should be applied. Staff should wear gloves when touching mucous membranes, nonintact skin, blood or other body fluids, or any items that could be contaminated. They should also be encouraged to their wash hands with an antimicrobial agent regardless of whether gloves have been worn. After use, gloves should be disposed of in a yellow hazard bag and not allowed to touch surfaces. Masks and gowns should only be worn when conducting procedures that generate aerosols of blood or other body fluids. Because this is an unlikely scenario in the custodial setting, masks and gowns should not be necessary. Gloves should be worn when handling bedding or clothing, and all items should be disposed of appropriately. Any open wounds should be covered as soon as possible. The cell should be cleaned professionally after use if there is any risk that it has been contaminated.

6.9. Other Bacteria Associated With Abscess Formation in IDUs

6.9.1. Epidemiology

During the last decade, there has been an increasing awareness of the bacterial flora colonizing injection sites that may potentially lead to life-threatening infection *(48)*. In 1997, a sudden increase in needle abscesses caused by a clonal strain of Group A *Streptococcus* was reported among hospitalized IDUs in Berne, Switzerland *(49)*. A recent UK study showed that the predominant isolate is *S. aureus*, with *Streptococcu*s species forming just under one-fifth (50% β-hemolytic streptococci) *(50)*. There have also been reports of both nonsporing and sporing anerobes (e.g., *Bacteroides* and *Clostridia* species, including *Clostridia botulinum*) *(51,52)*.

In particular, in 2000, laboratories in Glasgow were reporting isolates of *Clostridium novyi* among IDUs with serious unexplained illness. By June 12, 2000, a total of 42 cases (18 definite and 24 probable) had been reported. A definite case was defined as an IDU with both severe local and systemic inflammatory reactions. A probable case was defined as an IDU who presented to the hospital with an abscess or other significant inflammation at an injecting site and had either a severe inflammatory process at or around an injection site or a severe systemic reaction with multiorgan failure and a high white cell count *(53)*.

In the United Kingdom, the presence of *C. botulinum* in infected injection sites is a relatively new phenomenon. Until the end of 1999, there were no cases reported to the Public Health Leadership Society. Since then, the number has increased, with a total of 13 cases in the United Kingdom and Ireland being

reported since the beginning of 2002. It is believed that these cases are associated with contaminated batches of heroin. Simultaneous injection of cocaine increases the risk by encouraging anerobic conditions. Anerobic flora in wounds may have serious consequences for the detainee, but the risk of transmission to staff is virtually nonexistent.

6.9.2. Management in Custody

Staff should be reminded to wear gloves when coming into contact with detainees with infected skin sites exuding pus or serum and that any old dressings found in the cell should be disposed of into the yellow bag marked "clinical waste" in the medical room. Likewise, any bedding should be bagged and laundered or incinerated after use. The cell should be deemed out of use and professionally cleaned after the detainee has gone.

The health care professional managing the detainee should clean and dress open wounds as soon as possible to prevent the spread of infection. It may also be appropriate to start a course of antibiotics if there is abscess formation or signs of cellulites and/or the detainee is systemically unwell. However, infections can often be low grade because the skin, venous, and lymphatic systems have been damaged by repeated penetration of the skin. In these cases, signs include lymphedema, swollen lymph glands, and darkly pigmented skin over the area. Fever may or may not be present, but septicemia is uncommon unless the individual is immunocompromised (e.g., HIV positive). Co-Amoxiclav is the preferred treatment of choice because it covers the majority of staphylococci, streptococci, and anerobes (the dose depends on the degree of infection).

Necrotizing fasciitis and septic thrombophlebitis are rare but life-threatening complications of intravenous drug use. Any detainee suspected of either of these needs hospital treatment. Advice about harm reduction should also be given. This includes encouraging drug users to smoke rather than inject or at least to advise them to avoid injecting into muscle or skin. Although most IDUs are aware of the risk of sharing needles, they may not realize that sharing any drug paraphernalia could be hazardous. Advice should be given to use the minimum amount of citric acid to dissolve the heroin because the acid can damage the tissue under the skin, allowing bacteria to flourish. Drugs should be injected at different sites using fresh works for each injection. This is particularly important when "speedballing" because crack cocaine creates an anerobic environment. Medical help should be requested if any injection site become painful and swollen or shows signs of pus collecting under the skin. Because intravenous drug users are at increased risk of acquiring HBV and HAV, they should be informed that vaccination against both diseases is advisable.

Another serious but relatively rare problem is the risk from broken needles in veins. Embolization can take anywhere from hours to days or even longer if it is not removed. Complications may include endocarditis, pericarditis, or pulmonary abscesses *(54,55)*. IDUs should be advised to seek medical help as soon as possible, and should such a case present in custody, then send the detainee straight to the hospital.

6.10. Management of Human and Dog Bites

6.10.1. Introduction

The forensic physician may encounter bites in the following four circumstances:

1. During the examination of assault victims (both children and adults) where presentation is more likely to be late.
2. Among police officers bitten during the arrest of a detainee.
3. In detainees during the arrest if dogs have been used.
4. Where detainees have been involved in a fight either around the time of arrest or earlier.

A detailed forensic examination of bites is given in Chapter 4. With any bite that has penetrated the skin, the goals of therapy are to minimize soft tissue deformity and to prevent or treat infection.

6.10.2. Epidemiology

In the United Kingdom and the United States, dog bites represent approximately three-quarters of all bites presenting to accident and emergency departments *(56)*. A single dog bite can produce up to 220 psi of crush force in addition to the torsional forces as the dog shakes its head. This can result in massive tissue damage. Human bites may cause classical bites or puncture wounds (e.g., impact of fists on teeth) resulting in crush injuries.

6.10.3. Rates and Risks of Infection

An estimated 10–30% of dog bites and 9–50% of human bites lead to infection. Compare this with an estimated 1–12% of nonbite wounds managed in accident and emergency departments.

The risk of infection is increased with puncture wounds, hand injuries, full-thickness wounds, wounds requiring debridement, and those involving joints, tendons, ligaments or fractures.

Comorbid medical conditions, such as diabetes, asplenia, chronic edema of the area, liver dysfunction, the presence of a prosthetic valve or joint, and an immunocompromised state may also increase the risk of infection.

6.10.4. Other Complications of Bites

Infection may spread beyond the initial site, leading to septic arthritis, osteomyelitis, endocarditis, peritonitis, septicemia, and meningitis. Inflammation of the tendons or synovial lining of joints may also occur. If enough force is used, bones may be fractured or the wounds may be permanently disfiguring.

6.10.5. Initial Management

Assessment regarding whether hospital treatment is necessary should be made as soon as possible. Always refer if the wound is bleeding heavily or fails to stop when pressure is applied. Penetrating bites involving arteries, nerves, muscles, tendons, the hands, or feet, resulting in a moderate to serious facial wound, or crush injuries, also require immediate referral.

If management within custody is appropriate, ask about current tetanus vaccine status, HBV vaccination status, and known allergies to antibiotics.

Wounds that have breached the skin should be irrigated with 0.9% (isotonic) sodium chloride or Ringer's lactate solution instead of antiseptics, because the latter may delay wound healing.

A full forensic documentation of the bite should be made as detailed in Chapter 4.

Note if there are clinical signs of infection, such as erythema, edema, cellulitis, purulent discharge, or regional lymphadenopathy. Cover the wound with a sterile, nonadhesive dressing. Wound closure is not generally recommended because data suggest that it may increase the risk of infection. This is particularly relevant for nonfacial wounds, deep puncture wounds, bites to the hand, clinically infected wounds, and wounds occurring more than 6–12 hours before presentation. Head and neck wounds in cosmetically important areas may be closed if less than 12 hours old and not obviously infected.

6.10.6. Pathogens Involved

1. Bacteria
   - Dog bites—*Pasteurella canis, Pasteurella multocida, S. aureus*, other staphylococci, Streptococcus species, *Eikenella corrodens*, Corynebacterium species, and anerobes, including *Bacteroides fragilis* and *Clostridium tetani*
   - Human bites—Streptococcus species, *S. aureus, E. corrodens*, and anerobes, including bacteroides (often penicillin resistant), Peptostreptococci species, and *C. tetani*. Tuberculosis (TB) and syphilis may also be transmitted.
2. Viruses
   - Dog bites—outside of the United Kingdom, Australia, and New Zealand, rabies should be considered. In the United States, domestic dogs are mostly

vaccinated against rabies *(57)*, and police dogs have to be vaccinated, so the most common source is from racoons, skunks, and bats.
- Human bites—HBV, HBC, HIV, and herpes simplex.

6.10.7. Antibiotic Prophylaxis

Antibiotics are not generally needed if the wound is more than 2 days old and there is no sign of infection or in superficial noninfected wounds evaluated early that can be left open to heal by secondary intention in compliant people with no significant comorbidity *(58)*. Antibiotics should be considered with high-risk wounds that involve the hands, feet, face, tendons, ligaments, joints, or suspected fractures or for any penetrating bite injury in a person with diabetes, asplenia, or cirrhosis or who is immunosuppressed.

Coamoxiclav (amoxycillin and clavulanic acid) is the first-line treatment for mild–moderate dog or human bites resulting in infections managed in primary care. For adults, the recommended dose is 500/125 mg three times daily and for children the recommended does is 40 mg/kg three times daily (based on amoxycillin component). Treatment should be continued for 10–14 days. It is also the first-line drug for prophylaxis when the same dose regimen should be prescribed for 5–7 days. If the individual is known or suspected to be allergic to penicillin, a tetracycline (e.g., doxycycline 100 mg twice daily) and metronidazole (500 mg three times daily) or an aminoglycoside (e.g., erythromycin) and metronidazole can be used. In the United Kingdom, doxycycline use is restricted to those older than 12 years and in the United States to those older than 8 years old. Specialist advice should be sought for pregnant women.

Anyone with severe infection or who is clinically unwell should be referred to the hospital. Tetanus vaccine should be given if the primary course or last booster was more than 10 years ago. Human tetanus immunoglobulin should be considered for tetanus-prone wounds (e.g., soil contamination, puncture wounds, or signs of devitalized tissue) or for wounds sustained more than 6 hours old. If the person has never been immunized or is unsure of his or her tetanus status, a full three-dose course, spaced at least 1 month apart, should be given.

6.10.8. Management of Suspected Viral Infections From Human Bites

Penetrating bite wounds that involve only saliva may present a risk of HBV if the perpetrator belongs to a high-risk group. For management, *see* Subheadings 5.1.6. and 5.1.7. HCV and HIV are only a risk if blood is involved. The relevant management is dealt with in Subheadings 5.2.5. and 5.4.6.

7. Infections Transmitted Through the Respiratory Route

7.1. General Information

Respiratory tract infections are common, usually mild, and self-limiting, although they may require symptomatic treatment with paracetamol or a nonsteroidal antiinflammatory. These include the common cold (80% rhinoviruses and 20% coronaviruses), adenoviruses, influenza, parainfluenza, and, during the summer and early autumn, enteroviruses. Special attention should be given to detainees with asthma or the who are immunocompromised, because infection in these people may be more serious particularly if the lower respiratory tract is involved.

The following section includes respiratory pathogens of special note because they may pose a risk to both the detainee and/or staff who come into close contact.

7.2. *Meningococcal Meningitis* (Neisseria meningitidis)

7.2.1. General Information and Epidemiology

There are five serogroups of *Neisseria meningitidis*: A, B, C, W135, and Y. The prevalence of the different types varies from country to country. There is currently no available vaccine against type B, but three other vaccines (A+C, C, and ACWY) are available. Overall, 10% of the UK population carry *N. meningitidis* (25% in the 15–19 age group) *(59)*.

In the United Kingdom, most cases of meningitis are sporadic, with less than 5% occurring as clusters (outbreaks) amongst school children. Between 1996 and 2000, 59% of cases were group B, 36% were group C, and W135 and A accounted for 5%. There is a seasonal variation, with a high level of cases in winter and a low level in the summer. The greatest risk group are the under 5 year olds, with a peak incidence under 1 year old. A secondary peak occurs in the 15- to 19-year-old age group. In Sub-Saharan Africa, the disease is more prevalent in the dry season, but in many countries, there is background endemicity year-round. The most prevalent serogroup is A.

Routine vaccination against group C was introduced in the United Kingdom November 1999 for everybody up to the age of 18 years old and to all first-year university students. This has since been extended to include everyone under the age of 25 years old. As a result of the introduction of the vaccination program, there has been a 90% reduction of group C cases in those younger than under 18 years and an 82% reduction in those under 1 year old *(60,61)*.

An outbreak of serogroup W135 meningitis occurred among pilgrims on the Hajj in 2000. Cases were reported from many countries, including the United Kingdom. In the United Kingdom, there is now an official requirement

to be vaccinated with the quadrivalent vaccine (ACWY Vax) before going on a pilgrimage (Hajj or Umra), but illegal immigrants who have not been vaccinated may enter the country *(62)*.

7.2.2. Symptoms

After an incubation period of 3–5 days *(63,64)*, disease onset may be either insidious with mild prodromal symptoms or florid. Early symptoms and signs include malaise, fever, and vomiting. Sever headache, neck stiffness, photophobia, drowsiness, and a rash may develop. The rash may be petechial or purpuric and characteristically does not blanche under pressure. Meningitis in infants is more likely to be insidious in onset and lack the classical signs. In approx 15–20% of cases, septicemia is the predominant feature. Even with prompt antibiotic treatment, the case fatality rate is 3–5% in meningitis and 15–20% in those with septicemia. *(65)*.

7.2.3. Period of Infectivity

A person should be considered infectious until the bacteria are no longer present in nasal discharge. With treatment, this is usually approx 24 hour.

7.2.4. Routes of Transmission

The disease is spread through infected droplets or direct contact from carriers or those who are clinically ill. It requires prolonged and close contact, so it is a greater risk for people who share accommodation and utensils and kiss. It must also be remembered that unprotected mouth-to-mouth resuscitation can also transmit disease.

7.2.5. Management in Custody

It is not possible to tell if a detainee is a carrier. Nevertheless, the risk of acquiring infection even from an infected and sick individual is low, unless the individual has carried out mouth-to-mouth resuscitation. Any staff member who believes he or she has been placed at risk should report to the occupational health department (or equivalent) or the nearest emergency department at the earliest opportunity for vaccination.

If the detainee has performed mouth-to-mouth resuscitation, prophylactic antibiotics should be given before receiving vaccination. Rifampicin, ciprofloxacin, and ceftriaxone can be used; however, ciprofloxacin has numerous advantages *(66)*. Only a single dose of 500 mg (adults and children older than 12 years) is needed and has fewer side effects and contraindications than rifampicin. Ceftriaxone has to be given by injection and is therefore best avoided in the custodial setting. If the staff member is pregnant, advice should be sought from a consultant obstetrician, because ciprofloxacin is not recommended *(67)*.

For anyone dealing regularly with illegal immigrants (especially from the Middle East or Sub-Saharan Africa) (e.g., immigration services, custody staff at designated stations, medical personnel, and interpreters), should consider being vaccinated with ACWY Vax. A single injection provides protection for 3 years. Detainees suspected of disease should be sent directly to the hospital.

7.3. Tuberculosis

7.3.1. Prevalence and Epidemiology

Human TB is caused by infection with *Mycobacterium tuberculosis, Mycobacterium bovis, or Mycobacterium africanum*. It is a notifiable disease under legislation specific to individual countries; for example, in the United Kingdom, this comes under the Public Health (Control of Disease) Act of 1984. In 1993, the WHO declared TB to be a global emergency, with an estimated 7–8 million new cases and 3 million deaths occurring each year, the majority of which were in Asia and Africa. However, these statistics are likely to be an underestimate because they depend on the accuracy of reporting, and in poorer countries, the surveillance systems are often inadequate because of lack of funds.

Even in the United Kingdom, there has been an inconsistency of reporting particularly where an individual has concomitant infection with HIV. Some physicians found themselves caught in a dilemma of confidentiality until 1997, when the codes of practice were updated to encourage reporting with patient consent *(68)*.

With the advent of rapid identification tests and treatment and the use of Bacillus Calmette-Guérin (BCG) vaccination for prevention, TB declined during the first half of the 20th century in the United Kingdom. However, since the early 1990s, numbers have slowly increased, with some 6800 cases reported in 2002 *(69)*. In 1998, 56% of reported cases were from people born outside the United Kingdom and 3% were associated with HIV infection *(70,71)*.

London has been identified as an area with a significant problem. This has been attributed to its highly mobile population, the variety of ethnic groups, a high prevalence of HIV, and the emergence of drug-resistant strains (1.3% in 1998) (PHLS, unpublished data—Mycobnet).

A similar picture was initially found in the United States, when there was a reversal of a long-standing downward trend in 1985. However, between 1986 and 1992, the number of cases increased from 22,201 to 26,673 *(72)*. There were also serious outbreaks of multidrug-resistant TB (MDR-TB) in hospitals

Table 6
Symptoms of Tuberculosis

- Cough lasting >3 wk
- Anorexia and weight loss
- Mild hemoptysis (rusty colored)
- Swollen lymph glands
- Fatigue
- Fever and night sweats
- Cough with phlegm

in New York City and Miami *(73)*. Factors pertinent to the overall upswing included the emergence of HIV, the increasing numbers of immigrants from countries with a high prevalence of TB, and perhaps more significantly, stopping categorical federal funding for control activities in 1972. The latter led to a failure of the public health infrastructure for TB control. Since 1992, the trend has reversed as the CDC transferred most of its funds to TB surveillance and treatment program in states and large cities. From 1992 to 2001, the annual decline averaged by 7.3% *(74)*, but the following year this was reduced to 2%, indicating that there was no room for complacency. The WHO has been proactive and is redirecting funding to those countries most in need. In October 1998, a global partnership called Stop TB was launched to coordinate every aspect of TB control, and by 2002, the partnership had more than 150 member states. A target was set to detect at least 70% of infectious cases by 2005.

The acquisition of TB infection is not necessarily followed by disease because the infection may heal spontaneously. It may take weeks or months before disease becomes apparent, or infection may remain dormant for years before reactivation in later life especially if the person becomes debilitated or immunocompromised. Contrary to popular belief, the majority of cases of TB in people who are immunocompetent pass unnoticed. Of the reported cases, 75% involve the lung, whereas nonrespiratory (e.g., bone, heart, kidney, and brain) or dissemination (miliary TB) are more common in immigrant ethnic groups and individuals who are immunocompromised *(75)*. They are also more likely to develop resistant strains. In the general population, there is an estimated 10% lifetime risk of TB infection progressing to disease *(76)*.

There has been an increase in the number of cases of TB associated with HIV owing to either new infection or reactivation. TB infection is more likely to progress to active TB in HIV-positive individuals, with a greater than50% lifetime risk *(77)*. TB can also lead to a worsening of HIV with an increase in viral load *(78)*. Therefore, the need for early diagnosis is paramount, but it can be more difficult because pulmonary TB may present with nonspecific features (e.g., bilateral, unilateral, or lower lobe shadowing) *(79)*.

7.3.2. Symptoms of Pulmonary TB

After an incubation period of 4–12 weeks, symptoms may develop (*see* Table 6).

7.3.3. Routes of Transmission

The main route is airborne through infected droplets, but prolonged or close contact is needed. Nonrespiratory disease is not considered a risk unless the mycobacterium is aerosolized under exceptional circumstances (e.g., during surgery) or there are open abscesses.

7.3.4. Period of Infectivity

A person is considered infectious as long as viable bacilli are found in induced sputum. Untreated or incompletely treated people may be intermittently sputum positive for years.

After 2 weeks of appropriate treatment, the individual is usually considered as noninfectious. This period is often extended for treatment of MDR-TB or for those with concomitant HIV. Patient compliance also plays an important factor.

7.3.5. At-Risk Groups

The risk of infection is directly proportional to the degree of exposure. More severe disease occurs in individuals who are malnourished, immunocompromised (e.g., HIV), and substance misusers.

People who are immunocompromised are at special risk of MDR-TB or Mycobacterium avium intracellulare (MAI).

7.3.6. Management in Custody

Staff with disease should stay off work until the treatment course is complete and serial sputum samples no longer contain bacilli. Staff in contact with disease who have been vaccinated with BCG are at low risk of acquiring disease but should minimize their time spent in the cell. Those who have not received BCG or who are immunocompromised should avoid contact with the detainee wherever possible. Detainees with MAI do not pose a risk to a staff member, unless the latter is immunocompromised. Any staff member who is pregnant, regardless of BCG status or type of TB, should avoid contact.

Anyone performing mouth-to-mouth resuscitation with a person with untreated or suspected pulmonary TB should be regarded as a household contact and should report to occupational health or their physician if no other route exists. They should also be educated regarding the symptoms of TB. Anyone who is likely to come into repeated contact with individuals at risk of

TB should receive BCG (if he or she has not already done so), regardless of age, even though there is evidence to suggest that BCG administered in adult life is less effective. This does not apply to individuals who are immunocompromised or pregnant women. In the latter case, vaccination should preferably be deferred until after delivery.

Detainees with disease (whether suspected or diagnosed) who have not been treated or treatment is incomplete should be kept in custody for the minimum time possible. Individuals with TB who are immunocompromised are usually too ill to be detained; if they are, they should be considered at greater risk of transmitting disease to staff. Any detainee with disease should be encouraged to cover his or her mouth and nose when coughing and sneezing.

Staff should wear gloves when in contact with the detainee and when handling clothing and bedding. Any bedding should be bagged after use and laundered or incinerated. The cell should be deemed out of action until it has been ventilated and professionally decontaminated, although there is no hard evidence to support that there is a risk of transmission from this route *(70)*.

7.4. Severe Acute Respiratory Syndrome

7.4.1. General Information

On March 14, 2003, the WHO issued a global warning to health authorities about a new atypical pneumonia called SARS. The earliest case was believed to have originated in the Guandong province of China on November 16, 2002. The causative agent was identified as a new Corona virus—SARS–CoV *(80,81)*. By the end of June 2003, 8422 cases had been reported from 31 different countries, with a total of 916 deaths. Approximately 92% of cases occurred in China (including Hong Kong, Taiwan, and Macao). The case fatality rate varied from less than 1% in people younger than 24 years, 6% in persons aged 25–44 years, 15% in those aged 44–64 years, and more than 50% in persons 65 years or older. On July 5, 2003, the WHO reported that the last human chain of transmission of SARS had been broken and lifted the ban from all countries. However, it warned that everyone should remain vigilant, because a resurgence of SARS is possible. Their warning was well given because in December 2003, a new case of SARS was detected in China. At the time of this writing, three more cases have been identified. Knowledge about the epidemiology and ecology of SARS–CoV and the disease remains limited; however, the experience gained from the previous outbreak enabled the disease to be contained rapidly, which is reflected in the few cases reported since December 2003. There is still no specific treatment or preventative vaccine that has been developed.

7.4.2. Incubation Period and Symptoms

The incubation period is short, approx 3–6 days (maximum 10 days), and, despite the media frenzy surrounding the initial outbreak, SARS is less infectious than influenza. The following clinical case definition of SARS has been developed for public health purposes *(82)*.

A person with a history of any combination of the following should be examined for SARS:

- Fever (at least 38°C); and
- One of more symptoms of lower respiratory tract illness (cough, difficulty in breathing, or dyspnea); and
- Radiographic evidence of lung infiltrates consistent with pneumonia or respiratory distress syndrome or postmortem findings of these with no identifiable cause; and
- No alternative diagnosis can fully explain the illness.

Laboratory tests have been developed that include detection of viral RNA by PCR from nasopharyngeal secretions or stool samples, detection of antibodies by enzyme-linked immunosorbent assay or immunofluorescent antibody in the blood, and viral culture from clinical specimens.

7.4.3. Route of Transmission

Available information suggests that close contact via aerosol or infected droplets from an infected individual provide the highest risk of acquiring the disease. Most cases occurred in hospital workers caring for an index case or his or her close family members.

7.4.4. Management in Custody

Despite the re-emergence of SARS, it is highly unlikely that a case will be encountered in the custodial setting in the near future. However, forensic physicians must remain alert for the SARS symptoms and keep up-to-date with recent outbreaks. Information can be obtained from the WHO on a daily basis from its Web site. If SARS is suspected, medical staff should wear gloves and a surgical mask when examining a suspected case; however, masks are not usually available in custody. Anyone suspected of SARS must be sent immediately to the hospital, and staff who have had prolonged close contact should be alerted as to the potential symptoms.

8. Infections Transmitted Through the Fecal–Oral Route

8.1. General Considerations

The most consistent feature of diseases transmitted through the fecal–oral route is diarrhea (*see* Table 7). Infective agents include bacteria, viruses,

Table 7
Common Causes of Infective Diarrhea

Cause	Symptoms	Incubation	Infectivity	Notes
Campylobacter	C, F, N,V, BD	1–10 days	Untreated, 7 weeks	Requires antibiotics. Seek advice. Acute phase exclude from custody.
Escherichia coli O157:H7	BD (or WD) F unusual	3–8 days	Up to 7 days	Person to person spread. Can be serious with TTP, HUS, dehydration. Seek advice.
Norwalk virus	N, V, D, A P, mild F	24–48 hours	Up to 48 hours after diarrhea stops	Mild to moderate. Self-limiting.
Rotavirus	F, V, WD	24–72 hours	Up to 8 days. Up to 30 d in immuno-compromised	Symptomatic treatment. Persists in environment.
Salmonella	H, AP, D, N, F ± V	6–72 hours	1 day to 1 week	Persistent carriage can occur. Requires antibiotics. Seek advice.
Shigella	DY/WD, F, N (C,V)	12–96 hours	Up to 4 weeks	Usually mild in United Kingdom. Can be severe in IC. Requires antibiotics in custody. Take advice. Person to person spread.

AP, abdominal pain; BD, bloody diarrhea; C, cramps; D, diarrhea; DY, dysentery (blood and mucus); F, fever; H, headache; HUS, hemolytic–uremic syndrome; IC, immunocompromised; N, nausea; TTP, thrombotic thrombocytopenic purpura; V, vomiting; WD, watery diarrhea.

and protozoa. Because the causes are numerous, it is beyond the remit of this chapter to cover them all. It is safest to treat all diarrhea as infectious, unless the detainee has a proven noninfectious cause (e.g., Crohn's disease or ulcerative colitis).

All staff should wear gloves when in contact with the detainee or when handling clothing and bedding, and contaminated articles should be laundered or incinerated. The cell should be professionally cleaned after use, paying particular attention to the toilet area.

8.3. Hepatitis A

8.3.1. Epidemiology and Prevalence

This viral hepatitis occurs worldwide, with variable prevalence. It is highest in countries where hygiene is poor and infection occurs year-round. In temperate climates, the peak incidence is in autumn and winter, but the trend is becoming less marked.

All age groups are susceptible if they are nonimmune or have not been vaccinated. In developing countries, the disease occurs in early childhood, whereas the reverse is true in countries where the standard of living is higher.

In the United Kingdom, there has been a gradual decrease in the number of reported cases from 1990 to 2000 *(83,84)*. This results from, in part, improved standards of living and the introduction of an effective vaccine. The highest incidence occurs in the 15- to 34-year-old age group. Approximately 25% of people older than 40 years have natural immunity, leaving the remainder susceptible to infection *(85)*.

Small clusters occur from time to time, associated with a breakdown in hygiene. There is also an increasing incidence of HAV in gay or bisexual men and their partners *(86)*. An unpublished study in London in 1996 showed a seroprevalence of 23% among gay men (Young Y et al., unpublished).

8.3.2. Symptoms

The clinical picture ranges from asymptomatic infection through a spectrum to fulminant hepatitis. Unlike HBV and HCV, HAV does not persist or progress to chronic liver damage. Infection in childhood is often mild or asymptomatic but in adults tends to be more severe.

After an incubation period of 15–50 days (mean 28 days) symptomatic infection starts with the abrupt onset of jaundice anything from 2 days to 3 weeks after the anicteric phase. It lasts for approximately the same length of time and is often accompanied by a sudden onset of fever.

HAV infection can lead to hospital admission in all age groups but is more likely with increasing age as is the duration of stay.

The overall mortality is less than 1%, but 15% of people will have a prolonged or relapsing illness within 6–9 months (CDC fact sheet). Fulminant hepatitis occurs in less than 1% of people but is more likely to occur in individuals older than 65 years or in those with pre-existing liver disease. In patients who are hospitalized, case fatality ranges from 2% in 50–59 years olds to nearly 13% in those older than 70 years *(84)*.

8.3.3. Period of Infectivity

The individual is most infectious in the 2 weeks before the onset of jaundice, when he or she is asymptomatic. This can make control of infection difficult because the disease is not recognized.

8.3.4. Routes of Transmission

The main route is fecal–oral through the ingestion of contaminated water and food. It can also be transmitted by personal contact, including homosexuals practicing anal intercourse and fellatio. There is a slight risk from blood transfusions if the donor is in the acute phase of infection. It should not be considered a risk from needlestick injuries unless clinical suspicion of HAV is high.

8.3.5. Risk Groups

Risk groups include homeless individuals, homosexuals, IDUs, travellers abroad who have not been vaccinated, patients with chronic liver disease and chronic infection with HBV and HCV, employees and residents in daycare centers and hostels, sewage workers, laboratory technicians, and those handling nonhuman primates.

Several large outbreaks have occurred among IDUs, some with an epidemiological link to prisons *(87,88)*. Transmission occurs during the viremic phase of the illness through sharing injecting equipment and via fecal–oral routes because of poor living conditions *(89)*. There have also been reports of HAV being transmitted through drugs that have been carried in the rectum. A study in Vancouver showed that 40% of IDUs had past infection of HAV, and they also showed an increased prevalence among homosexual/bisuexual men *(90)*.

8.3.6. Management in Custody

Staff with disease should report to occupational health and stay off work until the end of the infective period. Those in contact with disease (either through exposure at home or from an infected detainee) should receive prophylactic treatment as soon as possible (*see* Subheading 8.3.7.).

Table 8
Suspicion of Exotica?
History and Examination Aide Memoir

- Has the detainee traveled to Africa, South East Asia, the Indian subcontinent, Central/South America, or the Far East in the last 6–12 months?
- Ascertain whether he or she received any vaccinations before travel and, if so, which ones.
- Ask if he or she took malaria prophylaxis, what type, and whether he or she completed the course.
- Ask if he or she swam in any stagnant lakes during the trip.
- If the answer to any of the above is yes, ask if he or she has experienced any of the following symptoms:
  - A fever/hot or cold flushes/shivering.
  - Diarrhea ± abdominal cramps ± blood or slime in the stool.
  - A rash.
  - Persistent headaches ± light sensitivity.
  - Nausea or vomiting.
  - Aching muscles/joints.
  - A persistent cough (dry or productive) lasting at least 3 weeks.
- Take temperature.
- Check skin for signs of a rash and note nature and distribution.
- Check throat.
- Listen carefully to the lungs for signs of infection/consolidation.

To minimize the risk of acquiring disease in custody, staff should wear gloves when dealing with the detainee and then wash their hands thoroughly. Gloves should be disposed of only in the clinical waste bags.

Detainees with disease should be kept in custody for the minimum time possible. They should only be sent to the hospital if fulminant hepatitis is suspected. The cell should be quarantined after use and professionally cleaned. Any bedding or clothing should be handled with gloves and laundered or incinerated according to local policy. Detainees reporting contact with disease should be given prophylactic treatment as soon as possible (*see* Subheading 8.3.7.).

8.3.7. Prophylaxis and Treatment

Contacts of HAV should receive HAV vaccine (e.g., Havrix Monodose or Avaxim) if they have not been previously immunized or had disease. Human normal immunoglobulin (HNIG), 500 mg, deep intramuscular in gluteal muscle should be used in the following circumstances:

Table 9
Tropical Diseases That Present With Fever

Disease	Countries	Incubation	Transmission	Management
Dengue	Most hot climates	3–14 days	Mosquito No person-to-person in UK	Symptomatic
Hantavirus	Eastern Europe	2 days–8 weeks	No person-to-person in UK	Symptomatic
Lassa Fever	West Africa			Hospital
Malaria	Sub-Saharan Africa, Southeast Asia, South America	7 days–1 years	Mosquito	No person-to-person in UK. Requires urgent treatment. Hospital.
Typhoid	Hot climates	Up to 72 hours	Oral–fecal	Requires antibiotics.
Yellow Fever	Sub-Saharan Africa, parts of South America	3–6 days No person-to-person in UK	Mosquito	Hospital

UK, United Kingdom.

Table 10
Tropical Diseases That Present With Diarrhea

Disease	Incubation	Infectivity	Transmission	Management
Amoebic dysentery	Days to months	1 Year	Oral–fecal	Requires antibiotics
Cholera	Hours–5 days	3–5 days after recovery	Oral–fecal; vomit.	Requires antibiotics
Giardia	3–25 days	Months	Oral–fecal	Treat with tinidazole
Malaria	7 days –1 years	None	No person-to-person	Urgent treatment. Hospital.
Typhoid	Up to 72 hours	Days to weeks	Oral–fecal	Requires antibiotics

- The contact is older than 50 years.
- Has cirrhosis or pre-existing HBV, HBC, or HDV.
- Contact has occurred more than 8 d but less than 28 days from exposure.

Staff at higher risk of coming in to contact with HAV should consider being vaccinated before exposure. Two doses of vaccine given 6–12 months apart give at least 10 years of protection.

There is no specific treatment for HAV, except supportive measures and symptomatic treatment.

9. Exotica

Although the chance of encountering a tropical disease in custo1dy is small, it is worth bearing in mind. It is not necessary for a forensic physician to be able to diagnose the specific disease but simply to recognize that the detainee/staff member is ill and whether he or she needs to be sent to the hospital (*see* Tables 8–10).

This is best achieved by knowing the right questions to ask and carrying out the appropriate examination. Tables 8–10 should be used as an aide to not missing some more unusual diseases.

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