

# **Guidelines on the Management of Communicable Diseases in Schools and Nurseries**

## **I**

**Evidence based data on the incubation periods and periods of infectiousness of  
infectious diseases**

## Disease: Campylobacter

		ref.
Mode of transmission <sup>1</sup> :	E: food, water, animals P: (faeco-oral)	1
Definition of onset:	Diarrhoea	
Incubation period <sup>2</sup> :	E: 1-10 days [3] (n = 16 outbreaks)	2
Risk of transmission:	Low. Person to person transmission and outbreaks rare in community and schools. Outbreaks occasionally occur in nurseries and institutions (attack rate 15-20%)	1,3
Duration of shedding:	0-3 weeks [mean 15 days] untreated (n = 12)	4
Period of infectiousness:		
Serial interval:	?1-3 weeks. (n = 9, incomplete data)	3
Exclusion period:	24 hours from last episode of diarrhoea. See comment (b)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Limited information on period of infectiousness. Patients probably not infectious if treated and diarrhoea has resolved.
- b) A longer period of exclusion may be appropriate for children < 5 years and for older children who are unable to maintain good personal hygiene (eg. 48 hours, ref 5).

### References:

1. Cowden J. Campylobacter: epidemiological paradoxes. *BMJ* 1992; 305: 132-3.
2. Wood RC, MacDonald KL, Osterholm MT. Campylobacter enteritis outbreaks associated with drinking raw milk during youth activities: a 10-year review of outbreaks in the United States. *JAMA* 1992; 268: 3228-30.
3. Evans MR, Roberts RJ, Ribeiro CD, Gardner D, Kembrey D. A milk-borne campylobacter outbreak following an educational farm visit. *Epidemiol Infect* 1996; 117: 457-62.
4. Blaser MJ, LaForce FM, Wilson NA, Wang WL. Reservoirs of human campylobacteriosis. *J Infect Dis* 1980; 141: 665-9.
5. Working Party of the PHLS Salmonella Committee. The prevention of human transmission of gastrointestinal infections, infestations, and bacterial intoxications. *Communicable Disease Report CDR Review* 1995; 5: R157-72.

## Disease: Chickenpox

		ref.
Mode of transmission <sup>1</sup> :	P: physical contact, respiratory droplets, airborne	1,2,3
Definition of onset:	Skin eruption	
Incubation period <sup>2</sup> :	E: 11-20 days [15] (n = 67)	4
Risk of transmission:	Very high. Attack rate up to 87% in susceptible children.	5
Duration of shedding:		
Period of infectiousness:	Up to +5 days (n = 75) As early as -4 days (n = 1) But cases usually not infectious before -1 day (n = 11) Cases often transmit before onset of rash	1,2 6 4 7,8
Serial interval:	10-23 days [mean 14-15] (n = 451) See comment (a)	5
Exclusion period:	5 days from start of skin eruption See comments (b) and (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Serial interval is very similar to incubation period. This suggests that most transmission occurs early in the disease.
- b) Traditionally children have been excluded until all lesions are crusted. However, transmission has never been reported beyond the fifth day of the rash.
- c) Some cases transmit the infection before the onset of disease so exclusion at the onset of chickenpox will not always prevent secondary cases (refs. 7,8).
- d) Risk of serious infection in immunocompromised host. Contacts with immune deficiency should receive prophylaxis.

### References:

1. Thomson FH. The aerial conveyance of infection with a note on the contact infection of chicken-pox. *Lancet* 1916; 1: 341-4.
2. Thomson FH. Contact infection of chicken-pox. *Lancet* 1919; 1: 397.
3. Leclair JM, Zaia JA, Levin MJ, Congdon RG, Goldman DA. Airborne transmission of chickenpox in a hospital. *N Engl J Med* 1980; 302: 450-3.
4. Gordon JE, Meader FM. The period of infectivity and serum prevention of chickenpox. *JAMA* 1929; 93: 2013-5.
5. Ross AH. Modification of chicken pox in family contacts by administration of gamma globulin. *N Engl J Med* 1962; 267: 369-76.
6. Evans P. An epidemic of chickenpox. *Lancet* 1940; 2: 339-40.

7. Brunell PA. Transmission of chickenpox in a school setting prior to the observed exanthem. *Am J Dis Child* 1989; 143: 1451-2.
8. Moore DA, Hopkins RS. Assessment of a school exclusion policy during a chickenpox outbreak. *Am J Epidemiol* 1991; 133: 1161-7.

**Disease: Conjunctivitis** (see comment a)

		ref.
Mode of transmission <sup>1</sup> :	P: physical contact	1,2
Definition of onset:	Conjunctivitis	
Incubation period <sup>2</sup> :	E: 3-29 days [mean 11] (n = 83) see comment (b)	1
Risk of transmission:	Moderate. Attack rate up to 25% among household contacts.	3
Duration of shedding:		
Period of infectiousness:	? up to 2 weeks (n = 40) see comments (b) and (c)	2
Serial interval:		
Exclusion period:	None. See comments (c) – (f)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- a) Information refers to adenovirus infection. There is very little information on other forms of viral conjunctivitis that affect children.
- b) Values undoubtedly vary between types of adenovirus and between viruses.
- c) Generally a mild condition.
- d) No data or very scanty data on shedding and period of infectiousness.
- e) Transmission by physical contact more likely in young children.
- f) Public Health authorities should be involved in the event of an outbreak.

**References:**

1. Keenlyside RA, Hierholzer JC, D'Angelo LJ. Keratoconjunctivitis associated with adenovirus type 37: an extended outbreak in an ophthalmologist's office. *J Infect Dis* 1983; 147: 191-8.
2. Barnard DL, Dean Hart JC, Marmion VJ, Clarke SK. Outbreak in Bristol of conjunctivitis caused by adenovirus type 8, its epidemiology and control. *BMJ* 1973; 2: 165-9.
3. Taylor JW, Chandler JW, Cooney MK. Conjunctivitis due to adenovirus type 19. *J Clin Microbiol* 1978; 8: 209-13.

## Disease: Cryptosporidiosis

		ref.
Mode of transmission <sup>1</sup> :	E: waterborne, food borne, animals P: faeco-oral	1
Definition of onset:	Diarrhoea	
Incubation period <sup>2</sup> :	E: 1-14 days [7] (n = 94)	2
Risk of transmission:	Low to moderate. See comment (a) High attack rates in nurseries	1,2 3
Duration of shedding:	2-4 weeks from onset [mean 19 days] (n = 44) 50% patients excrete oocysts after resolution of diarrhoea for 1-15 days [mean 7] (n = 44)	4
Period of infectiousness:		
Serial interval:		
Exclusion period:	24 hours from last episode of diarrhoea. See comments (b), (c) and (d)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Overall 25% cases transmit the infection. Outbreaks occur in nurseries and schools. Associated with farm visits.
- b) Transmission by faeco-oral route more likely in young children.
- c) A longer period of exclusion may be appropriate for children < 5 years and for older children who are unable to maintain good personal hygiene (eg. 48 hours, ref 5).
- d) Oocysts can survive in chlorinated water. Avoid swimming for 3 weeks after illness.

### References:

1. Public Health Laboratory Service Study Group. Cryptosporidiosis in England and Wales: prevalence and clinical and epidemiological features. *BMJ* 1990; 300: 774-7.
2. Mac Kenzie WR, Schell WL, Blair KA, Addiss DG, Peterson DE, Hoxie NJ, Kazmierczak JJ, Davis JP. Massive outbreak of waterborne cryptosporidium infection in Milwaukee, Wisconsin: recurrence of illness and risk of secondary transmission. *Clin Infect Dis* 1995; 21: 57-62.
3. Alpert G, Bell LM, Kirkpatrick CE, Budnick LD, Campos JM, Friedman HM, Plotkin SA. Outbreak of cryptosporidiosis in a day-care center. *Pediatrics* 1986; 77: 152-7.
4. Jokipii L, Jokipii AM. Timing of symptoms and oocyst excretion in human cryptosporidiosis. *N Engl J Med* 1986; 315: 1643-7.
5. Working Party of the PHLS Salmonella Committee. The prevention of human transmission of gastrointestinal infections, infestations, and bacterial intoxications. *Communicable Disease Report CDR Review* 1995; 5: R157-72.

**Disease: Enterovirus infections** (non-polio, non-HFM, see comment a)

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral, fomites, airborne E: waterborne	1,2 3
Definition of onset:	Varies. Usually a febrile illness.	
Incubation period <sup>2</sup> :	E: 5-7 days (n = 26 children, poorly substantiated) X: 2-3 days [3] (n = 10 adults)	3 2
Risk of transmission:	Moderate in families and nurseries. Children important in transmission.	1,4
Duration of shedding:	E: 1-2 weeks [1] (n = 14) X: 0-20 days from inoculation (n = 10)	4 2
Period of infectiousness:		
Serial interval:	1-15 days [6] (n = 11 household contacts) 3-10 days [7] (n = 22 household contacts)	4 5
Exclusion period:	None. See comments (b) and (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- a) Values are only approximate because category includes large numbers of coxsackie and echo viruses. Wide range of illnesses can be caused: eg. aseptic meningitis, encephalitis, exanthems, upper respiratory tract infections, myocarditis. Most are mild.
- b) Many infections are asymptomatic and most infections not confirmed by virology.
- c) Exclusion may be necessary in rare outbreaks of serious infection, eg. meningitis.

**References:**

1. Reeves WC, Quiroz E, Brenes MM, Centeno R, Campos G. Aseptic meningitis due to echovirus 4 in Panama City, Republic of Panama. *Am J Epidemiol* 1987; 125: 562-75.
2. Couch RB, Douglas RG, Lindgren KM, Gerone PJ, Knight V. Airborne transmission of respiratory infection with coxsackievirus A type 21. *Am J Epidemiol* 1970; 91: 78-86.
3. Lenaway DD, Brockmann R, Dolan GJ, Cruz-Uribe F. An outbreak of an enterovirus-like illness at a community wading pool: implications for public health inspection programs. *Am J Public Health* 1989; 79: 889-90.
4. Karzon DT, Eckert GL, Barron AL, Hayner NS, Winkelstein W. Aseptic meningitis due to echo 4 virus. *Am J Dis Child* 1961; 101: 610-22.
5. Kaplan GJ, Clark PS, Bender TR, Feltz ET, List-Young B, Nevius E, Chin TD. Echovirus type 30 meningitis and related febrile illness: epidemiologic study of an outbreak in an Eskimo community. *Am J Epidemiol* 1970; 92: 257-65.

**Disease: Escherichia coli enteritis** (see comment a)

		ref.
Mode of transmission <sup>1</sup> :	E: food borne, waterborne, animals P: faeco-oral	1,2
Definition of onset:	diarrhoea	
Incubation period <sup>2</sup> :	E: 2-48 hrs [18] (n = 229) EPEC E: 1-156 hrs [mean 35] (n = 670) EIEC E: 1-10 days [4] (n = 21) EHEC, E.coli 0157 E: 3-166 hrs [36] (n = 206) ETEC see comment (b)	3 4 5 6
Risk of transmission:	10% (households) EPEC to 38% (nurseries) EHEC	7 2
Duration of shedding:	< 12 days (n = 37) EPEC 2-62 days [17] (n = 24) EHEC, E.coli 0157 < 5 days (n = 11) ETEC	8 2 9
Period of infectiousness:		
Serial interval:	2-14 days (n = 137) EPEC	7
Exclusion period:	E.coli 0157: two negative stools. See comment (c) Other E.coli: 24 hours from last episode of diarrhoea. See comment (d)	2

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- Different types of E.coli cause enteritis by different mechanisms. Enteropathogenic and enteroinvasive E.coli (EPEC and EIEC) cause childhood diarrhoea, enterohaemorrhagic E.coli (EHEC eg. E.coli 0157) cause bloody diarrhoea and HUS. Enterotoxigenic E. Coli (ETEC) typically causes traveller's diarrhoea.
- Incubation period may depend on infective dose.
- Vigorous exclusion of children shedding E.coli 0157 is justified because of risk of haemolytic uraemic syndrome. Two negative stools sufficient to curtail outbreak (see ref. 2).
- A longer period of exclusion may be appropriate for children under the age of 5 years, and for older children who are unable to maintain good personal hygiene (eg. 48 hrs, ref 10).

**References:**

- Thomas A, Cheasty T, Frost JA, Chart H, Smith HR, Rowe B. Vero cytotoxin-producing Escherichia coli, particularly serogroup 0157, associated with human infection in England and Wales: 1992-4.

- Epidemiol Infect 1996; 117: 1-10.
2. Belongia EA, Osterholm MT, Soler JT, Ammend DA, Braun JE, MacDonald KL. Transmission of *Escherichia coli* O157:H7 infection in Minnesota child day-care facilities. *JAMA* 1993; 269: 883-8.
  3. Marier R, Wells JG, Swanson RC, Callahan W, Mehlman IJ. An outbreak of enteropathogenic *Escherichia coli* foodborne disease traced to imported French cheese. *Lancet* 1973; 2: 1376-8.
  4. Yamamura K, Sumi N, Egashira Y, Fukuoka I, Motomura S, Tsuchida R. Food poisoning caused by enteroinvasive *Escherichia coli* (O164:H) - a case in which the causative agent was identified. [Japanese] *J Jap Assoc Infect Dis* 1992; 66: 761-8.
  5. Keene WE, McAnulty JM, Hoesly KC, Williams P Jr, Hedberg K, Oxman GL, Barrett TJ, Pfaller MA, Fleming DW. A swimming-associated outbreak of hemorrhagic colitis caused by *Escherichia coli* O157:H7 and *Shigella sonnei*. *N Engl J Med* 1994; 331: 579-84.
  6. Taylor WR, Schell WL, Wells JG, Choi K, Kinnunen DE, Heiser PT, Helstad AG. A foodborne outbreak of *Escherichia coli* diarrhea. *N Engl J Med* 1982; 306: 1093-5.
  7. Viljanen MK, Peltola T, Junnila SY, Olkkonen L, Jarvinen H, Kuistila M, Huovinen P. Outbreak of diarrhoea due to *Escherichia coli* O111:B4 in schoolchildren and adults: association of Vi antigen-like reactivity. *Lancet* 1990; 336: 831-4.
  8. Schroeder SA, Caldwell JR, Vernon TM, White PC, Granger SI, Bennett JV. A waterborne outbreak of gastroenteritis in adults associated with *Escherichia coli*. *Lancet* 1968; 1: 737-40.
  9. Gorbach SL, Kean BH, Evans DG, Evans DJ, Bessudo D. Travellers' diarrhea and toxigenic *Escherichia coli*. *N Engl J Med* 1975; 292: 933-6.
  10. Working Party of the PHLS Salmonella Committee. The prevention of human transmission of gastrointestinal infections, infestations, and bacterial intoxications. *Communicable Disease Report CDR Review* 1995; 5: R157-72.

**Disease: Fifth disease** (erythema infectiosum, slapped cheek disease, parvovirus B19 infection)

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets	1,2,3
Definition of onset:	facial rash (“slapped cheeks”)	
Incubation period <sup>2</sup> :	E: 13-18 days (n = 3) X: 17-18 days (n = 3) see comment (a)	4 1
Risk of transmission:	Attack rate of 30% in families 10-60% in schools	2 3,5
Duration of shedding:	X: -6 to -3 days (n = 3) see comment (a)	1
Period of infectiousness:		
Serial interval:	Mostly 7-11 days (n = 194) see comment (b)	2
Exclusion period:	None see comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- a) This experiment in adults. Onset of disease defined as body rash because “slapped cheeks” rare in adults. Adults also have more marked biphasic illness than children with interval of 3-4 days between prodromal febrile illness and onset of rash (ref 1). If children have prodrome it is usually 1-2 days before rash (ref 2). Viral shedding occurs during prodrome.
- b) This range is consistent with quoted incubation periods and duration of shedding.
- c) Fifth disease is a minor illness in most children but infection should be avoided in pregnant women and patients with immune suppression or haematological conditions. However, exclusion of cases is likely to be ineffective because patients are probably only infectious during prodrome.

**References:**

1. Anderson MJ, Higgins PG, Davis LR, Willman JS, Jones SE, Kidd IM, Pattison JR, Tyrrell DA. Experimental parvoviral infection in humans. *J Infect Dis* 1985; 152: 257-65.
2. Ager EA, Chin TD, Poland JD. Epidemic erythema infectiosum. *N Engl J Med* 1966; 275: 1326-31.
3. Risks associated with human parvovirus B19 infection. *MMWR* 1989; 38: 81-97.
4. Joseph PR. Incubation period of fifth disease [letter]. *Lancet* 1986; 2: 1390-1.
5. Rice PS, Cohen BJ. A school outbreak of parvovirus B19 infection investigated using salivary antibody assays. *Epidemiol Infect* 1996; 116: 331-8.

## Disease: Gastroenteritis - rotavirus

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral, ? respiratory droplets see comment (a)	1,2
Definition of onset:	Diarrhoea	
Incubation period <sup>2</sup> :	X: 2-4 days (n = 4 adults)	1
Risk of transmission:	High. Attack rate 45% in families (75% amongst children)	3
Duration of shedding:	X: 6-10 days (n = 5 adults) E: 1-8 days (max at 3-5 days, n = 16)	1 4
Period of infectiousness:		
Serial interval:	mean 5-6 days (n = 30)	3
Exclusion period:	24 hours from last episode of diarrhoea or vomiting. See comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- Rotavirus is main cause of gastroenteritis in children < 2 years (ref 4)
- Respiratory transmission of rotavirus is suggested by some clinical studies but remains controversial (ref 2).
- Transmission by faeco-oral route more likely in young children. A longer period of exclusion may be appropriate for children < 5 years and for older children who are unable to maintain good personal hygiene.

### References:

- Kapikian AZ, Wyatt RG, Levine MM, Yolken RH, VanKirk DH, Dolin R, Greenberg HB, Chanock RM. Oral administration of human rotavirus to volunteers: induction of illness and correlates of resistance. *J Infect Dis* 1983; 147: 95-106.
- Lewis HM, Parry JV, Davies HA, Parry RP, Mott A, Dourmashkin RR, Sanderson PJ, Tyrrell DA, Valman HB. A year's experience of the rotavirus syndrome and its association with respiratory illness. *Arch Dis Child* 1979; 54: 339-46.
- Grimwood K, Abbott GD, Fergusson DM, Jennings LC, Allan JM. Spread of rotavirus within families: a community based study. *BMJ* 1983; 287: 575-7.
- Davidson GP, Bishop RF, Townley RR, Holmes IH, Ruck BJ. Importance of a new virus in acute sporadic enteritis in children. *Lancet* 1975; 1: 242-6.

## Disease: Gastroenteritis - adenovirus

		ref.
Mode of transmission <sup>1</sup> :	P: ? faeco-oral	1
Definition of onset:	Diarrhoea	
Incubation period <sup>2</sup> :	E: 8-10 days (n = 2)	1
Risk of transmission:	Causes outbreaks in children < 2 years	1
Duration of shedding:	At least 7 days but < 14 days (n = 7)	1
Period of infectiousness:		
Serial interval:	6-16 days (n = 5)	1
Exclusion period:	24 hours from last episode of diarrhoea or vomiting. See comment (c)	

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

### Comments:

- a) Very limited information.
- b) Illness lasts 4-9 days (ref 1)
- c) A longer period of exclusion may be appropriate for children < 5 years and for older children who are unable to maintain good personal hygiene.

### References:

1. Richmond SJ, Caul EO, Dunn SM, Ashley CR, Clarke SK. An outbreak of gastroenteritis in young children caused by adenoviruses. Lancet 1979; 1: 1178-80.

## Disease: Gastroenteritis - Norwalk virus

		ref.
Mode of transmission <sup>1</sup> :	E: waterborne, food borne P: faeco-oral, ? airborne (see comment b)	1 2
Definition of onset:	Vomiting or diarrhoea	
Incubation period <sup>2</sup> :	E: 4-77 hours [36] (n = 121)	3
Risk of transmission:	Moderate to high. Attack rate 4-32% in outbreaks. Attack rate > 50% in outbreaks among children.	1 3
Duration of shedding:	Faecal shedding occurs from 0 to 72 hours (n = 11)	4
Period of infectiousness:	Infectivity at +2 and +3 days (24 and 48 hours after recovery) (n = 2)	5
Serial interval:	E: 1-7 days [3] (n = 21)	3
Exclusion period:	3 days after onset see comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- Generally mild illness characterised by vomiting > diarrhoea in children.
- Airborne transmission proposed because of explosive nature of epidemics and limited / no contact between cases in Norwalk (-like) outbreak (ref 2).
- However agent will probably not have been identified. Therefore exclude for duration of illness.

### References:

- Kaplan JE, Gary GW, Baron RC, Singh N, Schonberger LB, Feldman R, Greenberg HB. Epidemiology of Norwalk gastroenteritis and the role of Norwalk virus in outbreaks of acute nonbacterial gastroenteritis. *Ann Intern Med* 1982; 96: 756-61.
- Sawyer LA, Murphy JJ, Kaplan JE, *et al.* 25- to 30-nm virus particle associated with a hospital outbreak of acute gastroenteritis with evidence for airborne transmission. *Am J Epidemiol* 1988; 127: 1261-71.
- Baron RC, Murphy FD, Greenberg HB, Davis CE, Bregman DJ, Gary GW, Hughes JM, Schonberger LB. Norwalk gastrointestinal illness: an outbreak associated with swimming in a recreational lake and secondary person-to-person transmission. *Am J Epidemiol* 1982; 115: 163-72.
- Thornhill TS, Kalica AR, Wyatt RG, Kapikian AZ, Chanock RM. Pattern of shedding of the Norwalk particle in stools during experimentally induced gastroenteritis in volunteers as determined by immune electron microscopy. *J Infect Dis* 1975; 132: 28-34.
- White KE, Osterholm MT, Mariotti JA, Korlath JA, Lawrence DH, Ristinen TL, Greenberg HB. A foodborne outbreak of Norwalk virus gastroenteritis: evidence for post-recovery transmission. *Am J Epidemiol* 1986; 124: 120-6.

## Disease: Gastroenteritis - calicivirus

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral E: food borne, waterborne	1
Definition of onset:	diarrhoea	
Incubation period <sup>2</sup> :	(? 1-3 days)	1
Risk of transmission:		
Duration of shedding:	1-11 days [4] (n = 16)	2
Period of infectiousness:		
Serial interval:		
Exclusion period:	24 hours from last episode of diarrhoea or vomiting. See comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Chiefly affects children < 6 months.
- b) Virology and epidemiology poorly understood (ref 1). Agents such as Norwalk better understood because large explosive outbreaks lend themselves to epidemiological study.
- c) A longer period of exclusion may be appropriate for children < 5 years and for older children who are unable to maintain good personal hygiene.

### References:

1. Blacklow NR, Greenberg HB. Viral gastroenteritis. N Engl J Med 1991; 325: 252-64.
2. Cubitt WD, McSwiggan DA. Calicivirus gastroenteritis in North West London. Lancet 1981; 2: 975-7.

## Disease: Gastroenteritis - astrovirus

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral	1
Definition of onset:	vomiting	
Incubation period <sup>2</sup> :	X: 3 days (n = 1) (6 days for diarrhoea)	
Risk of transmission:	Poor pathogenicity in adult volunteers (1 case / 17) Causes outbreaks in nurseries, attack rate 30%	2 3
Duration of shedding:	E: 2-30 days [8] (n = 35) see comment (b)	3
Period of infectiousness:		
Serial interval:		
Exclusion period:	24 hours from last episode of diarrhoea or vomiting. See comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Chiefly affects children < 2 years.
- b) About 50% young children have asymptomatic infection during outbreaks. Some children shed astrovirus before diarrhoea. Some children shed intermittently.
- c) Little information available. Agents such as Norwalk better understood because large explosive outbreaks lend themselves to epidemiological study.
- d) A longer period of exclusion may be appropriate for children < 5 years and for older children who are unable to maintain good personal hygiene.

### References:

1. Blacklow NR, Greenberg HB. Viral gastroenteritis. N Engl J Med 1991; 325: 252-64.
2. Kurtz JB, Lee TW, Craig JW, Reed SE. Astrovirus infection in volunteers. J Med Virol 1979; 3: 221-30.
3. Mitchell DK, Van R, Morrow AL, Monroe SS, Glass RI, Pickering LK. Outbreaks of astrovirus gastroenteritis in day care centers. J Pediatr 1993; 123: 725-32.

## Disease: Giardiasis

		ref.
Mode of transmission <sup>1</sup> :	E: waterborne, food borne, animals P: faeco-oral	1 2
Definition of onset:	Diarrhoea, abdominal cramps or flatulence	3
Incubation period <sup>2</sup> :	E: 5-20 days [7] (n = 31)	3
Risk of transmission:	Attack rate up to 50% during outbreaks in nurseries	2
Duration of shedding:	mean 2 weeks [SD 1.5 weeks] (n = 27)	4
Period of infectiousness:		
Serial interval:		
Exclusion period:	24 hours from last episode of diarrhoea. See comment (c)	4

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Most information on acute infection rather than chronic giardiasis.
- b) Many infections asymptomatic in young children (ref 4).
- c) Rauch et al. found much chronic and asymptomatic excretion in nurseries. Exclusion of children with loose stools was sufficient to terminate outbreaks.
- d) Ref 3 is a good example of modern epidemiological study being used to redefine incubation period etc.

### References:

1. Flanagan PA. Giardia - diagnosis, clinical course and epidemiology. *Epidemiol Infect* 1992; 109: 1-22.
2. Black RE, Dykes AC, Sinclair SP, Wells JG. Giardiasis in day-care centers: evidence of person-to-person transmission. *Pediatrics* 1977; 60: 486-91.
3. Hopkins RS, Juranek DD. Acute giardiasis: an improved case definition for epidemiological studies. *Am J Epidemiol* 1991; 133: 402-7.
4. Rauch AM, Van R, Bartlett AV, Pickering LK. Longitudinal study of Giardia lamblia infection in a day care center population. *Pediatr Infect Dis J* 1990; 9: 186-9.

**Disease: Haemophilus influenzae infection** (see comments a and b)

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets, nasal secretions	1
Definition of onset:	Invasive disease: meningitis, septicaemia, pneumonia or cellulitis	
Incubation period <sup>2</sup> :	No true incubation period, see comment (b) (case report: 4-5 days)	2
Risk of transmission:	< 1% in nurseries (1:7 received prophylaxis) 2% in household contacts < 6 years of age (without prophylaxis)	3 4
Duration of shedding:	Organism carried for unspecified period (untreated) see comment (b) Organism not isolated from nasopharynx 24 hours after antibiotics started. (n = 38).	5
Period of infectiousness:		
Serial interval:	1-52 days [13] (n = 7) in nurseries 0-48 days [3] (n = 9) in households	3 4
Exclusion period:	24 hours from start of appropriate antibiotic treatment.	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- a) Refers mainly to invasive disease due to *H. influenzae* type b. Children are now vaccinated against this organism. Close (household) contacts of cases should receive antibiotic prophylaxis.
- b) Organism is carried for an unknown time before clinical disease (and possibly afterwards).

**References:**

1. Shapiro ED, Ward JI. The epidemiology and prevention of disease caused by *Haemophilus influenzae* type b. *Epidemiol Rev* 1991; 13: 113-42.
2. Homer C, Poncher J, Yogev R, Hansen EJ. Simultaneous presentation of invasive *Haemophilus influenzae* type B disease after brief exposure in a day care setting. *Pediatr Infect Dis J* 1990; 9: 296-8.
3. Makintubee S, Istre GR, Ward JI. Transmission of invasive *Haemophilus influenzae* type b disease in day care settings. *J Pediatr* 1987; 111: 180-6.
4. Ward JI, Fraser DW, Baraff LJ, Plikaytis BD. *Haemophilus influenzae* meningitis: a national study of secondary spread in household contacts. *N Engl J Med* 1979; 301: 122-6.
5. Ogle JW, Rabalais GP, Glode MP. Duration of pharyngeal carriage of *Haemophilus influenzae* type b in

children hospitalized with systemic infections. *Pediatr Infect Dis* 1986; 5: 509-11.

**Disease: Hand, foot and mouth disease**

		ref.
Mode of transmission <sup>1</sup> :	P: ? respiratory droplets, ? direct contact, ?? faeco-oral	
Definition of onset:	Vesicles in mouth or extremities	
Incubation period <sup>2</sup> :	E: ? 3-5 days (n = 60) see comment (a)	1
Risk of transmission:	Attack rate up to 50% among household and nursery contacts. Affects young children especially.	1,2,3
Duration of shedding:	Faecal shedding up to 4 weeks days (n = 2). No shedding at 6 weeks (n = 2). See comment (b)	4
Period of infectiousness:	? up to 7 days, see comment (c)	2
Serial interval:	1-7 days [4] (n = 60)	3
Exclusion period:	None, see comments (d), (e) and (f)	2

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

**Comments:**

- a) No evidence given for this although 2 cases had incubation around 5 days.
- b) Relevance of faecal shedding uncertain with respect to infectiousness.
- c) Closure of nursery for 7 days terminated an outbreak.
- d) Generally a mild disease therefore exclusion is probably not necessary.
- e) It could be argued that exclusion is necessary because lesions are painful and spread to pregnant women may cause abortion (ref 1). However there is insufficient data to suggest an exclusion period.
- f) Asymptomatic infection thought to be common (ref 4). This, and possible transmission before onset of symptoms could limit effectiveness of exclusion, if attempted.

**References:**

1. Robinson CR, Doane FW, Rhodes AJ. Report of an outbreak of febrile illness with pharyngeal lesions and exanthem: Toronto, summer 1957 - isolation of group A coxsackie virus. *Can Med Assoc J* 1958; 79: 615-21.
2. Ferson MJ, Bell SM. Outbreak of coxsackievirus A16 hand, foot, and mouth disease in a child day-care center. *Am J Public Health* 1991; 81: 1675-6.
3. Goh KT, Doraisingham S, Tan JL, Lim GN, Chew SE. An outbreak of hand, foot, and mouth disease in Singapore. *Bull World Health Organ* 1982; 60: 965-9.
4. Higgins PG, Ellis EM, Boston DG. Hand, foot and mouth disease, 1963-64: a study of cases and family contacts. *Monthly Bull Minist Health* 1965; 24: 38-45.

**Disease: Head lice** (pediculosis)

		ref.
Mode of transmission <sup>1</sup> :	P: direct contact, (?? fomites)	1,2,3
Definition of onset:	Detection of lice	
Incubation period <sup>2</sup> :	No true incubation period. See comment (b) (period nits to lice given as 7-10 days)	4
Risk of transmission:	Moderate. Epidemics do occur in schoolchildren.	1,5,6
Duration of shedding:	Presumably indefinite unless life cycle is disrupted.	
Period of infectiousness:	See above	
Serial interval:		
Exclusion period:	None. See comments (c), (d) and (e).	

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

Comments:

- a) Epidemiology poorly understood.
- b) No IP as exposure is followed immediately by disease. IP of nits to lice is probably around 1 week (ref 3).
- c) Generally considered a mild problem.
- d) There is no evidence that exclusion of affected children has any effect on the spread of head lice in a school or nursery.
- e) Note need for treatment of cases and contacts shown to have head lice.

References:

1. Chunge RN, Scott FE, Underwood JE, Zavarella KJ. A review of the epidemiology, public health importance, treatment and control of head lice. *Can J Public Health* 1991; 82: 196-200.
2. Chunge RN, Scott FE, Underwood JE, Zavarella KJ. A pilot study to investigate the transmission of headlice. *Can J Public Health* 1991; 82: 207-8.
3. Slonka GF. Life cycle and biology of lice. *J Sch Health* 1977; 47: 349-51.
4. Ibarra J. Lice (Anoplura). In: Lane RP, Crosskey RW (eds). *Medical insects and arachnids*. London: Chapman and Hall, 1993.
5. Slonka GF, McKinley TW, McCroan JE, Sinclair SP, Schultz MG, Hicks F, Hill N. Epidemiology of an outbreak of head lice in Georgia. *Am J Trop Med Hyg* 1976; 25: 739-43.
6. Hopper JM. An epidemic of nits. *Can J Public Health* 1971; 62: 159-60.

## Disease: Hepatitis A

		ref.
Mode of transmission <sup>1</sup> :	E: food borne, waterborne P: faeco-oral	1,2 2,3
Definition of onset:	Jaundice, see comment (b)	
Incubation period <sup>2</sup> :	E: 25-50 days [33] (n = 113) X: 19-37 days [24] (n = 16) see comment (c) X: as short as 15 days has been reported.	1 2 4
Risk of transmission:	Generally low amongst household contacts. Outbreaks occur in nurseries and institutions with attack rates around 10%-15%. However, transmission in home > schools. Day-care facilities are a recognised source of hepatitis in adults.	2,5 3,6 5,6 7
Duration of shedding:	E: Up to 14 days [3] (n = 59/200, others had no detectable virus). Sharp fall off after 5 days. Much greater excretion before onset. See comment (d). E: None after peak ALT (= onset of jaundice, ref 4) (n = 6). See comment (e). X: -10 to +1 days (n = 2), peaks at -2 to -3 days	8 9 10
Period of infectiousness:	E: infectiousness begins at least -8 to -17 days (n = 8) E: no reports of transmission after hospitalisation X: stool infectious at -2 days (n = 3) but not at +20 days (n = 3) X: Stool infectious at -15 days (n > 20). X: pooled stool from days 1-8 or weeks 1-2 infectious. See comment (f).	3 9 11 4,12 11- 13
Serial interval:	E: 7-29 days [mean 14] (n = 24, institution) E: 20-32 days [27] (n = 28 schoolchildren) E: Mode = 28 days (n = 69, families) E: Mode = 31-33 days (n = 110, families) See comment (g)	3 14 6 5
Exclusion period:	Children < 5 yrs: 5 days. Children ≥ 5 yrs: none. See comment (i).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

Comments:

- a) Generally a mild illness in children (ref 7).
- b) May have non-specific prodromal illness for about one week prior to jaundice.
- c) NB: Incubation period inversely proportional to dose (ref 4). Note shorter incubation in experimental infection.
- d) This study used detection of dark urine as onset of disease. This precedes jaundice by 2 to 3 days. Thus, v. little virus excreted after 3 days of jaundice.
- e) Discrepancy in results probably depends on sensitivity of assays used.
- f) This data used to justify infectiousness in first week, but doses were high, and all samples contained specimens from day +1 (ref 13).
- g) Serial interval is shorter or equal to incubation period, indicating that transmission usually occurs before or around onset of jaundice.
- h) Asymptomatic infections common (refs 4,12).
- i) Exclusion not recommended in older children because hepatitis A is generally a mild illness. Furthermore, exclusion would be largely ineffective because patients are most infectious in prodrome, and asymptomatic cases are involved in transmission. However, exclusion should still be attempted in nurseries because of risk to adults.

References:

1. Hooper RR, Juels CW, Routenberg JA, Harrison WO, Kilpatrick ME, Kendra SJ, Dienstag JL. An outbreak of type A viral hepatitis at the Naval Training Center, San Diego: epidemiologic evaluation. *Am J Epidemiol* 1977; 105: 148-55.
2. Neefe JR, Stokes J. An epidemic of infectious hepatitis apparently due to a water borne agent. *JAMA* 1945; 128: 1063-75.
3. Batten PJ, Runte VE, Skinner HG. Infectious hepatitis: infectiousness during the presymptomatic phase of the disease. *Am J Hyg* 1963; 77: 129-36.
4. Krugman S, Ward R, Giles JP. The natural history of infectious hepatitis. *Am J Med* 1962; 32: 717-28.
5. Ström J. A comparison between family infections during epidemics of poliomyelitis and hepatitis in Stockholm. *Acta Med Scand* 1959; 165: 49-54.
6. Knight V, Drake ME, Belden EA, Franklin BJ, Romer M, Copple LO. Characteristics of spread of infectious hepatitis in schools and households in an epidemic in a rural area. *Am J Hyg* 1954; 59: 1-16.
7. Lemon SM. Type A viral hepatitis: new developments in an old disease. *N Engl J Med* 1985; 313: 1059-67.
8. Coulepsi AG, Locarnini SA, Lehmann NI, Gust ID. Detection of Hepatitis A virus in the feces of patients with naturally acquired infections. *J Infect Dis* 1980; 141: 151-6.
9. Rakela J, Mosley JW. Fecal excretion of Hepatitis A virus in humans. *J Infect Dis* 1977; 135: 933-8.
10. Dienstag JL, Feinstone SM, Kapikian AZ, Purcell RH, Boggs JD, Conrad ME. Faecal shedding of Hepatitis-A antigen. *Lancet* 1975; 1: 765-7.
11. Havens WP. Period of infectivity of patients with experimentally induced infectious hepatitis. *J Exp Med* 1946; 83: 251-8.
12. Ward R, Krugman S, Giles JP, Jacobs AM, Bodansky O. Infectious hepatitis: studies of its natural history and prevention. *N Engl J Med* 1958; 258: 407-16.
13. Neefe JR, Stokes J, Reinhold JG. Oral administration to volunteers of feces from patients with homologous serum hepatitis and infectious (epidemic) hepatitis. *Am J Med Sci* 1945; 210: 29-32.
14. Brodribb HS. Infective hepatitis in a boarding-school. *Lancet* 1952; 1: 339-42.

## Disease: Herpes simplex

		ref.
Mode of transmission <sup>1</sup> :	P: oral secretions, physical contact	1,2
Definition of onset:	Gingivostomatitis	
Incubation period <sup>2</sup> :	E: 1-6 days [mean 3.6] (n = 20 adults and children)	2
Risk of transmission:	Highly infectious, especially among young children	
Duration of shedding:	E: 1-8 weeks [3] (n = 12) see comment (b) (Excretion for about 3 days in recurrent infection)	1 (3)
Period of infectiousness:		
Serial interval:	E: 2-12 days [mean 6] (n > 1000) See comment (c)	4
Exclusion period:	None. See comment (d)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Refers to primary infection and gingivostomatitis.
- b) After primary infection children intermittently excrete virus in saliva. At any one time 20% young children may be shedding virus (ref 2).
- c) Most patients (> 70%) have no known contact with another case.
- d) Patients with primary lesions will be infectious for weeks after this but longer exclusion is unlikely to be effective because other children will be excreting virus and infection is virtually universal in early childhood.

### References:

1. Buddingh GJ, Schrum DI, Lanier JC, Guidry DJ. Studies of the natural history of herpes simplex infections. *Pediatrics* 1953; 11: 595-609.
2. Manzella JP, McConville JH, Valenti W, Menegus MA, Swierkosz EM, Arens M. An outbreak of herpes simplex type I gingivostomatitis in a dental hygiene practice. *JAMA* 1984; 252: 2019-22.
3. Daniels CA, LeGoff SG, Notkins AL. Shedding of infectious virus/antibody complexes from vesicular lesions of patients with recurrent herpes labialis. *Lancet* 1975; 2: 524-8.
4. Juretic M. Incubation period of primary herpetic infections. *Helv Paediatr Acta* 1960; 15: 102.

## Disease: Impetigo - staphylococcal

		ref.
Mode of transmission <sup>1</sup> :	P: physical contact	1
Definition of onset:	Skin lesions	
Incubation period <sup>2</sup> :	No true incubation period. See comment (b)	1
Risk of transmission:	? Low	1
Duration of shedding:		
Period of infectiousness:		
Serial interval:		
Exclusion period:	Until lesions healed / crusted See comment (c)	

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

### Comments:

- a) *S. aureus* traditionally associated with bullous impetigo but can also cause non-bullous form. Many cases have mixture of staphylococci and streptococci - with staph. as possible secondary infection (ref 1).
- b) *S. aureus* skin infection thought to be secondary to nasal or perineal carriage.
- c) Little evidence for this but organism can presumably be transmitted from open lesions. On the other hand most staph. probably acquired from nasal carriage.

### References:

1. Dillon HC. Impetigo contagiosa: suppurative and non-suppurative complications. Am J Dis Child 1968; 115: 530-41.

## Disease: Impetigo - streptococcal

		ref.
Mode of transmission <sup>1</sup> :	P: physical contact, see comment (a)	1
Definition of onset:	Skin lesions	
Incubation period <sup>2</sup> :	E: Skin carriage 2-33 days [8] before development of impetigo (n = 31) see comment (b)	2
Risk of transmission:	High (up to 100%) among household childhood contacts during epidemics.	1,2
Duration of shedding:	Untreated, skin carriage may persist for weeks	2
Period of infectiousness:		
Serial interval:	E: 2-12 days [4] (n = 11 close family members)	2
Exclusion period:	Until lesions healed / crusted See comment (c)	

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

### Comments:

- a) Broken skin usually required for development of streptococcal impetigo (refs1,2).
- b) In this study, skin carriage and impetigo preceded throat colonisation (ref 2).
- c) Little evidence for this but serial interval suggests that most transmission occurs in first week.

### References:

1. Dillon HC. Impetigo contagiosa: suppurative and non-suppurative complications. Am J Dis Child 1968; 115: 530-41.
2. Ferrieri P, Dajani AS, Wannamaker LW, Chapman SS. Natural history of impetigo: 1. site sequence of acquisition and familial patterns of spread of cutaneous streptococci. J Clin Invest 1972; 51: 2851-2862.

## Disease: Infectious mononucleosis

		ref.
Mode of transmission <sup>1</sup> :	P: oral secretions (kissing), (fomites)	1
Definition of onset:	Fever / malaise	
Incubation period <sup>2</sup> :	E: 33-49 days [no median] (n = 7 young adults and children)	1
Risk of transmission:	Low in school setting. Higher risk among young children in nurseries, but asymptomatic infection common in this age group.	2,3
Duration of shedding:	Up to and possibly > 16 months [median > 5 months] (n = 23)	4
Period of infectiousness:	(At least 2 months, n = 1)	1
Serial interval:		
Exclusion period:	None. See comment (b)	2

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

### Comments:

- a) Asymptomatic infection is probably common. Most presumed sources of the condition have no history of glandular fever (refs 2,3).
- b) Exclusion not warranted because infection is usually mild, there are unidentified asymptomatic sources, and virus is excreted for a prolonged time.

### References:

1. Hoagland RJ. The incubation period of infectious mononucleosis. *Am J Public Health* 1964; 54: 1699-705.
2. Brodsky AL, Heath CW. Infectious mononucleosis: epidemiologic patterns at United States colleges and universities. *Am J Epidemiol* 1972; 96: 87-93.
3. Sawyer RN, Evans AS, Niederman JC, McCollum RW. Prospective studies of a group of Yale University freshmen. I: occurrence of infectious mononucleosis. *J Infect Dis* 1971; 123: 263-70.
4. Miller G, Niederman JC, Andrews LL. Prolonged oropharyngeal excretion of Epstein-Barr virus after infectious mononucleosis. *N Engl J Med* 1973; 288: 229-32.

## Disease: Influenza

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets, airborne	1,2
Definition of onset:	Cough, fever and malaise	
Incubation period <sup>2</sup> :	E: 1-3 days [36 hours] (n = 37 adults) X: 2-3 days (n = 6)	2 3
Risk of transmission:	High. Epidemics are often explosive. Children are important reservoir of infection.	1,2 4
Duration of shedding:	7-21 days [mean 9] (n = 7 naturally infected children). X: mean 6 days (n = 7)	5 3
Period of infectiousness:		
Serial interval:	1-26 days [5] (n = 38 family contacts) see comment (c)	4
Exclusion period:	None. See comment (d)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Almost all data refers to infection with influenza A virus.
- b) Diagnosis is rarely confirmed in clinical practice.
- c) Longer SI may represent intermediate undiagnosed source.
- d) Exclusion would be ineffective because of explosiveness of outbreaks.

### References:

1. Alford RH, Kasel JA, Gerone PJ, Knight V. Human influenza resulting from aerosol inhalation. *Proc Soc Exp Biol Med* 1966; 122: 800-4.
2. Moser MR, Bender TR, Margolis HS, Noble GR, Kendal AP, Ritter DG. An outbreak of influenza aboard a commercial airliner. *Am J Epidemiol* 1979; 110: 1-6.
3. Couch RB, Douglas RG, Fedson DS, Kasel JA. Correlated studies of a recombinant influenza-virus vaccine. III: protection against experimental influenza in man. *J Infect Dis* 1971; 124: 473-80.
4. Jordan WS, Denny FW, Badger GF, Curtiss C, Dingle JH, Oseasohn R, Stevens DA. A study of illness in a group of Cleveland families XVII: the occurrence of Asian influenza. *Am J Hyg* 1958; 68: 190-212.
5. Hall CB, Douglas RG. Nosocomial influenza infection as a cause of intercurrent fevers in infants. *Pediatrics* 1975; 55: 673-7.

**Disease: Lyme disease**

		ref.
Mode of transmission <sup>1</sup> :	E: insect vector (tick bites)	1
Definition of onset:	Skin lesion	
Incubation period <sup>2</sup> :	E: 3-20 days [12] (n = 9 adults and children) See comment (a)	1
Risk of transmission:	Nil. See comment (b)	
Duration of shedding:		
Period of infectiousness:		
Serial interval:		
Exclusion period:	None. See comment (b).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- a) Very little data on incubation period. Other reports do not give IP.
- b) Person to person transmission not reported.

**References:**

1. Steere AC, Broderick TF, Malawista SE. Erythema chronicum migrans and Lyme arthritis: epidemiologic evidence for a tick vector. *Am J Epidemiol* 1978; 108: 312-21.

## Disease: Measles

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets, (airborne)	1
Definition of onset:	Rash	
Incubation period <sup>2</sup> :	E: 9-18 days [12] (n = 69 schoolchildren) 6-19 days [13] (n > 200 susceptible adults)	1 2
Risk of transmission:	Highly contagious in non-immune population. Low risk in vaccinated school population. See comment (a)	1,2,3 1
Duration of shedding:	X: -2 to +3 days (n = 13)	4
Period of infectiousness:		
Serial interval:	6-18 days [10] (n = 162 family contacts)	3
Exclusion period:	5 days from onset of rash. See comments (b) and (c).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Traditionally a highly contagious disease but transmission uncommon in vaccinated school age population. Young children at higher risk.
- b) Duration of shedding and serial interval suggest transmission generally occurs early.
- c) Exclusion may not be fully effective because some transmission occurs before onset of illness (ref 2).
- d) Risk of serious infection in immunocompromised host. Contacts with immune deficiency should receive prophylaxis.

### References:

1. Chen RT, Goldbaum GM, Wassilak SGF, Markowitz LE, Orenstein WA. An explosive point-source measles outbreak in a highly vaccinated population. *Am J Epidemiol* 1989; 129: 173-82.
2. Christensen PE, Schmidt H, Bang HO, Andersen V, Jordal B, Jensen O. An epidemic of measles in southern Greenland 1951. Measles in virgin soil II: the epidemic proper. *Acta Med Scand* 1953; 144: 430-49.
3. Hope Simpson RE. Infectiousness of communicable diseases in the household (measles, chickenpox, and mumps). *Lancet* 1952; 2: 549-54.
4. Ruckle G, Rogers KD. Studies with measles virus II: isolation of virus and immunologic studies in persons who have had the natural disease. *J Immunol* 1957; 78: 341-55.

## Disease: Meningococcal disease

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets	1
Definition of onset:	Petechial rash or meningitis	
Incubation period <sup>2</sup> :	See comment (a)	
Risk of transmission:	Low. Households > nurseries > schools. (Schools: 2.5-75:10 <sup>5</sup> )	2,3 2,4
Duration of shedding:	Untreated: duration of colonisation = median 9 months. (n = 42) (Stat. model also gives median 9 months, n = 152) Treated : < 2 days [1] from start of chemoprophylaxis (n = 28)	5 6 7
Period of infectiousness:	= duration of carriage (see above)	
Serial interval:	1-31 days [2] during school clusters (n = 32) see comment (c) 1-39 weeks [7 weeks] in households (n = 14)	4 3
Exclusion period:	Duration of illness. See comment (d).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- No true incubation period as organism is carried in nasopharynx for unknown (? highly variable) time before invasive disease. Short SI in clusters suggests short IP in secondary cases.
- Asymptomatic carriage in 5-10% general population and 17-50% household contacts (ref 1). Carriage 5-35% in school contacts depending on group.
- Could include co-primaries.
- Carriage should be eliminated by chemoprophylaxis. See appropriate guidelines for management of clusters in schools (CDR Review 1997; 7: R3-4).

### References:

- Broome CV. The carrier state: *Neisseria meningitidis*. J Antimicrob Chemother 1986; 18 suppl A: 25-34.
- De Wals P, Hertoghe L, Borlée-Grimée I, De Maeyer-Cleempoel S, Reginster-Haneuse, Dachy A, Bouckaert A, Lechat MF. Meningococcal disease in Belgium: secondary attack rate among household, day-care nursery and pre-elementary school contacts. J Infect 1981; 3 suppl 1: 53-61.
- Cooke RPD, Riordan T, Jones DM, Painter MJ. Secondary cases of meningococcal infection among close family and household contacts in England and Wales, 1984-7. BMJ 1989; 298: 555-7.
- Zangwill KM, Schuchat A, Riedo FX, Pinner RW, Koo DT, Reeves MW, Wenger JD. School-based clusters of meningococcal disease in the United States: descriptive epidemiology and a case-control

- analysis. JAMA 1997; 277: 389-95.
5. Greenfield S, Sheehe PR, Feldman HA. Meningococcal carriage in a population of “normal” families. J Infect Dis 1971; 123: 67-73.
  6. De Wals P, Bouckaert A. Methods for estimating the duration of bacterial carriage. Int J Epidemiol 1985; 14: 628-34.
  7. Deal WB, Sanders E. Efficacy of rifampicin in treatment of meningococcal carriers. N Engl J Med 1969; 281: 641-5.

**Disease: Molluscum contagiosum**

		ref.
Mode of transmission <sup>1</sup> :	P: direct contact, (fomites)	1,2,3
Definition of onset:	Skin lesions	
Incubation period <sup>2</sup> :	E: 6-12 weeks (n = 2 case reports) X: 14-25 days (n = 2 direct inoculation)	4,5 1
Risk of transmission:	Moderate among family members. No data from schools.	6
Duration of shedding:	(Presumably = duration of lesions)	
Period of infectiousness:	(Presumably = duration of lesions)	
Serial interval:		
Exclusion period:	None. See comment (a).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

a) Not a serious condition and probably not highly contagious in schools.

**References:**

1. Wile UJ, Kingery LB. The etiology of molluscum contagiosum: preliminary report of experimental study. *J Cutan Dis* 1919; 37: 431-46.
2. Cranston Low R. Molluscum contagiosum. *Edinburgh Med J* 1946; 53: 657-71.
3. Niizeki K, Kano O, Kondo Y. An epidemic study of molluscum contagiosum: relationship to swimming. *Dermatologica* 1984; 169: 197-8.
4. Foulds IS. Molluscum contagiosum: an unusual complication of tattooing. *BMJ* 1982; 285: 607.
5. Commens CA. Cutaneous transmission of molluscum contagiosum during orienteering competition. *Med J Aust* 1987; 146: 117.
6. Overfield TM, Brody JA. An epidemiologic study of molluscum contagiosum in Anchorage, Alaska. *J Pediatr* 1966; 69: 640-2.

## Disease: Mumps

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets	1
Definition of onset:	Parotitis	
Incubation period <sup>2</sup> :	O: 95% CI: 15-24 days [19] (n = 127) mathematical X: 14-19 days [16] (n = 4 children)	2 1
Risk of transmission:	Moderate in susceptible population. Low in vaccinated school population. See comment (b)	2,3
Duration of shedding:	X: -6 to +4 days (n = 4) reported as early as -7 days	1 5
Period of infectiousness:		
Serial interval:	14-29 days [18] (n = 127 schoolchildren) 10-31 days [19] (n = 142 family contacts)	2 3
Exclusion period:	5 days from onset. See comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Asymptomatic infections common in children (ref 1).
- b) Outbreaks have been reported in vaccinated secondary schoolchildren (ref 4).
- c) Exclusion may be ineffective as virus is often passed on before onset of parotitis (ref 6).
- d) Could argue that exclusion is not needed because disease is usually mild and most school contacts should be immune.

### References:

1. Henle G, Henle W, Wendell KK, Rosenberg P. Isolation of mumps virus from human beings with induced apparent or inapparent infections. *J Exp Med* 1948; 88: 223-32.
2. Meyer MB. An epidemiologic study of mumps; its spread in schools and families. *Am J Hyg* 1962; 75: 259-81.
3. Hope Simpson RE. Infectiousness of communicable diseases in the household (measles, chickenpox, and mumps). *Lancet* 1952; 2: 549-54.
4. Cheek JE, Baron R, Atlas H, Wilson DL, Crider RD. Mumps outbreak in a highly vaccinated school population. *Arch Pediatr Adolesc Med* 1995; 149: 774-8.
5. Ennis FA, Jackson D. Isolation of virus during the incubation period of mumps infection. *J Pediatr* 1968; 72: 536-7.
6. Brunell PA, Brickman A, O'Hare D, Steinberg S. Ineffectiveness of isolation of patients as a method of preventing the spread of mumps. *N Engl J Med* 1968; 279: 1357-61.

## Disease: Pertussis

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets	1,2
Definition of onset:	Cough	
Incubation period <sup>2</sup> :	O: 5 – 21 days (commonly 7, rarely > 10) see comment (a) X: 7 days (n = 2 children)	1 2
Risk of transmission:	Highly infectious in non-immune populations. Younger children largely protected by vaccination, but see comments (b) and (c).	3 3
Duration of shedding:	60% shedding at 2 weeks, 20% at 6 weeks (n=900) < 1 week if treated with macrolides (n = 34)	4 5
Period of infectiousness:		
Serial interval:	95% CI: 4 days-8 weeks [7 days] (n > 1000)	6
Exclusion period:	5 days if given erythromycin or azithromycin. Otherwise ? > 3 weeks. See comments (c) and (d).	5,7

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) This, the most often cited paper for the IP of pertussis, is from a largely unsubstantiated review.
- b) Efficacy of pertussis vaccine wanes with time so that attack rates up to 50% may be found in children 5 years after vaccination (100% in unvaccinated)(ref 3).
- c) Transmission may be limited by treating index case with erythromycin.
- d) Ref 6 (re 5 day isolation + erythromycin) is rare example of proven exclusion period. Other papers on shedding and SI suggest a much longer exclusion may be needed in untreated disease.

### References:

1. Gordon JE, Hood RI. Whooping cough and its epidemiological anomalies. Am J Med Sci 1951; 222: 333-61.
2. MacDonald H, MacDonald EJ. Experimental pertussis. J Infect Dis 1933; 53: 328-30.
3. Lambert HJ. Epidemiology of a small pertussis outbreak in Kent County, Michigan. Public Health Rep 1965; 80: 365-9.
4. Kwantes W, Joynson DH, Williams WO. *Bordetella pertussis* isolation in general practice: 1977-79 whooping cough epidemic in West Glamorgan. J Hyg (Camb) 1983; 90: 149-58.
5. Aoyama T, Sunakawa K, Iwata S, Takeuchi Y, Fujii R. Efficacy of short-term treatment of pertussis with clarithromycin and azithromycin. J Pediatr 1996; 129: 761-4.
6. Stocks P. Some epidemiological features of whooping-cough. Lancet 1933; 1: 265-9.

7. Christie CD, Marx ML, Daniels JA, Adcock MP. Pertussis containment in schools and day care centres during the Cincinnati epidemic of 1993. *Am J Public Health* 1997; 87: 460-2.

## Disease: Roseola infantum

		ref.
Mode of transmission <sup>1</sup> :	P: ? oral secretions	1,2,3
Definition of onset:	Onset of rash	
Incubation period <sup>2</sup> :	E: 10-15 days (n = 6) (poorly described) (X: 9 days, n = 1 iv injection)	4 3
Risk of transmission:	Moderate in populations of infants and young children. Otherwise v low. See comment (a).	1,2
Duration of shedding:	Lifelong? HHV-6 found in saliva of most adults	5
Period of infectiousness:	See above	
Serial interval:	5-15 days [10] (n = 15)	2
Exclusion period:	Nil. Mild disease. See comments (a) and (b)	

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

### Comments:

- a) 90% cases occur < 2 years of age, so spread in family or nursery is unusual.
- b) Nearly all children have evidence of infection by 2½ years of age.
- c) Infection is presumably asymptomatic (or undiagnosed) in most cases.

### References:

1. Cushing HB. An epidemic of roseola infantum. *Can Med Assoc J* 1927; 17: 905-6.
2. Barenberg LH, Greenspan L. Exanthema subitum (roseola infantum). *Am J Dis Child* 1939; 58: 983-93.
3. Kempe CH, Shaw EB, Jackson JR, Silver HK. Studies on the etiology of exanthema subitum (roseola infantum). *J Pediatr* 1950; 37: 561-8.
4. Berenberg W, Wright S, Janeway CA. Roseola infantum (exanthem subitum). *N Engl J Med* 1949; 241: 253-9.
5. Harnett GB, Farr TJ, Pietroboni GR, Bucens MR. Frequent shedding of human herpesvirus 6 in saliva. *J Med Virol* 1990; 30: 128-30.

## Disease: Rubella

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets	1,2
Definition of onset:	Rash	
Incubation period <sup>2</sup> :	E: 15-20 days [17] (n = 15 children and adults) X: 13-20 days [16] (n = 12 students)	3 1
Risk of transmission:	Moderate to high in susceptibles. Very low / nil in populations of immunised children.	2,3,5 3,6
Duration of shedding:	E: -13 to +6 days (usually -7 to +2 days)(n = 46) X: Usually -7 to +6 days (rarely +21 days) (n = 50) Most shedding before, or at, onset of rash.	5 2
Period of infectiousness:	(One case most infectious 1 to 3 days before onset)	3
Serial interval:	15-23 days [18] (n = 127 schoolchildren)	4
Exclusion period:	5 days from onset of rash. See comment (b)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) In young children, rubella is usually a mild disease with no sequelae. Rubella may cause arthritis in older children. Main risk is to fetus from infection in pregnancy.
- b) Exclusion will not be fully effective in preventing further cases because most viral shedding occurs before the onset of the rash. Patients are probably most infectious during the prodromal stage of the infection (ref 3). Furthermore, many infections are asymptomatic and asymptomatic cases are known to be involved in transmission (refs 2,5).
- c) Most children and pregnant women are immune as a result of vaccination.

### References:

1. Anderson SG. Experimental rubella in human volunteers. *J Immunol* 1949; 62: 29-40.
2. Green RH, Balsamo MR, Giles JP, Krugman S, Mirick GS. Studies of the natural history and prevention of rubella. *Am J Dis Child* 1965; 110: 348-65.
3. Hattis RP, Halstead SB, Herrmann KL, Witte JJ. Rubella in an immunized island population. *JAMA* 1973; 223: 1019-21.
4. Aycock WL, Ingalls TH. Maternal disease as a principle in the epidemiology of congenital anomalies with a review of rubella. *Am J Med Sci* 1946; 212: 366-79.
5. Sever JL, Brody JA, Schiff GM, McAlister R, Cutting R. Rubella epidemic on St. Paul Island in the Pribilofs, 1963. *JAMA* 1965; 191: 88-90.
6. Marks JS, Serdula MK, Halsey NA, Gunaratne MV, Craven RB, Murphy KA, Kobayashi GY, Wiebenga NH. Saturday night fever: a common-source outbreak of rubella among adults in Hawaii. *Am J*

Epidemiol 1981; 114: 574-83.

## Disease: Salmonellosis

		ref.
Mode of transmission <sup>1</sup> :	E: food borne, waterborne P: faeco-oral, ? fomites	1 2,3
Definition of onset:	Diarrhoea	
Incubation period <sup>2</sup> :	E: 4 hours - 5 days [16 hours] (n = 191 adults) 14 days has been reported. See comment (a)	1 4
Risk of transmission:	High risk in day care centres Low / moderate transmission in schools / colleges	2 3
Duration of shedding:	< 5 yrs age: median = 10 weeks (18% up to 6 months, 5% up to 12 months) > 5 yrs age: median = 4 weeks (up to 12 weeks) (Systematic review) (n > 100)	5
Period of infectiousness:		
Serial interval:		
Exclusion period:	< 5 years of age: negative stool x 1. ≥ 5 years of age: 24 hrs from last episode of diarrhoea. See comments (b) and (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- IP depends on infecting dose (ref 1). ? also on subspecies.
- A longer period of exclusion may be appropriate for children < 5 years and older children who are unable to maintain personal hygiene.
- No data on effectiveness of different lengths of exclusion or number of negative stools. In day care, where risk of transmission is high and carriage is long, isolation of carriers within centre until 2 negative stools contained outbreak (ref 2). In UK microbiological clearance is not required where adequate hygiene is practised.

### References:

- Glynn JR, Palmer SR. Incubation period, severity of disease, and infecting dose: evidence from a *Salmonella* outbreak. Am J Epidemiol 1992; 136: 1369-77.
- Chorba TL, Meriwether RA, Jenkins BR, Gunn RA, MacCormack JN. Control of a non-foodborne outbreak of salmonellosis: day care isolation. Am J Public Health 1987; 77: 979-81.
- Palmer SR, Jephcott AE, Rowland AJ, Sylvester DG. Person-to-person spread of *Salmonella typhimurium* phage type 10 after a common-source outbreak. Lancet 1981; 1: 881-4.

4. O'Mahony M, Barnes H, Stanwell-Smith R, Dickens T, Jephcott A. An outbreak of *Salmonella heidelberg* infection associated with a long incubation period. *J Public Health Med* 1990; 12: 19-21.
5. Buchwald DS, Blaser MJ. A review of human salmonellosis II: duration of excretion following infection with nontyphi *Salmonella*. *Rev Infect Dis* 1984; 6: 345-56.

## Disease: Scabies

		ref.
Mode of transmission <sup>1</sup> :	P: direct contact	1
Definition of onset:	Skin lesions	
Incubation period <sup>2</sup> :	E: 7-27 days [12] (n = 13 adults) See comment (a)	1
Risk of transmission:	Moderate / high in families. Low in schools. Epidemics occur in day care centres. See comment (b)	2 3,4
Duration of shedding:	Presumably indefinite without treatment.	
Period of infectiousness:	Presumably indefinite without treatment.	
Serial interval:		
Exclusion period:	Until treated. See comments (c) and (d).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Typical itchy rash is an allergic reaction to scabies mite. Mites burrow immediately after transmission but time to skin lesions is very variable. Re-infections have v short IP.
- b) Generally thought to need prolonged close contact to allow transmission.
- c) Risk of transmission is low in schools but outbreaks do occur.
- d) Scabies usually responds to 1 or 2 applications of permethrin or malathion (ref 5). Close contacts should also be treated.

### References:

1. Gooch JJ, Strasius SR, Beamer B, Reiter MD, Correll GW. Nosocomial outbreak of scabies. Arch Dermatol 1978; 114: 897-8.
2. Church RE, Knowelden J. Scabies in Sheffield: a family infestation. BMJ 1978; 1: 761-3.
3. Sargent SJ, Martin JT. Scabies outbreak in a day-care center. Pediatrics 1994; 94: 1012-3.
4. Barrett NJ, Morse DL. The resurgence of scabies. Communicable Disease Report CDR Review 1993; 3: R32-4.
5. Haustein UF, Hlawa B. Treatment of scabies with permethrin versus lindane and benzyl benzoate. Acta Derm Venereol (Stockh) 1989; 69: 348-51.

## Disease: Scarlet fever

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets, ? direct contact	1,2
Definition of onset:	Rash	
Incubation period <sup>2</sup> :	E: 12 hrs - 5 days [2 days] (n = 69 adults and children) refers to streptococcal pharyngitis E: 3 - 4 days (n = 2) X: 2 - 3 days (n = 2)	3 2 1
Risk of transmission:	Moderate within families. Low elsewhere, except for rare outbreaks (sometimes in schools)	4,5,6
Duration of shedding:	≥ 2 months untreated, 3 days treated (n = 13) See comment (a)	5
Period of infectiousness:		
Serial interval:		
Exclusion period:	Suggest 5 days if treated. See comment (b)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Chronic carriers occur and may be involved in transmission (ref 6).
- b) Usually low level endemic infection, but epidemics do (or did) occur.
- c) See also streptococcal pharyngitis.

### References:

1. Dick GF, Dick GH. Experimental scarlet fever. JAMA 1923; 81: 1166-7.
2. Richman DD, Breton SJ, Goldmann DA. Scarlet fever and group A streptococcal surgical wound infection traced to an anal carrier. J Pediatr 1977; 90: 387-90.
3. Claesson BE, Svensson NG, Gotthardsson L, Gotthardsson L, Garden B. A foodborne outbreak of group A streptococcal disease at a birthday party. Scand J Infect Dis 1992; 24: 577-86.
4. Schwentker FF, Janney JH, Gordon JE. The epidemiology of scarlet fever. Am J Hyg 1943; 38: 27-98.
5. Anthony BF, Yamauchi T, Penso JS, Kamei I, Chapman SS. Classroom outbreak of scarlet fever and acute glomerulonephritis related to type 2 (M-2, T-2) group A *Streptococcus*. J Infect Dis 1974; 129: 336-40.
6. Boissard JM, Fry RM. Streptococcal school outbreaks: a method of investigation and control. J Hyg 1966; 64: 221-30.

## Disease: Shigellosis

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral (via hands), fomites E: waterborne, foodborne	1 2,3
Definition of onset:	Diarrhoea	
Incubation period <sup>2</sup> :	E: 1-6 days [2] (n = 38) <i>S. sonnei</i> E: 0.5-4 days [2] (n = 46) <i>S. flexneri</i> X: 1-9 days [3] (n = 43 adults) <i>S. flexneri</i>	2 3 4
Risk of transmission:	Moderate (40-50%) in nurseries during outbreaks. Generally lower in older schoolchildren and families.	5,6 5,7
Duration of shedding:	X: 1-78 days [mean 27] (n = 29 untreated adults) 1-14 days [mean 7] (n = 25 treated adults) Children may carry organism on fingers > 4 weeks	4 4 1
Period of infectiousness:		
Serial interval:		
Exclusion period:	< 5 years of age: negative stool x 1. ≥ 5 years of age: 24 hours from last episode of diarrhoea. See comments (c) - (e)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- Surprisingly little information on IP and excretion despite large no. of outbreaks.
- Asymptomatic cases common. These may transmit organism (refs 1,7).
- School outbreaks can be controlled by hygiene measures with no need for evidence of negative stool x 3 (ref 7). Day care outbreaks contained by use of antibiotics and isolation until negative stool x 2 (ref 6). (UK recommendations state that clearance (-ve stool x 2) only required for *S. dysenteriae*.)
- CCDC will advise on outbreaks and cases in children ≤ 5 years old. Will usually require one negative stool.
- A longer period of exclusion may also be appropriate for older children who are unable to maintain good personal hygiene.

### References:

- Hutchinson RI. Some observations on the method of spread of Sonne dysentery. Monthly Bull Minist Health 1956; 15: 110-8.
- Makintubee S, Mallonee J, Istre GR. Shigellosis outbreak associated with swimming. Am J Public

- Health 1987; 77: 166-8.
3. Dunn RA, Hall WN, Altamirano JV, Dietrich SE, Robinson-Dunn B, Johnson DR. Outbreak of *Shigella flexneri* linked to salad prepared at a central commissary in Michigan. Public Health Rep 1995; 110: 580-6.
  4. DuPont HL, Hornick RB, Dawkins AT, Snyder MJ, Formal SB. The response of man to virulent *Shigella flexneri* 2a. J Infect Dis 1969; 119: 296-9.
  5. Weissman JB, Schmerier A, Weiler P, Filice G, Godbey N, Hansen I. The role of preschool children and day-care centres in the spread of shigellosis in urban communities. J Pediatr 1974; 84: 797-802.
  6. Tauxe RV, Johnson KE, Boase JC, Helgerson SD, Blake PA. Control of day care shigellosis: a trial of convalescent day care in isolation. Am J Public Health 1986; 76: 627-30.
  7. Beer B, O'Donnell GM, Henderson RJ. A school outbreak of Sonne dysentery controlled by hygienic measures. Monthly Bull Minist Health 1966; 25: 36-41.

## Disease: Streptococcal pharyngitis

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets, direct contact, fomites E: food borne	1
Definition of onset:	Sore throat / fever	
Incubation period <sup>2</sup> :	E: 12 hrs - 5 days [2 days] (n = 69 adults and children) see comment (a)	1
Risk of transmission:	Moderate in close contacts. Outbreaks can occur in schools.	1,2
Duration of shedding:	Untreated: 1-12 months [3] (n = 433) (statistical model). See comment (b) Treated: 95% cleared by 4 days (n = 109)	3 4
Period of infectiousness:		
Serial interval:		
Exclusion period:	None, see comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- This relates to food borne transmission and therefore may not be typical.
- Chronic carriers occur and may be involved in transmission (ref 2).
- Generally not a severe condition with low risk of transmission in schools.
- See also scarlet fever.

### References:

- Claesson BE, Svensson NG, Gotthardsson L, Gotthardsson L, Garden B. A foodborne outbreak of Group A streptococcal disease at a birthday party. *Scand J Infect Dis* 1992; 24: 577-86.
- Boissard JM, Fry RM. Streptococcal school outbreaks: a method of investigation and control. *J Hyg* 1966; 64: 221-30.
- De Wals P, Bouckaert A. Methods for estimating the duration of bacterial carriage. *Int J Epidemiol* 1985; 14: 628-34.
- Stillerman M, Isenberg HD, Facklam RR. Treatment of pharyngitis associated with group A *Streptococcus*: comparison of amoxicillin and potassium phenoxymethyl penicillin. *J Infect Dis* 1974; 129 (suppl): S169-77.

**Disease: Threadworms** (enterobiasis, oxyuriasis, pinworms)

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral, fomites	1
Definition of onset:	Pruritis ani	
Incubation period <sup>2</sup> :	X: 15-28 days (quote Leuckhart, 1868) (7-8 weeks, quotes from textbooks) See comment (b)	1,2 3
Risk of transmission:	High within families. Moderately high in schools.	1,3
Duration of shedding:	Presumably indefinite if untreated	
Period of infectiousness:	Presumably indefinite if untreated	
Serial interval:		
Exclusion period:	None. See comment (c)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

Comments:

- a) Both symptomatic and asymptomatic infections are extremely common in childhood, especially during schooling (refs 1,2).
- b) Long IP due to fact that, after ingestion and hatching, worms live asymptotically in gut. Pruritis is caused by gravid females migrating to exterior at the end of their life cycle.
- c) Index case *and family contacts* should be treated.

References:

1. Cram EB. Studies on oxyuriasis XXVIII: summary and conclusions. Am J Dis Child 1943; 65: 46-59.
2. Lane C. Threadworm infections: prevalence pathogenicity, periodicity and prevention. Lancet 1944; 2: 511-13.
3. Pryor HB. Oxyuriasis vermicularis: the most prevalent parasite encountered in the practice of pediatrics. J Pediatr 1955; 46: 262-7.

**Disease: Tinea (ringworm)**

		ref.
Mode of transmission <sup>1</sup> :	P: (anthropophilic) direct contact, fomites, E: (zoophilic) animals, (geophilic) earth / plants (anthropophilic) airborne scales of skin	1,2 3,4 5
Definition of onset:	Skin lesion	
Incubation period <sup>2</sup> :	E: 2-4 weeks (n = 2 case reports, tinea corporis) X: 2-38 weeks [8] (n = 24 adults, tinea pedis) X: < 6 weeks (n = 4, tinea corporis) See comment (c)	3,4 6 7
Risk of transmission:	Low in schools, moderate in families: generally need prolonged exposure. In experimental studies need broken skin.	1,2 6
Duration of shedding:	Probably indefinite unless treated	1,2
Period of infectiousness:	Probably indefinite unless treated	
Serial interval:		
Exclusion period:	None. Low infectiousness, not a serious disease.	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

- a) Many different dermatophytes involved. Major dermatophytes in UK children are: *Trichophyton tonsurans*, *T. rubrum*, *Microsporum canis*, *M. rivalieri*.
- b) Different sites: scalp (capitis), body (corporis), feet (pedis).
- c) An incubation period of 20 years has been reported (ref 8).

**References:**

1. Mackenzie DW, Burrows D, Walby AL. *Trichophyton sulphureum* in a residential school. *BMJ* 1960; 2: 1055-8.
2. English MP. *Trichophyton rubrum* infection in families. *BMJ* 1957; 1: 744-6.
3. Lunder M, Lunder M. *Tinea corporis* durch ein Eichhörnchen übergeben. *Mykosen* 1981; 25: 391-2.
4. Weller R, Leifert C. Transmission of *Trichophyton interdigitale* via an intermediate plant host. *Br J Dermatol* 1996; 135: 656-7.
5. Mackenzie DW. The extra-human occurrence of *Trichophyton tonsurans* var. *sulfureum* in a residential school. *Sabouraudia* 1961; 1: 58-64.
6. Baer RL, Rosenthal SA. The biology of fungous infections of the feet. *JAMA* 1966; 197: 1017-20.
7. de Brito Caldeira J, Cardoso JM, Figueiredo M. An epidemic of human ringworm due to *T. verrucosum*. *Trans St Johns Hosp Dermatol Soc* 1965; 51: 97-8.
8. Blank H. *Tinea nigra*: a twenty-year incubation period? *J Am Acad Dermatol* 1979; 1: 49-51.

## Disease: Tuberculosis

		ref.
Mode of transmission <sup>1</sup> :	P: respiratory droplets (E: milkborne transmission of <i>M. bovis</i> )	1
Definition of onset:	Symptomatic disease (usually respiratory)	
Incubation period <sup>2</sup> :	Few weeks to a lifetime, see comment (b) E: 1-12 months [2] (n = 14 children, includes extrapulmonary disease)	2 3
Risk of transmission:	Moderate within households. See comments (c) and (d) Low outside home but outbreaks with very high rates of infection can occur in schools.	1,4 4,5,6
Duration of shedding:	Smear +ve, on treatment: 11% culture +ve at 12 weeks, 3% at 16 weeks.	1
Period of infectiousness:	Smear +ve, on treatment: < 2 weeks No contacts infected after treatment started, 23% contacts infected in previous 2 months (n = 156)	1,7 8
Serial interval:	0-12 months [2] (n = 22 schoolchildren) -4 to +5 months [3] (n = 8 schoolchildren)	5 6
Exclusion period:	Smear +ve: 2 weeks after starting treatment Smear -ve: nil See comment (e)	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- Refers mainly to pulmonary tuberculosis and infection with *M. tuberculosis*. Values refer to symptomatic primary infection.
- Epidemiology of TB is complex. Exposure may be followed by infection but this is usually asymptomatic. However, infection may be followed by symptomatic disease (primary tuberculosis) in some cases, especially in young children. In other cases disease follows reactivation of infection in later life (adult-type or secondary tuberculosis).
- Children are usually infected by smear +ve adults in home environment (refs 1,3). Children < 5 years at greatest risk of becoming infected and developing symptomatic disease (ref 2). Children rarely develop symptomatic disease from contact with smear -ve cases (ref 1).
- Adolescents are also at higher risk of infection (ref 2). However, in the UK, adolescents are largely protected by routine BCG vaccination.

- e) There are national guidelines for the control of TB in various situations, including schools (ref 7).

References:

1. Rouillon A, Perdrizet S, Parrot R. Transmission of tubercle bacilli: the effects of chemotherapy. *Tubercle* 1976; 57: 275-99.
2. Comstock GW, Livesay VT, Woolpert SF. The prognosis of a positive tuberculin reaction in childhood and adolescence. *Am J Epidemiol* 1974; 99: 131-8.
3. Smith WHR, Davies D, Mason KD, Onions JP. Intraoral and pulmonary tuberculosis following dental treatment. *Lancet* 1982, 1, 842-4.
4. Medical Research Council Tuberculosis and Chest Diseases Unit. Tuberculosis in children: a national survey of notifications in England and Wales in 1983. *Arch Dis Child* 1988; 63: 266-76.
5. Aspin J, Sheldon M. An epidemic of tuberculosis in a Staffordshire school. *Tubercle* 1965; 46: 321-44.
6. Wales JM, Buchan AR, Cookson JB, Jones DA, Marshall BS. Tuberculosis in a primary school: the Uppingham outbreak. *BMJ* 1985; 291: 1039-40.
7. Joint Tuberculosis Committee of the British Thoracic Society. Control and prevention of tuberculosis in the United Kingdom: code of practice 1994. *Thorax* 1994; 49: 1193-1200.
8. Riley RL, Moodie AS. Infectivity of patients with pulmonary tuberculosis in inner city homes. *Am Rev Resp Dis* 1974; 110: 810-2.

## Disease: Typhoid

		ref.
Mode of transmission <sup>1</sup> :	E: waterborne, food borne. See comment (a) P: faeco-oral	1
Definition of onset:	Fever	
Incubation period <sup>2</sup> :	E: 6-33 days [16] (n = 43 adults) E: 5-34 days [15-21] (n = 56 children) X: 3-56 days [5-9] (n = 96 adults). See comment (b)	2 3 1
Risk of transmission:	Low / moderate within families. V. low elsewhere. No data from schools or nurseries.	3
Duration of shedding:	Most patients excrete bacillus during IP until 2nd week of illness regardless of antibiotics. Few adults positive after this (unsubstantiated). 60% children excrete > 2 weeks despite antibiotics 15% excrete > 4 weeks. 1% adults become chronic carriers despite ABs	1 3 4
Period of infectiousness:	Presumably > 2 weeks. Carriers indefinite	
Serial interval:		
Exclusion period:	24 hours from last episode of diarrhoea. See comments (c) and (d).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- Often behaves as environmentally acquired but humans are only host.
- Incubation period inversely proportional to dose. Hence wide range (3-90 days quoted).
- Traditionally children excluded until 3 negative stools obtained (ref 5). But this may take months. Risk of transmission after diarrhoeal stage is probably very low.
- A longer period of exclusion may be appropriate for children under the age of 5 years, and for older children who are unable to maintain good personal hygiene (suggest 1 negative stool).

### References:

- Hornick RB, Greisman SE, Woodward TE, DuPont HL, Dawkins AT, Snyder MJ. Typhoid fever: pathogenesis and immunologic control. *N Engl J Med* 1970; 283: 686-91.
- Birkhead GS, Morse DL, Levine WC, Fudala JK, Kondracki SF, Chang HG, Shayegani M, Novick L, Blake PA. Typhoid fever at a resort hotel in New York: a large outbreak with an unusual vehicle. *J Infect Dis* 1993; 167: 1228-32.
- Galloway H, Clark NS, Blackhall M. Paediatric aspects of the Aberdeen typhoid outbreak. *Arch Dis*

- Child 1966; 41: 63-8.
4. Russell EM, Sutherland A, Walker W. Ampicillin for persistent typhoid excreters, including a trial in convalescence. *BMJ* 1966; 2: 555-7.
  5. Working Party of the PHLS Salmonella Committee. The prevention of human transmission of gastrointestinal infections, infestations, and bacterial intoxications. *Communicable Disease Report CDR Review* 1995; 5: R157-72.

## Disease: Paratyphoid

		ref.
Mode of transmission <sup>1</sup> :	P: faeco-oral E: waterborne, food borne. See comment (a)	
Definition of onset:	Fever	
Incubation period <sup>2</sup> :	E: 2-3 weeks (n = 2) E: 2 weeks + (n = 59)	1 2,3
Risk of transmission:	Low within families (and elsewhere)	3,4
Duration of shedding:	Carriers occur as with typhoid. About 6% cases become persistent excretors (n = 58).	1 4
Period of infectiousness:		
Serial interval:		
Exclusion period:	24 hours from last episode of diarrhoea. See comments (b) and (c).	

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

### Comments:

- a) Often behaves as environmentally acquired but humans are only host.
- b) Traditionally children excluded until 3 negative stools obtained (ref 5). But this may take months. Risk of transmission after diarrhoeal stage is probably very low.
- c) A longer period of exclusion may be appropriate for children under the age of 5 years, and for older children who are unable to maintain good personal hygiene (suggest 1 negative stool).

### References:

1. Francis S, Rowland J, Rattenbury K, Powell D, Rogers WN, Ward L, Palmer SR. An outbreak of paratyphoid fever in the UK associated with a fish-and-chip shop. *Epidemiol Infect* 1989; 103: 445-8.
2. Public Health Laboratory Service. Paratyphoid B infection: reception W Midlands. *Commun Dis Rep* 1988; 88/07: 1.
3. Public Health Laboratory Service. Paratyphoid B infection: reception W Midlands. *Commun Dis Rep* 1988; 88/09: 1.
4. Goh KT. An outbreak of paratyphoid A in Singapore: clinical and epidemiological studies. *Southeast Asian J Trop Med Public Health* 1981; 12: 55-62.
5. Working Party of the PHLS Salmonella Committee. The prevention of human transmission of gastrointestinal infections, infestations, and bacterial intoxications. *Communicable Disease Report CDR Review* 1995; 5: R157-72.

## Disease: Warts and verrucas

		ref.
Mode of transmission <sup>1</sup> :	P: direct contact, fomites	1
Definition of onset:	Wart or verruca	
Incubation period <sup>2</sup> :	E: 1-24 months [6] (n = 5 case reports) X: 1-20 months [usually 2-6] (review of 17 studies)	2 1
Risk of transmission:	Undetermined. Presumably low.	
Duration of shedding:	Undetermined. Presumably as long as wart is present. See comment (b).	
Period of infectiousness:	As above	
Serial interval:		
Exclusion period:	None. See comment (c).	

Notes: 1. P = person to person; E = environmental  
 2. E = data from point source epidemic; X = experimental; O = other  
 All intervals are range [median] unless otherwise stated.

### Comments:

- a) Very little data available.
- b) Warts known to shed large number of infectious particles (ref 3).
- c) Care needed with verrucas re swimming pools, gymnasiums and changing rooms.

### References:

1. Rowson KE, Mahy BW. Human papova (wart) virus. *Bacteriol Rev* 1967; 31: 110-31.
2. Long GE, Rickman LS. Infectious complications of tattoos. *Clin Infect Dis* 1993; 18: 610-9.
3. Grussendorf-Conen EI, Gissmann L, Holters J. Correlation between content of viral DNA and evidence of mature virus particles in HPV-1, HPV-4, and HPV-6 induced virus acanthomata. *J Invest Dermatol* 1983; 81: 511-3.

**Disease:**

		ref.
Mode of transmission <sup>1</sup> :		
Definition of onset:		
Incubation period <sup>2</sup> :		
Risk of transmission:		
Duration of shedding:		
Period of infectiousness:		
Serial interval:		
Exclusion period:		

Notes: 1. P = person to person; E = environmental  
2. E = data from point source epidemic; X = experimental; O = other  
All intervals are range [median] unless otherwise stated.

**Comments:**

a)

**References:**

1.