Snake bites. Most snake species are non-venomous and belong to the colubrid family although a few colubrids are technically venomous. The 3 families of venomous front-fanged snakes are the elapids, vipers, and sea snakes. Elapids include cobras, mambas, kraits, coral snakes, and the Australasian venomous land snakes. Vipers are subdivided into crotalids (pit vipers) and viperids. Viper bites are much more common than elapid bites, except in Australasia, where vipers do not occur naturally. Sea snake bites occur among fishermen of the Asian and western Pacific coastal areas. Although there are some notable exceptions, viper bites tend to cause vasculotoxicity, elapids cause neurotoxicity, and sea snakes cause myotoxicity.

Only a few snakes are known to be of medical importance. Of the vipers these include *Bothrops atrox* (Central and South America), *Bitis arietans* (Africa), *Echis carinatus* (Africa and Asia), *Vipera russelli* (Asia), and *Agkistrodon rhodostoma* (south-east Asia). In a few restricted areas of Africa and Asia, cobra bites are common; bites by mambas (Africa) and kraits (Asia) are rare. The carpet viper, *Echis pyramidum*, and saw-scaled viper, *Echis carinatus*, can justifiably be labelled the most dangerous snakes in the world and they cause more deaths and serious poisoning than any other snake.

Management of snake bite involves general supportive care and monitoring of vital functions but in a systemic snake-bite poisoning, specific snake venom antiserum is the most effective therapeutic agent available. If used correctly, it can reverse systemic poisoning when given hours or even days after the bite. It is highly desirable to wait for clear clinical evidence of systemic poisoning before giving an antiserum and therefore it should not be given routinely in all cases of snake bite. Monospecific antisera are more effective, and less likely to cause reactions, than polyvalent antisera. The dosage of antiserum to be used is dependent on the species of snake and the consequent potency of the requisite antiserum. The antiserum should be given intravenously diluted in isotonic saline, either by infusion or bolus injection (see under Adverse Effects and Precautions, above). First aid measures including incisions and suction to remove the venom and application of tourniquets are generally to be discouraged. In most cases, the bitten limb should be immobilised and the victim transferred to a medical facility, together with the snake if possible. For bites by elapids, when respiratory failure may occur before the patient reaches hospital, a tourniquet may be justified to delay the onset of neurotoxicity. Supportive treatment is necessary even in patients who have received an adequate dose of antiserum. Local pain may be treated with a suitable analgesic. Artificial respiration may be required in patients with symptoms of neurotoxicity. Anticholinesterases may be of benefit against the neurotoxic effects of some snake venoms and it has been recommended that an intravenous test dose of edrophonium preceded by atropine should be tried in patients with severe symptoms of neurotoxicity. For those patients who respond, treatment with neostigmine should be started but anticholinesterases are unlikely to affect outcome in patients who already require assisted respiration. Hypovolaemia should be corrected cautiously with parenteral fluids. Hypotension may be treated with subcutaneous adrenaline or, in patients bitten by Russell's viper, a response to dopamine has been noted. Patients with renal impairment may require dialysis if they do not respond to rehydration, diuretics, and dopamine. Broad spectrum antibacterials and a tetanus vaccine should be given as prophylactic measures. Surgical decompression and debridement of necrotic tissue may be necessary once normal haemostasis has been restored.

References.
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12. Cheng AC, Currie BJ. Venomous snakebites worldwide with a focus on the Australia-Pacific region: current management and controversies. *J Intensive Care Med* 2004; **19:** 259–69.
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16. Prenzel F, *et al.* Kreuzotterbisse—Klinik, Diagnostik und Behandlung. *Dtsch Med Wochenschr* 2008; **133:** 1075–80.

Preparations

Ph. Eur.: European Viper Venom Antiserum;
USP 31: Antivenin (Crotalidae) Polyvalent; Antivenin (Micrurus Fulvius).

Proprietary Preparations (details are given in Part 3)
Arg.: Suero Antiofidico Polivalente; ***Austral.:*** Polyvalent Snake Antivenom; ***Fr.:*** Viperfav; ***Hong Kong:*** Tiger Snake; ***Mex.:*** Antivipmyn; Coralmyn; ***USA:*** CroFab.

Spider Venom Antisera

Antisuero contra el veneno de arañas; Spider Antivenins; Spider Antivenoms.

Pharmacopoeias. Many pharmacopoeias, including *US*, have monographs.
USP 31 (Antivenin (Latrodectus Mactans)). A sterile freeze-dried preparation of specific venom-neutralising globulins obtained from the serum of healthy horses immunised against venom of black widow spiders (*Latrodectus mactans*). One dose neutralises the venom in not less than 6000 mouse LD_{50} of *L. mactans*. It contains thiomersal as preservative. It should be preserved in single-dose containers and stored at a temperature not exceeding 40°.

Adverse Effects and Precautions
As for antisera in general, p.2201.

Uses and Administration
The use of a spider venom antiserum suitable for the species of spider can prevent symptoms, provided that it is done with the least possible delay; other general supportive measures and symptomatic treatment may also be needed.

An antiserum against the black widow spider (*Latrodectus mactans*) is available in the USA and Canada. The contents of a vial containing at least 6000 antivenin units is the usual dose for adults and children. In severe cases and in children under 12 years of age it is given by intravenous infusion in sodium chloride 0.9% over 15 minutes; in less severe cases, it may be given by intramuscular injection.

Antivenoms are also available against other *Latrodectus* species, including the Australian red-back spider (*L. hasselti*) and the South African button spiders. An antiserum against the funnel-web spider (*Atrax robustus*) is available in Australia.

Antivenoms have also been developed against *Loxosceles* spiders and against *Phoneutria* spiders, but there is little evidence of their effectiveness.

Spider bites. Although many species of spider are venomous, relatively few pose a danger to man. Two main clinical syndromes are recognised; necrotic araneism, produced mainly by members of the genus *Loxosceles* which includes the brown recluse spider *L. reclusa*, and neurotoxic araneism produced by members of the genera *Latrodectus* (including the black widow and red-back spiders), *Phoneutria* (South American banana spiders), and *Atrax* (funnel-web spiders).

Necrotic araneism presents as local pain and erythema at the site of the bite, commonly developing into a necrotic lesion with a black eschar that sloughs after a few weeks, sometimes leaving an ulcer that heals gradually. The area affected can be extensive. Rarely, systemic symptoms including intravascular coagulation, haemolytic anaemia, respiratory distress, and renal failure, occur and may be life-threatening. A number of therapies have been suggested, but conservative management is usually adequate with surgical repair of any persistent defects if necessary. Dapsone is reported to produce beneficial effects on healing. Treatment for systemic manifestations is supportive. Antisera are available in some countries.

Neurotoxic araneism may involve severe pain, headache, vomiting, tachycardia, hypertension, muscle spasms, and occasionally pulmonary oedema, and coma, depending upon the species. Antisera are available and reported to be more effective than those for necrotic araneism, but should be reserved for serious envenomation. Intravenous injection of calcium gluconate 10% has been suggested to relieve muscle spasm as an alternative to conventional muscle relaxants.

References.
1. Clark RF, *et al.* Clinical presentation and treatment of black widow spider envenomation: a review of 163 cases. *Ann Emerg Med* 1992; **21:** 782–7.
2. Isbister GK, *et al.* Antivenom treatment in arachnidism. *J Toxicol Clin Toxicol* 2003; **41:** 291–300.
3. Nimorakiotakis B, Winkel KD. The funnel web and common spider bites. *Aust Fam Physician* 2004; **33:** 244–51.
4. Saucier JR. Arachnid envenomation. *Emerg Med Clin North Am* 2004; **22:** 405–22, ix.
5. Swanson DL, Vetter RS. Bites of brown recluse spiders and suspected necrotic arachnidism. *N Engl J Med* 2005; **352:** 700–707.

Preparations

USP 31: Antivenin (Latrodectus Mactans).

Proprietary Preparations (details are given in Part 3)
Canad.: Antivenin (Latrodectus Mactans); ***Mex.:*** Aracmyn.

Staphylococcal Immunoglobulins

Profile
Staphylococcal immunoglobulins are under investigation for passive immunisation against infection with *Staphylococcus aureus*.

Staphylococcal Vaccines

Vacunas estafilocócicas.

Profile
Staphylococcal vaccines have been developed for the prophylaxis of staphylococcal infections.

◊ A vaccine containing *Staphylococcus aureus* type 5 and type 8 capsular polysaccharides conjugated to non-toxic recombinant *Pseudomonas aeruginosa* exotoxin A showed promise[1] in early studies in patients with end-stage renal disease who were receiving haemodialysis; however, later work failed to confirm benefit and its development was stopped.

1. Shinefield H, *et al.* Use of a Staphylococcus aureus conjugate vaccine in patients receiving hemodialysis. *N Engl J Med* 2002; **346:** 491–6.

Preparations

Proprietary Preparations (details are given in Part 3)
Braz.: Estafiloide; ***Cz.:*** Polystafana; Stafal; ***USA:*** SPL.

Stone Fish Venom Antisera

Antisuero contra el veneno del pez piedra estuarino; Stone Fish Antivenins; Stone Fish Antivenoms.

Adverse Effects and Precautions
As for antisera in general, p.2201.

Uses and Administration
An antiserum for use in the management of stings by the stone fish (*Synanceja trachynis*) is available in Australia. The antiserum is prepared from the serum of horses that have been immunised with the venom of the stone fish. Other symptomatic and supportive treatments are given in addition.

Stone fish venom antiserum may be given by intramuscular injection or, in more severe cases, by intravenous infusion. When given by intravenous infusion, it should be diluted 1 in 10 with an intravenous solution. The initial dose of stone fish antivenom given to both adults and children is dependent on the number of visible puncture sites: 1 to 2 puncture sites, 2000 units; 3 to 4 puncture sites, 4000 units; and 5 or more puncture sites, 6000 units. The initial dose may be repeated if necessary should symptoms persist.

◊ References.

1. Sutherland SK. Stone fish bite. *BMJ* 1990; **300:** 679–80.
2. Lehmann DF, Hardy JC. Stonefish envenomation. *N Engl J Med* 1993; **329:** 510–11.

Streptococcus Group B Vaccines

Vacunas contra estreptococos del grupo B.

Profile
Vaccines for active immunisation against group B streptococcal infections are being developed. Giving a vaccine to pregnant women to prevent neonatal infection has been proposed.

◊ References.

1. Baker CJ, Edwards MS. Group B streptococcal conjugate vaccines. *Arch Dis Child* 2003; **88:** 375–8.

Tetanus Antitoxins

Antitoxinas tetánicas.
ATC — J06AA02.

Pharmacopoeias. Many pharmacopoeias, including *Eur.* (see p.vii), have monographs.
Ph. Eur. 6.2 (Tetanus Antitoxin for Human Use; Immunoserum Tetanicum ad Usum Humanum). A sterile preparation containing the specific antitoxic globulins that have the power of neutralising the toxin formed by *Clostridium tetani*. It is obtained by fractionation from the serum of horses, or other mammals, that have been immunised against tetanus toxin. For prophylactic use, it has a potency of not less than 1000 international units/mL, and for therapeutic use not less than 3000 international units/mL. It should be stored at 2° to 8°, and not be allowed to freeze.
The BP 2008 states that Tet/Ser may be used on the label.

Profile
Tetanus antitoxins neutralise the toxin produced by *Clostridium tetani* and have been used to provide temporary passive immunity against tetanus, but tetanus immunoglobulins (below) are preferred. A test dose of tetanus antitoxin should always be given to identify those who might suffer hypersensitivity reactions.

Whenever a non-immune patient is seen because of injury, a course of active immunisation should be instituted (see Tetanus Vaccines, p.2240).

Preparations

Ph. Eur.: Tetanus Antitoxin for Human Use.

Tetanus Immunoglobulins

Inmunoglobulinas contra el tétanos.
ATC — J06BB02.

Pharmacopoeias. Many pharmacopoeias, including *Eur.* (see p.vii) and *US*, have monographs.
Ph. Eur. 6.2 (Human Tetanus Immunoglobulin; Immunoglobulinum Humanum Tetanicum). A liquid or freeze-dried preparation

containing immunoglobulins, mainly immunoglobulin G (IgG). It is obtained from plasma containing specific antibodies against the toxin of *Clostridium tetani*. Normal immunoglobulin may be added. It contains not less than 100 international units/mL. Both the liquid and freeze-dried preparations should be stored, protected from light, in a colourless, glass container. The freeze-dried preparation should be stored under vacuum or under an inert gas.

USP 31 (Tetanus Immune Globulin). A sterile solution of globulins derived from the plasma of adult human donors who have been immunised with tetanus vaccine. It contains not less than 50 units of tetanus antitoxin/mL. It contains 10 to 18% of protein of which not less than 90% is gamma globulin. It contains glycine as a stabilising agent, and a suitable preservative. It should be stored at 2° to 8°.

Adverse Effects and Precautions

As for immunoglobulins in general, p.2201.

Interactions

As for immunoglobulins in general, p.2201.

Tetanus immunoglobulins will neutralise tetanus toxoid and should not be injected into the same site or in the same syringe as a tetanus vaccine.

Uses and Administration

Tetanus immunoglobulins are used for passive immunisation against tetanus.

The use of tetanus immunoglobulins is recommended in the UK and the USA as part of the management of tetanus-prone wounds in persons unimmunised or incompletely immunised against tetanus, in persons whose immunisation history is unknown, in persons who received the last dose of tetanus vaccine more than 10 years previously, and in patients with impaired immunity. Active immunisation with a tetanus vaccine (p.2240) should also be started simultaneously, and antibacterials and symptomatic therapy given as appropriate (see p.196 and p.1901). The usual dose of tetanus immunoglobulin is 250 units by intramuscular injection but, if more than 24 hours have elapsed since the wound was sustained, or if there is a risk of heavy contamination, or after burns, 500 units should be given irrespective of the immunisation history.

Tetanus immunoglobulin is also used in the treatment of tetanus, a recommended dose being 150 units/kg in total, given intramuscularly into multiple sites.

A preparation suitable for intravenous use is available in some countries. It is given for the treatment of tetanus in a dose of 5000 to 10 000 units by intravenous infusion.

Preparations

Ph. Eur.: Human Tetanus Immunoglobulin;
USP 31: Tetanus Immune Globulin.

Proprietary Preparations (details are given in Part 3)

Arg.: Gammatet; Igantet; IT SD-T; Tetabulin; ***Austria:*** Tetabulin; Tetagam; ***Belg.:*** Tetabuline; ***Braz.:*** Tetanobulin†; Tetanogamma; ***Canad.:*** BayTet†; Hypertet; ***Chile:*** Igantet; ***Cz.:*** Tetabulin; Tetaglobuline†; ***Fr.:*** Gammatetanos; ***Ger.:*** Tetagam N; Tetanobulin; ***Gr.:*** Tetagam-P; ***Hong Kong:*** BayTet; Tetabulin†; Tetuman†; ***Hung.:*** Tetig; ***India:*** Tetagam-P; ***Indon.:*** Tetagam P; ***Irl.:*** Tetabulin; ***Israel:*** BayTet; Tetaglobuline; ***Ital.:*** Gamma-Tet P; Ig Tetano†; Igantet; Immunotetan; Tetabulin; Tetagamma†; Tetanus-Gamma; Tetaven†; ***Malaysia:*** Igantet; Sero-Tet; Tetuman†; ***Mex.:*** BayTet†; Probi-Tet†; Tetanogamma; ***Neth.:*** TetaQuin; ***Philipp.:*** BayTet; Tetagam-P; Tetanea; ***Pol.:*** Tetabulin; ***Port.:*** Tetagam; Tetuman†; ***S.Afr.:*** Tetagam; ***Singapore:*** BayTet†; Igantet; ***Spain:*** Gamma Antitetanos; Tetagamma P; Tetuman†; ***Switz.:*** Tetagam; Tetuman; ***Thai.:*** Tetagam; Tetuman†; ***Turk.:*** Tetanea; Tetuman; ***UK:*** Liberim T†; Tetabulin†; ***USA:*** BayTet.

Tetanus Vaccines

Vacunas del tétanos.

ATC — J07AM01.

Pharmacopoeias. Many pharmacopoeias, including *Eur.* (see p.vii) and *US*, have monographs.

Ph. Eur. 6.2 (Tetanus Vaccine (Adsorbed); Vaccinum Tetani Adsorbatum). It is prepared from tetanus formol toxoid adsorbed on a mineral carrier which may be hydrated aluminium phosphate or aluminium hydroxide. The resulting mixture is isotonic with blood. Suitable antimicrobial preservatives may be added. The antigenic properties are adversely affected by certain antimicrobial preservatives particularly those of the phenolic type and these should not be added to the vaccine. It contains not less than 40 units per dose. It should be stored at 2° to 8°, not be allowed to freeze, and be protected from light.
The BP 2008 states that Tet may be used on the label.
The BP 2008 directs that when Tetanus Vaccine is prescribed or demanded and the form is not stated, Tetanus Vaccine (Adsorbed) may be dispensed or supplied.

BP 2008 (Tetanus Vaccine). It is prepared from tetanus toxin produced by the growth of *Clostridium tetani*. The toxin is converted to tetanus formol toxoid by treatment with formaldehyde solution. It contains suitable non-phenolic antimicrobial preservatives. It should be stored at 2° to 8° and be protected from light.
The BP 2008 states that Tet/Vac/FT may be used on the label.
The BP 2008 directs that when Tetanus Vaccine is prescribed or demanded and the form is not stated, Tetanus Vaccine (Adsorbed) may be dispensed or supplied.

USP 31 (Tetanus Toxoid). A sterile solution of the formaldehyde-treated products of growth of *Clostridium tetani*. It contains a non-phenolic preservative. It should be stored at 2° to 8° and not be allowed to freeze.

USP 31 (Tetanus Toxoid Adsorbed). A sterile preparation of plain tetanus toxoid precipitated or adsorbed by alum, aluminium hydroxide, or aluminium phosphate adjuvants. It should be stored at 2° to 8° and not be allowed to freeze.

Adverse Effects and Precautions

As for vaccines in general, p.2201.

Local reactions, usually after the use of adsorbed vaccines, and mild systemic reactions may occur. The incidence and severity of reactions increases with the number of doses given.

Anaphylaxis and neurological reactions have been reported rarely.

Although vaccination is usually postponed in patients suffering from an acute febrile illness, tetanus vaccine should be given to such patients in the presence of a tetanus-prone wound.

With the exception of the first booster dose of tetanus vaccine (which is usually given before school entry and about 3 years after the primary course), further boosters should not generally be given at intervals of less than 10 years because of an increased risk of severe local reactions.

Effects on the nervous system. Neuropathies have been reported rarely with tetanus vaccination. Optic neuritis and myelitis occurred[1] in an 11-year-old girl after a routine booster dose. Corticosteroids and immunoglobulin were given, and both vision and muscle power were restored after 11 months. Acute transverse myelitis was reported[2] in a 50-year-old man who received a tetanus vaccine and immunoglobulin after an injury. Neurological deficits were unchanged after 1 month despite use of corticosteroids. Other causes could not be ruled out in either case. Brachial neuritis that developed in 2 infants after immunisation with diphtheria, tetanus, and pertussis vaccine was attributed to the tetanus component.[3]

1. Topaloglu H, *et al.* Optic neuritis and myelitis after booster tetanus toxoid vaccination. *Lancet* 1992; **339:** 178–9.
2. Read SJ, *et al.* Acute transverse myelitis after tetanus toxoid vaccination. *Lancet* 1992; **339:** 1111–12.
3. Hamati-Haddad A, Fenichel GM. Brachial neuritis following routine childhood immunization for diphtheria, tetanus, and pertussis (DTP): report of two cases and review of the literature. *Pediatrics* 1997; **99:** 602–3.

GUILLAIN-BARRÉ SYNDROME. For a discussion on the relationship between tetanus-containing vaccines and Guillain-Barré syndrome, see Diphtheria and Tetanus Vaccines, p.2210.

Pregnancy. No connection has been found between use of tetanus vaccine during pregnancy and either congenital malformations[1] or spontaneous abortion.[2]

1. Silveira CM, *et al.* Safety of tetanus toxoid in pregnant women: a hospital-based case-control study of congenital anomalies. *Bull WHO* 1995; **73:** 605–8.
2. Catindig N, *et al.* Tetanus toxoid and spontaneous abortions: is there epidemiological evidence of an association? *Lancet* 1996; **348:** 1098–9.

Interactions

As for vaccines in general, p.2202.

Tetanus immunoglobulins will neutralise tetanus toxoid and should not be injected into the same site or in the same syringe as a tetanus vaccine.

Uses and Administration

Tetanus vaccines are used for active immunisation against tetanus.

For primary immunisation combined tetanus vaccines, usually diphtheria, tetanus, and pertussis vaccines (p.2210) or diphtheria, tetanus, pertussis, poliomyelitis, and Haemophilus influenzae vaccines (p.2212), are used. For discussion of immunisation schedules, see under Vaccines, p.2202. In adults requiring primary immunisation combined vaccines such as diphtheria and tetanus vaccines (p.2210) or diphtheria, tetanus, and poliomyelitis vaccines (p.2212) are used.

In children who complete the primary course in infancy, reinforcing doses are given at school entry and in adolescence using the recommended appropriate combined vaccines. In adults, a reinforcing dose is desirable 10 years later with a further dose after a further 10 years.

Tetanus vaccines should be part of wound management if primary immunisation is incomplete or boosters are not up-to-date. For tetanus-prone wounds, tetanus immunoglobulin (see above) may also be required. Tetanus vaccine and tetanus immunoglobulin may be given at the same time, but not at the same site. In the event of injury in non-immunised persons or if immunisation status is uncertain, the opportunity is usually taken to initiate a course of primary immunisation. Since this provides no immediate protection, prophylactic treatment with tetanus immunoglobulin is recommended for tetanus-prone wounds. Suitable antibacterial therapy may also be given (see p.196).

Neonatal tetanus. In 1989 WHO adopted a resolution to eliminate neonatal tetanus after estimates revealed that worldwide (but excluding China) it was the cause of 800 000 neonatal deaths each year, a figure representing about 50% of all such deaths in developing countries. Control of neonatal tetanus may be achieved by ensuring adequate hygiene during delivery and by ensuring protective immunity of the mother in late pregnancy. However, by mid-2000 there were 57 countries that had still not eliminated maternal and neonatal tetanus and WHO, UNICEF, and UNFPA agreed to set a target date of 2005 for elimination (defined as a rate of neonatal tetanus below 1 in 1000 live births at district level). However, by the end of 2007, 47 countries were still considered to have not achieved elimination.

Tetanus vaccine is given to all women of child-bearing age as part of WHO's Expanded Programme on Immunization. For pregnant women, 2 doses of vaccine should be given, the second dose at least 4 weeks after the first and at least 2 weeks before delivery; this may provide the newborn infant with about 80% protection against tetanus. For all women of child-bearing age, 3 doses of vaccine, with at least 4 weeks between the first two doses and 6 to 12 months between the second and third doses, provide 95 to 98% protection for at least 5 years. Fourth and fifth doses, each at least one year after the previous dose, prolong the immunity for 10 and 20 years respectively.

Reinforcing doses in adults. Although the current recommendation in the UK is that 5 doses of tetanus vaccine (as a 3-dose primary course in infancy and 2 reinforcing doses at preschool and in adolescence) is sufficient to produce satisfactory long-term protection in most circumstances, there has been concern about immunity in the elderly, and in particular women. Routine primary immunisation against tetanus was introduced in the UK in 1961, so individuals born before that year would not have been immunised in infancy, and unless they had been in the armed forces, may never have received a full primary course. Unless there is a clear immunisation history immunity to tetanus may be difficult to assess. It is also recommended in the UK that travellers to areas where medical attention may not be accessible, and who had the last dose of vaccine more than 10 years previously, should receive a booster even if they have had 5 doses previously.

Studies in the USA,[1] Australia,[2] and Austria[3] have shown that at least half of healthy people over 50 years of age did not have adequate circulating tetanus antibodies. However, the level of circulating antibodies in the absence of an antigen challenge may not be an appropriate measure of the immune status. The low incidence of clinical tetanus in adults provides circumstantial evidence of an adequate inducible antibody response on exposure to tetanus despite a decline in antibody concentrations with increasing age.[4,5] Conversely, there have been reports of tetanus occurring despite high antibody concentrations.[6,7] There have been calls for the introduction of regular booster injections in adults,[3,7-9] as is standard practice in the USA or alternatively a single booster in late middle age[10,11] or giving a primary course to elderly persons who have never received one.[1]

1. Gergen PJ, *et al.* A population-based serologic survey of immunity to tetanus in the United States. *N Engl J Med* 1995; **332:** 761–6.
2. Heath TC, *et al.* Tetanus immunity in an older Australian population. *Med J Aust* 1996; **164:** 593–6.
3. Steger MM, *et al.* Vaccination against tetanus in the elderly: do recommended vaccination strategies give sufficient protection? *Lancet* 1996; **348:** 762.
4. Bowie C. Tetanus toxoid for adults—too much of a good thing. *Lancet* 1996; **348:** 1185–6.
5. Baily G. Are the elderly inadequately protected against tetanus? *Lancet* 1996; **348:** 1389–90.
6. Passen EL, Andersen BR. Clinical tetanus despite a 'protective' level of toxin-neutralising antibody. *JAMA* 1986; **255:** 1171–3.
7. Bowman C, *et al.* Tetanus toxoid for adults. *Lancet* 1996; **348:** 1664.
8. Rethy LA, Rethy L. Can tetanus boosting be rejected? *Lancet* 1997; **349:** 359–60.
9. Sehgal R. Tetanus toxoid for adults. *Lancet* 1997; **349:** 573.
10. Balestra DJ, Littenberg B. Tetanus immunization in adults. *JAMA* 1994; **272:** 1900.
11. Gardner P, LaForce FM. Protection against tetanus. *N Engl J Med* 1995; **333:** 599.