# Infection control in child care settings

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## Abstract

**Over one-third of all under five year old Australian children use some form of licensed child care. The majority of research on infectious diseases in children using care, mainly emanating from North America and Scandinavia, suggests that children in preschool or long day care suffer more frequent infections and more days of illness than those cared for at home or in family day care. In order to minimise these risks it is necessary to apply infection control principles. In this article infection risk factors are outlined and recommendations for immunisation, preventative practices, the use of antibiotics and outbreak management are presented.**

## *Introduction*

Largely as a result of an increasing proportion of families in which both parents are in paid employment, there has been a steady rise in the demand for care of young children. This is provided by informal arrangements (care by relatives and friends) and by formal child care (family day care, child care centres and preschools or kindergartens). The latest Australian Bureau of Statistics survey of child care use estimated that 473,000 or 36.6 per cent of under five year old children attended formal child care in 1996[1]. The higher prevalence of infections in children attending child care centres can be minimised by applying infection control principles. However, such principles are unlikely to be put into practice unless substantial support, in the form of training and ongoing advice, can be provided to child care workers by the public health and clinical community.

## *Increased risk of infections*

The spread of infections in child care centres is facilitated by crowding and microbial contamination of the child care environment, as well as the unhygienic behaviours and greater susceptibility of young children[2].

Children attending child care centres experience a greater number of illnesses than do children cared for at home. Wald et al[3] reported that children attending centres had 51 per cent more episodes of infection, and 134 per cent more days of illness than children cared for at home. Another study found that Swedish children in child care required 40 - 80 per cent more medical consultations for acute infections than did children who remained at home[4]. Excess illnesses may be related to upper and lower respiratory tract infections including middle ear infection[5-7]. Gastroenteritis is also an important cause of illness among children attending

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centre based care[8]. The important pathogens, especially among toddlers, are enteric viruses, particularly rotavirus[9], bacteria such as *Shigella* and the parasites *Cryptosporidium*[10] and *Giardia*[11]. Hepatitis A, also an enteric virus, has been responsible for outbreaks in child care centres in Australia[12,13], although not to the extent described in Phoenix, Arizona, where 42 per cent of notified cases in the community were associated with child care[14].

Although invasive *Haemophilus influenzae* type b (Hib) infection has declined by approximately 90 per cent since the infant vaccination program against this disease began in 1993, earlier data from Victoria implicated child care as a risk factor for invasive disease[15]. A Belgian study conducted during a prolonged meningococcal epidemic estimated that child care exposure conferred a 76 times greater risk of infection compared to home care[16]. Both infections have public health ramifications in relation to prophylaxis of secondary cases.

Child care workers and other adult contacts are also at increased risk of infections such as upper respiratory tract infection, gastroenteritis and hepatitis A[17]. Concern has been expressed about acquisition of cytomegalovirus (CMV) by pregnant carers, which may cause severe congenital infection[18], and parvovirus B19 which may be associated with intrauterine death or stillbirth due to fetal hydrops[19].

## *Immunisation of children*

In the case of vaccine preventable diseases, the risk of infection in child care can be significantly reduced if children are age-appropriately immunised prior to entry, and continue to receive recommended vaccines at the appropriate ages. High levels of immunisation in children attending day care are particularly important when the facility is used by children under 12 months of age, in whom diseases such as measles and pertussis may be life threatening.

Child care centres are advised to ensure that they hold an immunisation record for each child, which is updated every six months[20].

In endorsing the *National Immunisation Strategy*[21] in June 1993, the National Health and Medical Research Council (NHMRC) drew particular attention to the recommendation that States and Territories introduce legislation to require all children to show evidence of immunisation status at the time of enrolment in child care facilities and schools[22]. The purpose of such legislation is to allow, in the event of an outbreak of a vaccine preventable disease, the rapid identification of children who are not adequately protected by immunisation, so that they can be excluded from child care. Exclusion is both to protect the health of the child and to prevent further transmission of the disease.

In New South Wales such legislation has been enacted under the Public Health Act 1991, and documentation is also referred to in licencing regulations. The New South Wales legislation also applies to preschools and primary schools. The Australian Capital Territory has similar legislation. Victorian law applies specifically to school entry but it is anticipated that the legislation will be extended to include entry to preschool and child care. All other jurisdictions are considering the introduction of school entry legislation.

## *Immunisation and screening of staff*

Child care workers should maintain up to date immunisations against diphtheria and tetanus and should also be immunised against measles, mumps and rubella. Hepatitis A immunisation is recommended for all child care workers, although the risk of the disease is largely limited to staff caring for children who are not yet fully toilet trained[23]. Hepatitis B immunisation is not recommended routinely as the risk for child care staff of contracting the disease is minimal[23].

Female employees of child bearing age should be screened for rubella immunity at the start of employment. If a child care worker is planning a pregnancy, it is strongly recommended that serological screening for immunity to CMV be carried out prior to conception. Those who are seronegative for CMV should be counselled regarding the small risk of primary maternal CMV infection that can cause damage to the fetus. They should be advised that attention to hand washing, and not caring for children under three years of age can reduce the risk of CMV acquisition[24].

## *Hand washing and the use of gloves*

Human enteric bacteria[25] and viruses[26] can be easily isolated from the hands of children and staff, and from surfaces and toys in child care centres during gastroenteritis outbreaks. Pathogenic viruses including hepatitis A virus[27], rotavirus[28], rhinovirus[29] and respiratory syncytial virus (RSV)[30] can survive on the hands for many hours. Hand contact is important in the transmission of viral respiratory infections caused by rhinovirus[31] and RSV[30] as well as diarrhoeal infections.

Hand washing, using soap and warm running water, is the principal means of reducing transmission. The effectiveness of hand washing has been illustrated by a study[32] which showed that the incidence of diarrhoeal episodes among young children in child care centres was markedly reduced after the introduction of an intensive hand washing program for carers. Carers washed their hands after arrival at the centre, before handling food, and after using the toilet or changing children's nappies. Carers should wash their hands on these occasions as well as after wiping their own or a child's nose, after cleaning up body fluids such as blood, faeces, vomit or urine and before going home[20].

Nappy change areas must be located close to a hand basin. Where a hand basin is not available, alcohol-based hand rinses, shown to reduce the bacterial skin flora[33], can be used. Staff may prefer to use disposable gloves when changing dirty nappies, but their use is optional and does not replace the need for hand washing. Disposable gloves should be worn when cleaning up spills of blood or body fluids, and when handling food. Cuts and open lesions on carers' hands should be kept covered with water resistant occlusive dressings.

## *Cleaning and disinfection*

Contaminated fomites, surfaces, toys and utensils in the child care environment may also be vehicles for the spread of infection. Influenza virus[34], RSV[30], rhinovirus, parainfluenza virus[29] and CMV[35] may survive on non-porous objects for many hours. Rotavirus[28], hepatitis A virus[36] and parasites such as *Cryptosporidium*[37] may remain viable for days or weeks outside the body.

All surfaces and articles should be chosen for their ease of cleaning. Daily vigorous physical cleaning of toys and surfaces using water and a neutral detergent is generally all that is required to remove pathogens from contaminated articles. The use of disinfectants should be left to a supplementary role in the control of outbreaks of enteric infection; in such instances a disinfectant should be chosen to suit the pathogen. Specific advice should be sought from a hospital microbiologist or infection surveillance practitioner.

Nappy change areas should use a non-absorbent change mat which is cleaned after each use. Nappies and other items contaminated with body substances should be handled as little as possible. If they are to be laundered at the centre, they should be sluiced with care and machine washed in either hot or cold water using a recommended detergent. Ideally, they should be placed in bins for cleaning by a commercial laundry service.

## *Separation of children in nappies from older children*

Most child care related infections are more common in infants and toddlers than among older children. A study of bacterial contamination in centres found that the prevalence of faecal coliforms on hands, surfaces and in air samples was inversely related to the age of the children. The likelihood of faecal contamination was greatest on the hands of infants and carers, and least on those of the older children[38]. Disposable nappies appear to be superior to cloth nappies in preventing faecal contamination of the environment[39]. Whether the use of disposable nappies can reduce the incidence of diarrhoeal illness is not clear.

Two prospective studies of risk factors for diarrhoeal illness found that centres with non-toilet trained infants, and those in which food-handling staff also changed nappies, had higher diarrhoeal rates[40,41]. The risk of diarrhoeal illness in three year old children who stayed in the same room as under two year olds was 4.3 (95%, CI 2.1-9.0) times greater than the risk in those separated from the under two year olds[40]. In common with other enteric infections, hepatitis A outbreaks are most likely to involve centres containing many children who are still in nappies[42].

Prevention of the spread of enteric infections is best achieved by ensuring that wherever possible, carers have not been involved in nappy changing prior to handling food on the same shift, that minimal contact occurs between children in nappies and older children, and that the same members of staff do not look after both age groups at the same time.

## *Antibiotics in outbreak control*

Antibiotics are generally prescribed when clinical indications are present. Their prescription is influenced by the wish for the child to return to care promptly, as is the case with bacterial conjunctivitis, streptococcal pharyngitis and impetigo. In other infections, the use of antibiotics beyond the first few days of illness has no clear benefit for the patient, but may reduce the likelihood of transmission to contacts. Examples include gastroenteritis caused by *Shigella*[43] or *Campylobacter*[44]. Management of giardiasis remains problematic in the child care setting, as it is usually not clear whether detection of the organism in a child with diarrhoea indicates a causal relationship or coincidence[45-47]. If testing in response to an outbreak of diarrhoeal illness reveals that a large proportion of children in a group are affected, a recommendation for 'mass treatment' with metronidazole or tinidazole may be warranted following expert advice. However, treatment of individual children found to be excreting *Giardia* cysts should remain a clinical decision.

In pertussis, a ten day course of erythromycin should be administered to the case if it is within three weeks of onset of the cough, to reduce the infectious period[48]. Prophylactic treatment is recommended for all contacts within household settings (including family day care) who have been in contact with the case within three weeks of the onset of cough. Within child care centres, antibiotic prophylaxis should be limited to contacts under one year of age and children not up to date with pertussis vaccinations. If there is more than one case within a child care centre, prophylaxis should be extended to include all attendees and staff in contact with the case. Roxithromycin may be a suitable alternative to erythromycin for the treatment of cases and contacts, however, it has not been approved for that purpose[48].

When a case of meningococcal or Hib infection occurs in a centre, the public health authority should arrange for dispensing of prophylactic rifampicin to child care contacts, both children and staff, in accordance with current guidelines[49,50].

## *Immunisation in outbreak control*

### Normal human immunoglobulin

Post-exposure prophylaxis with normal human immunoglobulin (NHIG) is indicated in a limited number of infections. If given within seven days of exposure in a dose of 0.2ml/kg it may prevent measles, and is indicated for contacts who are immunocompromised, or under 12 months of age[51]. Infants who have received NHIG should be vaccinated against measles, using measles-mumps-rubella (MMR) vaccine as close as possible to 12 months of age, but at least three months after the NHIG[23]. In a dose of 0.03ml/kg, immunoglobulin may be used to prevent or ameliorate hepatitis A if used within two weeks of exposure. Mass administration of immunoglobulin has been used successfully to terminate hepatitis A outbreaks in child care centres[52].

### Vaccines

During measles outbreaks, vaccination with MMR vaccine is recommended for all susceptible contacts from nine months of age (unless there are medical contraindications or NHIG has been given). Infants who are vaccinated against measles prior to 12 months of age should be revaccinated in three months time or after the age of 12 months (whichever is the later) to avoid interference by maternal antibody.

Recent guidelines suggest the consideration of vaccination when two or more cases of invasive meningococcal infection with the same serogroup occur in a child care centre within a three month period[51].

It could be speculated that there might also be a place for the use of hepatitis A vaccine (a new formulation for 2-15 year olds), or varicella and pertussis-only vaccines when they become available in the near future.

## *Exclusion*

Child care regulations in each State and Territory require exclusion of children and employees from the centre whilst infectious with a significant, acute illness. Children with mild illnesses, for example the common cold, or with chronic infections such as HIV, hepatitis B or CMV infection are generally not excluded. The NHMRC exclusion table is reprinted in *Staying healthy in child care*[20].

Exclusion policies are time-honoured but have a number of drawbacks. Parents may have difficulty in finding alternative care for mildly unwell children. As a result, they may be tempted to place the children in other centres, thereby increasing the chance of the spread of infection into the wider community. The childhood exanthemata are most infectious during the prodrome, before the illness is recognised and the child excluded. Persons with erythema infectiosum (fifth disease or slapped-cheek syndrome), caused by infection with parvovirus B19, are no longer infectious once the rash appears, so that exclusion is generally not warranted[53]. There is evidence that exclusion of children with chickenpox has little effect on the course of an outbreak[54,55]. Recent studies suggest that children with rotavirus gastroenteritis may be infectious for up to one week before the onset of diarrhoea[9,56]. Thus exclusion for some infections may be less effective than previously thought.

## *Cohorting of infectious children*

If appropriate staffing and space are available, cohorting of children during outbreaks may reduce the need for exclusion. Cohorting would involve separating affected and unaffected children, and also ensuring that staff who care for one of these groups do not care for the other group for the course of the outbreak. During shigellosis outbreaks in child care, asymptomatic carrier children were successfully cohorted after initiation of specific antibiotic therapy, until the organism was eradicated from the faeces[43]. The Centers for Disease Control and Prevention in the United States of America now recommends cohorting during convalescence, in the management of shigellosis outbreaks in child care[57]. Cohorting was successfully used in a similar way during an outbreak of gastroenteritis caused by *Salmonella typhimurium*[58].

## *Education, surveillance and reporting*

Child care workers need to be supported with formal in-service training which covers modes of spread of infection, immunisation, hygiene (in particular frequent hand washing), reporting requirements and the local public health infrastructure[59]. Infection surveillance practitioners and personnel working in the areas of clinical infectious diseases, microbiology and public health can expect to be called on for advice, and should encourage this contact. Such personnel may encourage the development of practical case definitions, and use of appropriate confirmatory testing as a basis for formal or informal surveillance networks. Surveillance which actively involves child care staff is likely to promote the early seeking of expert advice and recognition of outbreaks, and would serve to enhance preventative approaches to communicable disease in the child care setting[60,61] .

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