

JCVI Statement on Tetanus Immunisation

Executive Summary

UK tetanus vaccination policy has been successful in controlling tetanus. The incidence of tetanus in the UK decreased following the national introduction of tetanus immunisation in 1961 and is now very low. On average, ten cases of tetanus were reported annually in England and Wales between 1984 and 2000. Of these, 75% were in individuals over 45 years of age, with the highest annual incidence in those over 64 years of age. Of cases with information on immunisation status, 63% had never been immunised with tetanus vaccine, and only one case (with mild clinical disease) had received the five recommended doses of tetanus vaccine (Rushdy *et al.*, 2003). No cases of tetanus were reported in infants or children under five years of age.

Since 2003, there has been a change in the epidemiology of tetanus with injecting drug users (IDUs) becoming the most important risk group (HPA, 2005; Hahne *et al.*, 2006). Forty cases of tetanus were reported in the period 2003-5 (12 cases in 2003, 22 in 2004 and 6 in 2005). Only 13 of these were not, or not known to be IDUs. Only one in the 27 cases in known IDUs was documented to be fully vaccinated.

Current tetanus prevention policy recommends five doses of tetanus toxoid, with a primary immunisation course at 2,3 and 4 months of age and booster doses three years following completion of primary immunisation (pre-school booster) and again at 13-18 years of age (school-leaving booster).

Age-related falls in both humoral and cell mediated immune responses to tetanus vaccine have been observed (Schatz *et al.*, 1998; Bayas *et al.*, 2001). When routine tetanus vaccination was first introduced in the 1960's, older age groups are likely to have received tetanus vaccine doses as older children and adults on an ad hoc basis. As more individuals are now increasingly likely to have completed a 5-dose immunisation course by 18 years of age compared to when tetanus vaccination was first introduced, it may be necessary to add further booster doses of tetanus to the UK immunisation schedule in the future if there is evidence that protection wanes over time. The current epidemiology suggests that the addition of a routine sixth dose of tetanus vaccine is not required at this time. The incidence of confirmed tetanus cases should continue to be carefully monitored to ensure levels of disease remain low.

Because the incubation period for tetanus typically varies between 3-21 days, vaccination at the time of tetanus-prone injury will only benefit those cases where the incubation period is longer than the time it takes for the tetanus toxoid to confer or boost immunity. In the case of an unimmunised individual, a single dose will not confer protection. The secondary immune response to vaccine boosting may develop in less than a week (Odendahl *et al.*, 2005; Di Genova *et al.*, 2006) but other studies have found no boosting of antibody

levels after four days (Porter *et al.*, 1992) but have found protective antibody titres around seven days following immunisation (Simonsen *et al.*, 1987).

For this reason, tetanus toxoid is not considered adequate for treating a tetanus prone wound and the administration of tetanus immunoglobulin (TIG) is the preferred treatment. Tetanus toxoid may have some benefit and so may be used for treatment of a tetanus prone wound in the absence of supplies of TIG. However, the presence of the individual at a health care facility provides an opportunity for the individual's vaccination status to be checked, to ensure that the individual is fully protected against future risk. This is particularly important for high risk groups such as injecting drug users who may have missed their school-leaver dose.

It is important that high vaccine uptake rates are achieved with the school-leaving booster as this is the last routine opportunity to ensure that individuals are fully vaccinated against tetanus.

Older people, unlikely to have been routinely vaccinated against tetanus as children, should have their vaccination status checked opportunistically at routine appointments, for instance when attending for annual flu immunisation. Intravenous drug users also are at greater risk of tetanus. Every opportunity should be taken to ensure that they are fully protected against tetanus. Where there is no reliable history of previous immunisation, it should be assumed that the individual is unimmunised, and the full UK recommendation should be followed.

Background

Tetanus is an acute disease caused by the action of tetanus toxin release following infection by the bacterium *Clostridium tetani*. Tetanus spores are present in soil or manure and may be introduced into the body through a puncture wound, burn or scratch. The disease is characterised by generalised rigidity and spasms of skeletal muscles. The muscle stiffness usually involves the jaw (lockjaw) and neck and then becomes generalised.

The incubation period for tetanus is usually 3-21 days, but may be as short as 24 hours and may be greater, possibly up to several months (2001; Odendahl *et al.*, 2005). The median incubation period in a recent UK case series was eight days, with a range of 1-54 days.

Tetanus can never be eradicated because the spores are commonly present in the environment, including soil. Tetanus is not spread from person to person.

Current UK tetanus immunisation recommendations

Current tetanus prevention policy recommends five doses of tetanus toxoid, with a primary immunisation course given at 2, 3 and 4 months of age and booster doses three years following completion of primary immunisation and at 12 -18 years of age (school-leaving booster).

A total of five doses of tetanus toxoid at the appropriate intervals are considered to give satisfactory long-term protection and further 10 yearly booster doses are not recommended. Tetanus toxoid vaccination is recommended in the management of a tetanus-prone wound for individuals if there is any doubt that they have completed 5 doses of tetanus toxoid. After receiving a booster dose, the patient should be referred to their GP, who should have a record of their vaccination history. If there is no reliable history of tetanus vaccination then a primary course of three vaccinations should be completed.

Tetanus toxoid-containing boosters beyond five doses are currently recommended for Travellers to areas where medical attention and TIG may not be available and who have not had a booster for 10 years. They should have a further (sixth) dose of tetanus toxoid.

Current practice in Emergency Departments

In a recent audit of practice in Emergency Departments in England, nearly half of respondents indicated that they would give a tetanus toxoid booster for a wound if it has been more than 10 years since the patient had received a booster (Savage *et al.*, 2007), reflecting the previous guidance published in 1996. Since half of all patients being treated for tetanus-prone wounds in Emergency Departments are likely to receive an additional booster dose, this current practice may have had an impact on current epidemiology.

Current epidemiology of tetanus in the UK

During the 1984-2000 period, 175 cases of tetanus were reported in England and Wales (around 10 cases annually) (Rushdy *et al.*, 2003). The highest number of tetanus cases were in those over 64 years. The majority of reported cases had no history of previous tetanus vaccination, and unvaccinated individuals tended to have more severe forms of the disease. Vaccination status was only available for 65% of cases. Of these, 11% had received primary vaccination and at least one booster, of whom one had received two boosters.

Since 2003 a change in the epidemiology of tetanus has occurred with injecting drug users (IDUs) becoming the most important risk group (HPA, 2005; Hahne *et al.*, 2006). Forty cases of tetanus were reported in the period 2003-5 (12 cases in 2003, 22 in 2004 and 6 in 2005). Only 13 of these were not, or not known to be, IDUs. Of the 27 cases in IDUs, 26 were not documented as being fully vaccinated. Three of the patients had protective levels of antibody: one had mild and two had severe disease, illustrating the capacity of the organism to cause tetanus in the presence of apparently protective levels of antibody.

Routine tetanus vaccination was introduced in the UK in 1961 and a five dose schedule has been recommended since then. At the current time, there is therefore a significant cohort effect, with those cohorts born before the 1960s

being increasingly unlikely with increasing age to have received 5 doses of tetanus-containing vaccine in childhood. Some of the doses that they might have had would have been given in adulthood. It will therefore be at least another 20 years before surveillance will determine whether those individuals who completed a 5-dose course routinely as children are still protected in later adult life.

Vaccination coverage and population immunity to tetanus

Vaccination coverage for the first three doses of tetanus vaccination is high in most parts of the UK. In 2006/07 it was 94% by 2 years of age in the UK, varying between 93% in England to 98% in Scotland (<http://www.ic.nhs.uk/pubs/immstats2005to2006>).

Coverage of the preschool booster is not as high; ranging between 88% by 5 years of age in Northern Ireland, dropping to 79% in England. Vaccination coverage of the 5th dose is not measured by COVER; 439,000 tetanus boosters were given to children in England in 2005/6 (KC50 reports), a coverage of approximately 70%. Numbers are not robust with wide variations in service delivery between school-delivered and primary care delivered immunisations and consequent data collection problems.

Estimates of duration of tetanus immunity using statistical modelling have concluded that protection after four or more doses of tetanus toxoid is greater than 12 years (Peebles *et al.*, 1969). A booster given five years after the primary course (i.e. the pre-school booster) may protect children for up to 20 years. Protection decreases to about 13 years when given to elderly subjects (Simonsen, 1989; Bracebridge *et al.*, 2004). Further study of the duration of immunity against tetanus after the recommended 5-dose vaccination schedule is warranted.

Analysis of residual sera submitted to the Public Health Laboratory Service Sero-epidemiology Unit in 1996 found a progressive decline in antibody levels below protective levels from 70% in the 40-49-year age group to 53% in those aged 60 and over (Maple *et al.*, 2000). Poor immunity against tetanus appears to be common among older adults in the western world; however few cases of tetanus occur. A population-based serological survey in the United States showed that the levels of tetanus antitoxin were lowest among the elderly (Gergen *et al.*, 1995). Surveys of population immunity from Australian, Austrian, and Swedish studies have shown that only 40% of elderly persons have detectable immunity, and that only 85% of subjects born after the introduction of general childhood vaccinations are protected (Baily, 1996; Heath *et al.*, 1996; Bottiger *et al.*, 1998).

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