

Hepatitis A

NOTIFIABLE

The disease

Hepatitis A is an infection of the liver caused by hepatitis A virus. The disease is generally mild, but severity tends to increase with age. Asymptomatic disease is common in children. Jaundice may occur in 70–80% of those infected as adults. Fulminant hepatitis can occur but is rare. The overall case–fatality ratio is low but is greater in older patients and those with pre-existing liver disease. There is no chronic carrier state and chronic liver damage does not occur.

The virus is usually transmitted by the faecal–oral route through person-to-person spread or contaminated food or drink. Foodborne outbreaks have been reported following ingestion of certain shellfish (bivalve molluscs such as mussels, oysters and clams that feed by filtering large volumes of sewage-polluted waters) and salad vegetables. Transmission of hepatitis A has been associated with the use of factor VIII and factor IX concentrates where viral inactivation procedures did not destroy hepatitis A virus. The incubation period is usually around 28–30 days but may occasionally be as little as 15 or as much as 50 days.

History and epidemiology of the disease

Improved standards of living and hygiene have led to a marked fall in the incidence of hepatitis A infection. In the UK, this has resulted in high susceptibility levels in adults, with the typical age of infection shifting from children to older age groups. In 1996, the overall seroprevalence of hepatitis A in England and Wales was estimated to be 31%, and was 11% among those aged 10–19 years (Morris *et al.*, 2002). Therefore, the majority of adolescents and adults remain susceptible to hepatitis A infection and will remain so throughout life, with the potential for outbreaks to occur.

Hepatitis A infection acquired in the UK may either present as sporadic cases, as community-wide outbreaks resulting from person-to-person transmission or, uncommonly, as point of source outbreaks related to contaminated food. Previously, the incidence of hepatitis A showed a cyclical pattern in the UK. However, there has been no peak in incidence since 1990 when 7545 cases

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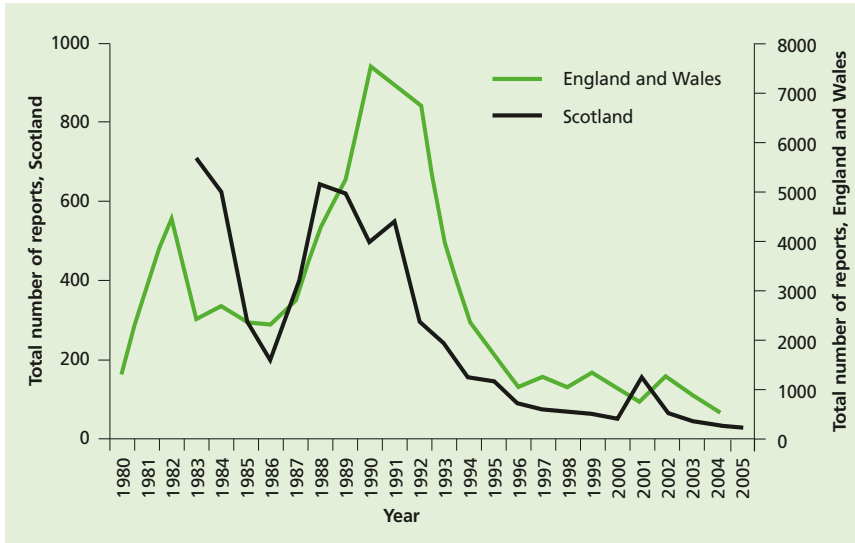


Figure 17.1 Number of laboratory-confirmed hepatitis A reports in England and Wales (1980–2004) and Scotland (1983–2005)

were reported for England and Wales. There were 669 reports in 2004 (HPA, 2005). In Scotland, 26 cases of hepatitis A infection were reported to Health Protection Scotland (formerly the Scottish Centre for Infection and Environmental Health (SCIEH)) in 2005. This is the lowest annual number of acute cases ever recorded. Acute hepatitis A infection had been observed to decrease steadily in Scotland from 1993 (241 cases) to 2000 (50 cases).

In recent decades in the UK, there has been a number of outbreaks of hepatitis A among men who have sex with men (MSM). Similarly, outbreaks have also been documented in a number of other European countries. Transmission appears to be by the faecal–oral route. Some studies have shown associations with multiple anonymous sexual contacts, particularly in ‘darkrooms’ or clubs (Reintjes *et al.*, 1999; Bell *et al.*, 2001).

Outbreaks of hepatitis A have also been documented among injecting drug users in several countries. An outbreak among injecting drug users in Aberdeen (Roy *et al.*, 2004) contributed to a major increase in the number of cases in Scotland in 2001 (148 cases). Recently, outbreaks of hepatitis A in other parts of the UK have involved a high proportion of individuals with a history of injecting and homeless people living together in hostels and shelters (O’Donovan *et al.*, 2001; Syed *et al.*, 2003; Perrett *et al.*, 2003). Close contact and poor standards of personal hygiene among these groups, with possible

faecal contamination of shared injecting equipment or drugs, appears to be the most likely mode of transmission (Hutin *et al.*, 2000; Roy *et al.*, 2004).

Hepatitis A is more common in countries outside Northern and Western Europe, North America, Australia and New Zealand. Travel abroad is a common factor in sporadic cases in the UK. The highest risk areas for UK travellers are the Indian subcontinent and the Far East, but the risk extends to Eastern Europe.

The hepatitis A vaccination

There are two products for immunisation against hepatitis A. An immunoglobulin provides rapid but temporary immunity. The vaccine confers active immunity but response is not immediate. Vaccines are available as either monovalent, or combined with either typhoid or hepatitis B.

Hepatitis A monovalent vaccines and those combined with either typhoid or hepatitis B do not contain thiomersal. The vaccines are inactivated, do not contain live organisms and cannot cause the diseases against which they protect.

Monovalent vaccines

Four monovalent vaccines are currently available, prepared from different strains of the hepatitis A virus; all are grown in human diploid cells (MRC5). Three (Havrix[®], Vaqta[®] and Avaxim[®]) are adsorbed onto an aluminium hydroxide adjuvant. The fourth, Epaxal[®] vaccine, contains formalin-inactivated hepatitis A particles attached to phospholipid vesicles together with influenza virus haemagglutinin derived from inactivated influenza virus H1N1 (Gluck *et al.*, 1992; Loutan *et al.*, 1994). These vaccines can be used interchangeably (Bryan *et al.*, 2000; Clarke *et al.*, 2001; Beck *et al.*, 2004).

Combined hepatitis A and hepatitis B vaccine

Combined vaccines containing purified inactivated hepatitis A virus and purified recombinant hepatitis B surface antigen adsorbed onto aluminium hydroxide (Twinrix[®]) or aluminium phosphate (Ambirix[®]), may be used when protection against both hepatitis A and hepatitis B infections is required. If rapid protection against hepatitis A is required for adults, for example following exposure or during outbreaks, then a single dose of monovalent vaccine is recommended. In children under 16 years, a single dose of Ambirix[®] may also be used for rapid protection against hepatitis A. Both vaccines contain the higher amount of hepatitis A antigen and will therefore provide hepatitis A protection more quickly than Twinrix[®].

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Combined hepatitis A and typhoid vaccine

Combined vaccines containing purified inactivated hepatitis A virus adsorbed onto aluminium hydroxide and purified Vi capsular polysaccharide typhoid vaccine (Hepatyrix® or ViATIM®) may be used where protection against hepatitis A and typhoid fever is required (see also Chapter 34 on typhoid).

Human normal immunoglobulin

Human normal immunoglobulin (HNIG) is prepared from pooled plasma derived from blood donations. Use of HNIG should be limited to situations where it may have a definite advantage over vaccine. HNIG can provide immediate protection, although antibody levels are lower than those eventually produced by hepatitis A vaccine. There have been no studies directly comparing the efficacy of HNIG with vaccine for prophylaxis in contacts of cases. HNIG licensed for use for prophylaxis must have a hepatitis A antibody level of at least 100IU/ml.*

Because of a theoretical risk of transmission of vCJD from plasma products, HNIG used in the UK is now prepared from plasma sourced from outside the UK, and supplies are scarce. All donors are screened for HIV, hepatitis B and C, and all plasma pools are tested for the presence of RNA from these viruses. A solvent detergent inactivation step for envelope viruses is included in the production process.

Storage

Vaccines should be stored in the original packaging at +2°C to +8°C and protected from light. All vaccines are sensitive to some extent to heat and cold. Heat speeds up the decline in potency of most vaccines, thus reducing their shelf life. Effectiveness cannot be guaranteed for vaccines unless they have been stored at the correct temperature. Freezing may cause increased reactogenicity and loss of potency for some vaccines. It can also cause hairline cracks in the container, leading to contamination of the contents.

HNIG should be stored in the original packaging in a refrigerator at +2°C to +8°C. These products are tolerant to higher ambient temperatures for up to one week. They can be distributed in sturdy packaging outside the cold chain, if needed.

* HNIG for hepatitis A prophylaxis is in short supply and, from time to time, alternative products and doses may need to be used. For the latest advice, please check with the Health Protection Agency (www.hpa.org.uk) or Health Protection Scotland (www.hps.scot.nhs.uk).

Presentation

Vaccine	Product	Pharmaceutical presentation	Instructions on handling before use
Monovalent hepatitis A vaccines	Havrix Monodose® Avaxim® Vaqta® Vaqta Paediatric® Havrix Junior Monodose®	Suspension for injection	Shake well to produce a slightly opaque, white suspension
	Epaxal®	Emulsion for injection	Check for any particulate matter
Combined hepatitis A and B vaccine	Twinrix Adult® Twinrix Paediatric®	Suspension for injection	Shake the vaccine well to obtain a slightly opaque suspension
	Ambirix®	Suspension for injection in a pre-filled syringe	Shake the vaccine well to obtain a slightly opaque suspension
Combined hepatitis A and typhoid vaccine	ViATIM®	A dual-chamber syringe containing a cloudy, white suspension and a clear, colourless solution	Shake to ensure suspension is fully mixed. The contents of the two compartments are mixed as the vaccines are injected
	Hepatyrix®	Slightly opaque white suspension for injection	Shake the container well

Dosage and schedule

The immunisation regimes for hepatitis A vaccine and for combined hepatitis A and typhoid vaccine consist of a single dose. The standard schedule for the combined hepatitis A and hepatitis B vaccine depends on the product. For Twinrix® the schedule consists of three doses, the first on the elected date, the second one month later and the third six months after the first dose. For Ambirix® the schedule consists of two doses, the first administered on the elected date and the second between six and twelve months after the first dose.

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An accelerated schedule of Twinrix Adult® at 0, 7 and 21 days may be used when early protection against hepatitis B is required (e.g. for travellers departing within one month).

Dosage for monovalent hepatitis A immunisation

Vaccine product	Ages	Dose	Volume
Havrix Monodose®	16 years or over	1440 ELISA units	1.0ml
Havrix Junior Monodose®	One to 15 years	720 ELISA units	0.5ml
Avaxim®	16 years or over	160 antigen units	0.5ml
Vaqta Paediatric®	One to 17 years	~25 units	0.5ml
Epaxal®	One year or over	500 RIA units	0.5ml

Dosage of combined hepatitis A and typhoid vaccines

Vaccine product	Ages	Dose HAV	Dose Vi P Ty	Volume
Hepatyrix®	15 years or over	1440 ELISA units	25µg	1.0ml
ViATIM®	16 years or over	160 antigen units	25µg	1.0ml

Dosage of combined hepatitis A and hepatitis B vaccines

Vaccine product	Ages	Dose HAV	Dose HBV	Volume
Twinrix Adult®	16 years or over	720 ELISA units	20µg	1.0ml
Twinrix Paediatric®	1 to 15 years	360 ELISA units	10µg	0.5ml
Ambirix®	1 to 15 years	720 ELISA units	20µg	1.0ml

Dosage of HNIG

- 250mg for children under ten years.
- 500mg for those aged ten years or older.

Administration

Vaccines are routinely given into the upper arm or anterolateral thigh. However, for individuals with a bleeding disorder, vaccines should be given by deep subcutaneous injection to reduce the risk of bleeding.

Hepatitis A-containing vaccines can be given at the same time as other vaccines such as hepatitis B, MMR, MenC, Td/IPV and other travel vaccines. The vaccines should be given at a separate site, preferably in a different limb. If given in the same limb, they should be given at least 2.5cm apart (American Academy of Pediatrics, 2003). The site at which each vaccine was given should be noted in the individual's records.

HNIG can be administered in the upper outer quadrant of the buttock or anterolateral thigh (see Chapter 4). If more than 3ml is to be given to young children and infants, or more than 5ml to older children and adults, the immunoglobulin should be divided into smaller amounts and administered at different sites. HNIG may be administered, at a different site, at the same time as hepatitis A vaccine.

Disposal

Equipment used for vaccination, including used vials, ampoules, or partially discharged vaccines should be disposed of at the end of a session by sealing in a proper, puncture-resistant 'sharps' box according to local authority regulations and guidance in the technical memorandum 07-01 (Department of Health, 2006).

Recommendations for the use of the vaccine

Pre-exposure vaccination

The objective of the immunisation programme is to provide two doses of a hepatitis A-containing vaccine at appropriate intervals for all individuals at high risk of exposure to the virus or of complications from the disease.

Groups recommended to receive pre-exposure vaccination

People travelling to or going to reside in areas of high or intermediate prevalence

Immunisation with hepatitis A vaccine is recommended for those aged one year and over travelling to areas of moderate or high endemicity, such as the Indian subcontinent, for prolonged periods, particularly if sanitation and food hygiene is likely to be poor. Vaccine is also recommended for all individuals going to reside in or likely to be posted for long periods to hepatitis A virus-endemic countries.

Although hepatitis A is usually sub-clinical in children, it can be severe and require hospitalisation. Even children who acquire mild or sub-clinical hepatitis A may be a source of infection to others. The risks of disease for

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children under one year old are low, and vaccines are not licensed for their use at this age. Care should be taken to prevent exposure to hepatitis A infection through food and water.

For travellers, vaccine should preferably be given at least two weeks before departure, but can be given up to the day of departure. Although antibodies may not be detectable for 12–15 days following administration of monovalent hepatitis A vaccine, the vaccine may provide some protection before antibodies can be detected using current assays.

Immunisation is not considered necessary for individuals travelling to or going to reside in Northern or Western Europe (including Spain, Portugal and Italy), or North America, Australia or New Zealand. HNIG is no longer recommended for travel prophylaxis. Country-by-country recommendations for hepatitis A and other travel vaccines are given in *Health information for overseas travel* (www.nathnac.org).

Patients with chronic liver disease

Although patients with chronic liver disease may be at no greater risk of acquiring hepatitis A infection, it can produce a more serious illness in these patients (Akriviadis and Redeker, 1989; Keefe, 1995). Immunisation against hepatitis A is therefore recommended for patients with severe liver disease of whatever cause. Vaccine should also be considered for individuals with chronic hepatitis B or C infection and for those with milder forms of liver disease.

Patients with haemophilia

As standard viral inactivation processes may not be effective against hepatitis A, patients with haemophilia who are receiving plasma-derived clotting factors should be immunised against hepatitis A. Patients with haemophilia should be immunised subcutaneously.

Men who have sex with men

MSM with multiple sexual partners need to be informed about the risks of hepatitis A, and about the need to maintain high standards of personal hygiene. Immunisation should be offered to such individuals, particularly during periods when outbreaks are occurring.

Injecting drug users

Hepatitis A immunisation is recommended for injecting drug users and can be given at the same time as hepatitis B vaccine, as separate or combined preparations.

Individuals at occupational risk

Hepatitis A vaccination is recommended for the following groups:

- **laboratory workers:** individuals who may be exposed to hepatitis A in the course of their work, in microbiology laboratories and clinical infectious disease units, are at risk and must be protected.
- **staff of some large residential institutions:** outbreaks of hepatitis A have been associated with large residential institutions for those with learning difficulties. Transmission can occur more readily in such institutions and immunisation of staff and residents is appropriate. Similar considerations apply in other institutions where standards of personal hygiene among clients or patients may be poor.
- **sewage workers:** raw, untreated sewage is frequently contaminated with hepatitis A. A UK study to evaluate this risk showed that frequent occupational exposure to raw sewage was an independent risk factor for hepatitis A infection (Brugha *et al.*, 1998). Immunisation is, therefore, recommended for workers at risk of repeated exposure to raw sewage, who should be identified following a local risk assessment.
- **people who work with primates:** vaccination is recommended for those who work with primates that are susceptible to hepatitis A infection.

Hepatitis A vaccination may be considered under certain circumstances for:

- **food packagers and handlers:** food packagers or food handlers in the UK have not been associated with transmission of hepatitis A sufficiently often to justify their immunisation as a routine measure. Where a case or outbreak occurs, advice should be sought from the local Health Protection Team
- **staff in day-care facilities:** infection in young children is likely to be sub-clinical, and those working in day-care centres and other settings with children who are not yet toilet trained may be at increased risk (Severo *et al.*, 1997). Under normal circumstances, the risk of transmission to staff and children can be minimised by careful attention to personal hygiene. However, in the case of a well-defined community outbreak, such as in a pre-school nursery, the need for immunisation of staff and children should be discussed with the local Health Protection Team
- **healthcare workers:** most healthcare workers are not at increased risk of hepatitis A and routine immunisation is not indicated.

Post-exposure immunisation

Either passive or active immunisation, or a combination of the two, is available for the management of contacts of cases and for outbreak control. There have been no trials directly comparing the efficacy of hepatitis A vaccine alone against HNIG in the management of contacts. HNIG is preferred when protection is required in a shorter time than it takes for a protective antibody response to the vaccine. Vaccine and HNIG may be given at the same time, but in different sites, when both rapid and prolonged protection is required. A single dose of monovalent hepatitis A vaccine will provide more rapid protection than the combined preparations where more than one dose is required.

HNIG has a proven record in providing prophylaxis for contacts of cases of acute hepatitis A. HNIG will protect against hepatitis A infection if administered within 14 days of exposure, and may modify disease if given after that time (Winokur and Stapleton, 1992). Protection lasts for four to six months.

There is some evidence that vaccine may be effective in preventing infection in contacts of cases, provided it can be given soon enough after the onset of symptoms in the index case. A study in Naples (Sagliocca *et al.*, 1999) showed hepatitis A vaccine had a 79% protective efficacy in household contacts of people with sporadic infection, where 56% of contacts received vaccine within four days of onset of symptoms in the index cases, and all within eight days. If vaccine is to be used in preference to HNIG for prophylaxis of contacts, cases of acute hepatitis A will need to be diagnosed and reported to public health officials quickly enough to allow administration of vaccine within one week of onset.

Contacts of cases of hepatitis A infection

Hepatitis A vaccine should be given to previously unvaccinated contacts of cases of hepatitis A with onset of jaundice within the last week. When the interval is longer, HNIG should be used, particularly for older people, given the greater severity of disease in this age group. Further guidance on the management of contacts is available in 'Guidelines for the control of hepatitis A virus infection' (Crowcroft *et al.*, 2001).

Prophylaxis restricted to household and close contacts may be relatively ineffective in controlling further spread. If given to a wider social group of recent household visitors (kissing contacts and those who have eaten food prepared by an index case), spread may be prevented more effectively.

If a food handler develops acute jaundice or is diagnosed clinically or serologically with hepatitis A infection, the local Health Protection Team should be immediately informed by telephone. This will allow a timely risk assessment of whether other food handlers in the same food preparation area could have been exposed and should be considered for post-exposure prophylaxis. Rapid serological confirmation and notification of hepatitis A infection will allow an assessment of the possible risks to any customers who can be traced and offered prophylaxis.

Further prophylaxis will not be required in immunocompetent contacts who have previously received hepatitis A vaccine.

If a contact is at ongoing risk of hepatitis A infection because of their lifestyle or any other reason, then they should be offered vaccine irrespective of whether they are offered HNIG.

Outbreaks

Active immunisation with monovalent hepatitis A vaccine provides longer duration of protection, and will be more effective in prolonged outbreaks, such as those that may occur among MSM or injecting drug users, where transmissions may continue after the protective effects of HNIG have ceased.

The appropriate approach to the management of outbreaks of hepatitis A infection with HNIG and/or hepatitis A vaccine should be discussed with the local Health Protection Team. Further guidance on the management of outbreaks is available in ‘Guidelines for the control of hepatitis A virus infection’ (Crowcroft *et al.*, 2001).

Primary immunisation

The primary immunisation course for hepatitis A vaccine and for combined Hepatitis A and typhoid vaccine consists of a single dose. For adult combined hepatitis A and B vaccines (Twinrix®) a primary course consists of three doses. There are two combined hepatitis A and B vaccines suitable for use in children. A primary course of Twinrix consists of three doses, whereas Ambirix® consists of two doses at a longer interval. The first dose of Ambirix®, however, provides equivalent protection to a primary course of single hepatitis A vaccine, although protection against hepatitis B is not complete until after the second dose. Protection from a primary course of single or combined vaccines lasts for at least one year.

Reinforcing immunisation

A booster dose of hepatitis A vaccine should be given at six to 12 months after the initial dose. This results in a substantial increase in the antibody titre and will give immunity beyond ten years, however, effective protection beyond ten years cannot be assured until this booster is given. Until further evidence is available on persistence of protective immunity, a further booster at 25 years is indicated for those at ongoing risk (Van Damme, 2003).

Where a combined hepatitis A and typhoid vaccine has been used to initiate immunisation, a dose of single antigen hepatitis A vaccine will be required six to 12 months later in order to provide prolonged protection against hepatitis A infection. Booster doses of the typhoid component will be required at three years.

For individuals who have received combined hepatitis A and B vaccine in an accelerated schedule, a booster dose is required at one year.

Delayed administration of the booster dose

Ideally, the manufacturers' recommended timing for the administration of the booster dose of hepatitis A vaccine should be followed. In practice, and particularly in infrequent travellers, there may be a delay in accessing this injection. Studies have shown that successful boosting can occur even when the second dose is delayed for several years (Landry *et al.*, 2001; Beck *et al.*, 2003), so a course does not need to be re-started.

Contraindications

There are very few individuals who cannot receive hepatitis A-containing vaccines. When there is doubt, appropriate advice should be sought from a consultant paediatrician, immunisation co-ordinator or local HPU rather than withholding vaccine.

The vaccine should not be given to those who have had:

- a confirmed anaphylactic reaction to a previous dose of a hepatitis A-containing vaccine, or
- a confirmed anaphylactic reaction to any component of the vaccine.

Epaxal should not be given to those who have had a confirmed anaphylactic hypersensitivity to egg products as a component of the vaccine is prepared on hens' eggs.

Precautions

Minor illnesses without fever or systemic upset are not valid reasons to postpone immunisation.

If an individual is acutely unwell, immunisation may be postponed until they have fully recovered. This is to avoid confusing the differential diagnosis of any acute illness by wrongly attributing any signs or symptoms to the adverse effects of the vaccine.

HNIG

When HNIG is being used for prevention of hepatitis A, it must be remembered that it may interfere with the subsequent development of active immunity from live virus vaccines. If immunoglobulin has been administered first, then an interval of three months should be observed before administering a live virus vaccine. If immunoglobulin has been given within three weeks of administering a live vaccine, then the vaccine should be repeated three months later. This does not apply to yellow fever vaccine since HNIG does not contain significant amounts of antibodies to this virus.

Pregnancy and breast-feeding

Hepatitis A-containing vaccines may be given to pregnant women when clinically indicated. There is no evidence of risk from vaccinating pregnant women or those who are breast-feeding with inactivated viral or bacterial vaccines or toxoids (Plotkin and Orenstein, 2004).

Immunosuppression and HIV infection

Individuals with immunosuppression and HIV infection can be given hepatitis A-containing vaccines (Bodsworth *et al.*, 1997; Kemper *et al.*, 2003) although seroconversion rates and antibody titre may be lower and appear to be related to the individual's CD4 count at the time of immunisation (Nielsen *et al.*, 1997; Kemper *et al.*, 2003). Re-immunisation should be considered and specialist advice may be required.

Further guidance is provided by the Royal College of Paediatrics and Child Health (www.rcpch.ac.uk), the British HIV Association (BHIVA) *Immunisation guidelines for HIV-infected adults* (BHIVA, 2006) and the Children's HIV Association of UK and Ireland (CHIVA) immunisation guidelines (www.bhiva.org/chiva).

Adverse reactions

Adverse reactions to hepatitis A vaccines are usually mild and confined to the first few days after immunisation. The most common reactions are mild, transient soreness, erythema and induration at the injection site. A small, painless nodule may form at the injection site; this usually disappears and is of no consequence.

General symptoms such as fever, malaise, fatigue, headache, nausea and loss of appetite are also reported less frequently.

HNIG is well tolerated. Very rarely, anaphylactoid reactions occur in individuals with hypogammaglobulinaemia who have IgA antibodies, or those who have had an atypical reaction to blood transfusion.

Serious, suspected adverse reactions to vaccines should be reported through the Yellow Card scheme.

No cases of blood-borne infection acquired through immunoglobulin preparations designed for intramuscular use have been documented in any country.

Supplies

Hepatitis A vaccine

- Avaxim® (adolescents and adults aged 16 years or over)
- Vaqta Paediatric® (children and adolescents from one up to 17 years)

These vaccines are available from Sanofi Pasteur MSD
(Tel: 0800 0855511).

- Havrix Monodose® (adults aged 16 years or over)
- Havrix Junior Monodose® (children and adolescents from one up to 15 years)

These vaccines are available from GlaxoSmithKline
(Tel: 0808 1009997).

- Epaxal® (adults and children from one year of age)

This vaccine is available from Crucell
(Tel: 084 4800 3907).

Combined vaccines

- ViATIM® (adults and adolescents aged 16 years or over) (with typhoid)
This vaccine is available from Sanofi Pasteur MSD.

- Ambirix® (children/adolescents aged one to 15 years) (with hepatitis B)
- Twinrix Adult® (aged 16 years or over) (with hepatitis B)
- Twinrix Paediatric® (children/adolescents aged one to 15 years) (with hepatitis B)
- Hepatyrix® (adults and adolescents aged 15 years or over) (with typhoid)

These vaccines are available from GlaxoSmithKline.

Immunoglobulin

HNIG is available **for contacts of cases and control of outbreaks only** from:

England and Wales:

Public Health England,
Centre for Infectious Disease Surveillance and Control
(Tel: 020 8200 6868).

Scotland:

Health Protection Scotland
Glasgow
(Tel: 0141 300 1100).

Northern Ireland:

Northern Ireland Public Health Laboratory
Belfast City Hospital
(Tel: 02890 329241).

HNIG is produced by the Scottish National Blood Transfusion Service
(Tel: 0131 536 5797 or 5763).

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