

Enteric Disease Associated with Animal Contact, Minnesota, 1999-2004

Animals are the reservoir of several important enteric pathogens, including *E. coli* O157:H7, *Cryptosporidium parvum*, *Campylobacter* spp., and *Salmonella enterica*. Whereas foodborne (*E. coli* O157:H7, *Campylobacter*, *Salmonella*) or waterborne (*Cryptosporidium*) are considered the predominant routes of transmission, direct contact with their animal reservoirs is also an important source of these pathogens. In recent years, enteric disease associated with venues where the public has contact with farm animals (e.g., petting zoos, state or county fairs, educational farms) has been identified with increasing frequency.¹⁻⁴ Minnesota is no exception to this trend. This article summarizes zoonotic enteric disease transmission from animals to humans in Minnesota in recent years, including outbreaks associated with animal contact in public and private settings, and the role of animal contact in sporadic cases of disease. Tips and prevention information for health care providers and public health professionals involving this topic are also provided.

Enteric Disease Outbreaks Due to Animal Contact in Minnesota

A list of enteric disease outbreaks linked to animal contact investigated by the Minnesota Department of Health (MDH) in recent years is provided in Table 1. Highlights of selected outbreaks are given below.

1999

Salmonellosis from kittens⁵

From August 1999 through March 2000, seven cases of multidrug-

resistant *Salmonella enterica* serotype Typhimurium phage type DT104 were associated with kittens adopted from a large Twin Cities humane society. The median age of the cases was 6 years (range, 11 months-23 years). The median duration of diarrhea was 8 days (range, 5-11 days). One case was hospitalized for 4 days. Two of the cases resulted from secondary transmission; they attended the same day-care center as an ill child who owned a kitten from the shelter. An adult case who had been treated with ciprofloxacin shed *S. Typhimurium* in her stool at least 214 days after illness onset (note: antimicrobial treatment does not eradicate nontyphoidal *Salmonella* carriage but rather can prolong it). Some of the cases' cats had been ill with bloody diarrhea after adoption, but some were asymptomatic and still carried *S. Typhimurium* for prolonged periods.

2000

Salmonellosis from chicks

In May-June 2000, four case isolates of *Salmonella* Montevideo that were indistinguishable by pulsed-field gel electrophoresis (PFGE) were identified at MDH through routine surveillance. Two of the cases had contact with chicks purchased at the same farm store in Chippewa County, and another case had recently consumed chicken that had been raised on a neighbor's farm.

Multiple pathogens from calves at a farm day camp – part 1³

During June-July 2000, an outbreak of enteric infections caused by multiple pathogens occurred at a farm day

camp in the Twin Cities. Bottle-fed calves were the source of the outbreak, which affected 59 campers, predominately those in kindergarten-fourth grade. The primary pathogen identified was *Cryptosporidium parvum*. The median duration of illness among cases was 6 days (range, 1-25 days). One child was hospitalized for 6 days. Children worked with calves in their street clothes. Duties included feeding and grooming the calves and cleaning up calf feces from the pen. The nearest hand-washing facility was in a building adjacent to the calf barn. Taking care of an ill calf was a risk factor for illness. Washing hands before going home for the day, and always washing hands with soap after touching a calf, were protective.

E. coli O157:H7 and hemolytic uremic syndrome (HUS) from calves on a private farm

In August 2000, two cases of *E. coli* O157:H7 infection with the same PFGE subtype were identified among cousins (ages 3 and 11 years, respectively) who attended a family reunion at a relative's farm in Carlton County and played with young dairy calves. Both children developed HUS; one child was hospitalized for 15 days, and one continued...

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for 23 days. The outbreak PFGE subtype of *E. coli* O157:H7 was recovered from the feces of four of six calves tested. *Campylobacter jejuni* was recovered from all six calves.

2001

Salmonellosis from owl pellets⁶

In May 2001, outbreaks of salmonellosis at two elementary schools in Washington County resulted from dissection of owl pellets (i.e., regurgitated indigestible bones, fur and feathers from an owl's recent meals) as part of science club. The first outbreak was identified through telephone reports from two physicians. In the first outbreak, 33 primary cases and 17 secondary cases were identified. The median duration of illness was 72 hours (range, 15-192 hours), and four cases were hospitalized. Owl pellets were dissected directly on a table in the school's cafeteria. The students did not wear gloves and were not instructed to wash their hands. After science club, the table was used for snacks for children in the after-school care program, which also was held in the cafeteria. The table was not sanitized until after school lunch the following day. In the second outbreak, the school did have a dedicated science room for science club, but seven of the nine students who dissected pellets developed salmonellosis, along with two secondary cases among household members of students.

All of the pellets for these science clubs originated from a single captive barred owl. The outbreak PFGE subtype was recovered from numerous pellets from this owl, the owl's feces, and all four frozen chicks left over from a batch used to feed the owl. Our investigation documented owl pellets as a novel vehicle for salmonellosis. Dissection of owl pellets has become an increasing popular educational activity for elementary school children. We recommend using heat-treated owl pellets from commercial sources as well as appropriate hygienic practices after handling the pellets.

Multiple pathogens from calves at a farm day camp – part 2³

Despite the implementation of prevention measures (e.g., education and attempts to facilitate better handwashing) at the farm day camp during 2000 (see above), another outbreak due to calf contact occurred in 2001.

Again, multiple pathogens were involved. *Cryptosporidium parvum* was the most common pathogen recovered, but several cases of infection with *E. coli* O157:H7 or with non-O157 Shiga toxin-producing *E. coli* (STEC) also were identified. Overall, 25 cases were identified among campers. No HUS cases were identified, but two children were hospitalized, each for 4 days; this included one child who had both *E. coli* O157:H7 and *C. parvum*. Getting visible manure on the hands was a risk factor. The camp was closed until more extensive interventions could be implemented. We recovered the same PFGE subtypes of non-O157 STEC from children and calves; this was the first time in the United States and only the second time in the world that cattle have been directly implicated as the source of a non-O157 STEC outbreak.

2002

Campylobacter jejuni and *Cryptosporidium parvum* from dairy calves

In June 2002, three cases of *Campylobacter jejuni* infection and two cases of cryptosporidiosis were linked to the same local dairy farm in Kittson County. Four cases had purchased young calves from the dairy, and one was an employee of the dairy who had milked sick cows. Three of the five cases were hospitalized. Evaluation of the dairy revealed that many of the calves on the farm were ill. Of note, in 2000 this dairy was implicated in an outbreak of campylobacteriosis associated with the consumption of malts made with unpasteurized milk.

Campylobacter coli from chickens or pigs

In June 2002, three cases of *Campylobacter coli* gastroenteritis occurred among employees of a Traverse County farm. Isolates from all three cases were indistinguishable by PFGE. Illness durations were 5 days, 13 days, and over 1 month, respectively; one case was hospitalized. Job duties for the three cases included handling chickens, cleaning pens, and hauling pig waste.

Campylobacter coli from turkeys

In June 2002, nine cases of campylobacteriosis were identified among workers who volunteered to help pick up 13,000 turkey carcasses on a farm after flooding in Roseau County. *Campylobacter coli* was

identified from one case. The median duration of illness was 96 hours (range, 48 to 168 hours). Washing hands with soap and running water (vs. in a communal bucket or with a hose) was protective.

2003

Cryptosporidium parvum from calves at a teaching farm

In February 2003, an outbreak of cryptosporidiosis occurred among middle and high school students in Crow Wing County who participated in an animal science class that involved caring for young calves at an educational farm. Thirty-one cases were identified. The median duration of illness was 7 days (range, 6 hours-19 days). Symptoms included diarrhea (90%), abdominal cramps (66%), vomiting (43%), and fever (17%). Of nine students who visited a health care provider, only two had stool samples submitted for enteric pathogen testing. Contact with calves was the primary risk factor; students cared for calves in street clothing and practiced poor handwashing.

Our recommendations for the program included eliminating student contact with ill calves, supervised handwashing, use of protective coveralls/boots, and eliminating food and drink at the farm. However, when the class resumed in September 2003, another outbreak of cryptosporidiosis occurred among students. This time, 37 cases were identified. Getting visible manure on one's hands was a risk factor, as were eating/drinking on the farm campus and drying hands on one's clothing. Interestingly, wearing coveralls and wearing boots were also risk factors. This was attributed to the fact that the closet for these items was at the exit to the calf barn; these soiled items were removed after handwashing occurred. And, handwashing was observed to still be poor.

Salmonella Ealing from reptiles in a private home

Two cases of *Salmonella* Ealing infection were linked to the private home of a herpetologist (one who studies reptiles). The first case, in February 2003, was a friend who visited the herpetologist's home for several hours and consumed some food and drink. Two days later she became ill with *Salmonella* gastroenteritis; she was subsequently hospitalized...
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Table 1. Outbreaks of Enteric Disease Associated with Animal Contact, Minnesota, 1999-2004

Year	Pathogen	No. of Human Cases (No. Confirmed)*	Animal Source	Setting	Comments
1999	<i>Salmonella</i> Typhimurium	7 (7)	Kittens from a humane society	Private homes	<i>S.</i> Typhimurium was multidrug-resistant, phage type DT104
2000	<i>Salmonella</i> Montevideo	4(4)	Chicks purchased from a farm store	Private homes	Chicks purchased to raise for food
2000	<i>Cryptosporidium parvum</i> , <i>Salmonella</i> Typhimurium, <i>Campylobacter jejuni</i> , non-O157, Shiga toxin-producing <i>E. coli</i> (O111)	59 (13)	Calves	Farm day camp	Risk factors: -taking care of an ill calf -washing hands before going home (protective) -always washing hands with soap after touching a calf (protective)
2000	<i>E. coli</i> O157:H7	2 (2)	Calves	Family reunion, private farm	2 cases of hemolytic uremic syndrome
2001	<i>Salmonella</i> Typhimurium	40 (26)	Owl pellets	Elementary schools	Outbreak PFGE subtype of <i>S.</i> Typhimurium cultured from owl pellets, owl feces, chicks used to feed owl
2001	<i>Cryptosporidium parvum</i> , <i>E. coli</i> O157:H7, non-O157 Shiga toxin-producing <i>E. coli</i> (O111:NM, O51:H11)	25 (14)	Calves	Farm day camp	Risk factor: -getting visible manure on hands
2002	<i>Campylobacter coli</i>	3 (3)	Chickens or pigs	Private farm	Cases were employees of the farm
2002	<i>Cryptosporidium parvum</i> , <i>Campylobacter jejuni</i>	5 (5)	Calves	Private farms	Calves sold by a local dairy farm to other farms
2002	<i>Campylobacter coli</i>	9 (2)	Turkeys	Private farm	Cases exposed during disposal of turkey carcasses after a flood
2003	<i>Cryptosporidium parvum</i>	31 (7)	Calves	Teaching farm for middle and high school students	Risk factors: -being in animal science class -contact with calves
2003	<i>Cryptosporidium parvum</i>	37 (7)	Calves	Teaching farm for middle and high school students	Risk factors: -eating/drinking on farm -visible manure on hands -wearing coveralls and boots
2003	<i>Salmonella</i> Ealing	2 (2)	Reptiles/ amphibians	Private home	<i>S.</i> Ealing cultured from reptiles/ amphibians, bathroom countertop, edge of kitchen sink
2003	<i>Cryptosporidium parvum</i>	2 (2)	Calves	Veterinary clinic	Cases were employees of clinic, cleaned pen of sick calf
2003	<i>E. coli</i> O157:H7	5 (5)	Unknown	County fair	Specific source not identified
2004	<i>Salmonella</i> Typhimurium	1 (1)	Pet "fancy" mouse	Private home	At least 14 additional cases identified in other states from commercially distributed pet hamsters, mice, rats; <i>S.</i> Typhimurium was multidrug-resistant

*Includes primary cases only (secondary cases not included)

ized for 2 days. The second case, in April 2003, was the 3-month-old grandchild of the herpetologist; the infant and the infant's mother were living at the herpetologist's home at the time. The herpetologist kept approximately 50 reptiles and amphibians in her home. *Salmonella* was isolated from 16 (76%) of 21 reptile fecal/cage samples and four (29%) of 14 environmental samples. *Salmonella* Ealing was isolated from a pooled fecal sample from a gecko and frog terrarium in the front room; this terrarium was only a few feet away from the infant's playpen. *Salmonella* Ealing was also isolated from the edge of the kitchen sink and a bathroom countertop.

Cryptosporidium parvum among employees at a veterinary clinic

In June 2003, two teen-age employees of a veterinary clinic in Kandiyohi County acquired cryptosporidiosis after cleaning a pen that had been occupied by a calf that was sick with diarrhea. The cases did not wear gloves while cleaning the pen. Durations of illness were 6 days and 13 days, respectively.

E. coli O157:H7 from a county fair

In August 2003, an outbreak of *E. coli* O157:H7 infections occurred at the Scott County Fair. Two of the five cases were hospitalized, including one who developed hemolytic uremic

syndrome. The fair held a petting zoo that included calves, sheep, and goats, but no specific source of the outbreak could be confirmed.

2004 Multidrug-resistant Salmonella Typhimurium from pet rodents

In 2004, MDH led an investigation of a multi-state outbreak of *S. Typhimurium* infections associated with commercially distributed pet rodents. The investigation is still in process, but at least 15 confirmed infections in 10 states (including one Minnesota case) have been identified. Rodent exposures included pet hamsters, pet mice/rats, and mice/rats purchased to feed snakes. The median case age was 16 years (range, 0-43 years); seven cases (47%) were ≤7 years of age. Six cases were hospitalized. In Minnesota, the outbreak strain of *S. Typhimurium* was cultured from a 5-year-old case's pet "fancy" mouse, and from several ill hamsters from a group submitted by a Minnesota pet distributor.

The Role of Animal Contact in Sporadic Infections with Enteric Pathogens in Minnesota: Results of Case-Control Studies

The majority of cases of infection with the enteric bacterial and protozoal pathogens reported to MDH are not associated with recognized outbreaks. Thus, to better understand the epide-

miology of these pathogens it is necessary to understand sources for sporadic infections. Since 1995, MDH has been part of the Centers for Disease Control and Prevention Centers Emerging Infections Program. Part of this program, termed the Foodborne Diseases Active Surveillance Network (FoodNet), incorporates a multi-faceted approach to study bacterial and parasitic foodborne pathogens, including active laboratory-based surveillance to ensure ascertainment of all confirmed cases of infections with these pathogens. MDH also has conducted case-control studies of sporadic infections with select pathogens. Although, the studies have identified numerous food and water-related risk factors, animal contact has also been identified as an important risk factor for infection with several of our prominent enteric pathogens (Table 2). Highlights of recent FoodNet case-control studies concerning animal contact-related risk factors follow.

Cryptosporidiosis⁷

This case-control study, carried out from 1999 to 2001, involved 282 cases and 490 age- and residence-matched well controls in seven states. Minnesota contributed 145 cases and 239 controls. In the overall analysis, contact with calves or cows was a risk factor. Other risk factors included

Table 2. Animal Contact-Related Risk Factors for Infection with Enteric Pathogens: Results from FoodNet* Case-Control Studies⁷⁻¹⁰

Pathogen	Risk Factor	Percent with Exposure			
		Cases	Controls	OR (95% CI)*	PAR%*
<i>Cryptosporidium</i> ⁷	Contact with calves or cows	22%	8%	3.5 (1.8-6.8)	16%
<i>E. coli</i> O157:H7 ⁸	<6 years of age	9%	2%	5.2 (1.3-22)	6%
	≥6 years of age	7%	1%	10.0 (1.8-53)	8%
Nontyphoidal	Any reptile or amphibian contact	9%	5%	1.6 (1.1-2.2)	3%
<i>Salmonella</i> serogroup B and D ⁹	Having a reptile/amphibian in the home	7%	4%	1.6 (1.2-2.4)	3%
	Touching a reptile	5%	3%	1.6 (1.9-2.4)	2%
<i>Campylobacter</i> ¹⁰	Contact with animal stool	22%	16%	1.4 (1.0-1.9)	6%
	Having a pet puppy	7%	2%	3.4 (1.8-6.5)	5%
	Contact with farm animals (≥12 years of age)	**	**	2.0 (1.2-3.6)	4%
	Contact with farm animals (2 to <12 years of age)	**	**	21.0 (2.5-178)	2%
	Drinking raw milk	2%	0.6%	4.3 (1.3-14.2)	2%

*FoodNet=Foodborne Diseases Active Surveillance Network; OR=Odds Ratio; CI=Confidence Interval; PAR=Population Attributable Risk

**Calculated for population as a whole (10% of cases and 6% of controls had this exposure).

international travel, contact with children with diarrhea, and freshwater swimming. In Minnesota specifically, well water consumption also was a risk factor. The largest proportion of cases in the study population was attributable to contact with cattle (population attributable risk [PAR]=16%).

E. coli O157:H7⁸

This case-control study, carried out from 1996 to 1997, involved 196 cases and 372 age- and residence-matched well controls in five states. Minnesota contributed 112 cases and 212 controls. For children <6 years of age, living on or visiting a farm was a risk factor. For persons ≥6 years of age, visiting (but not living on) a farm with cattle was a risk factor. Overall, 18% of cases in Minnesota had visited a farm with cattle during the week before their illness onset. Other risk factors (all ages) included eating at a table service restaurant (PAR=20%), eating a pink hamburger at home (PAR=8%), and eating a pink hamburger away from home (PAR=7%). Among those who consumed ground beef or hamburgers at home, obtaining beef through a private slaughter arrangement was a risk factor. For persons ≥6 years of age, using an immunosuppressive medication was a risk factor (PAR=5%).

Salmonella enterica⁹

This case-control study evaluated nontyphoidal *Salmonella enterica* serogroup B and D cases from five states from 1996 to 1997; 463 cases and 7,618 well controls were included. Risk factors included any reptile or amphibian contact, having a reptile or amphibian in the home, and touching a reptile. Other risk factors included international travel, eating eggs in a restaurant, and having a chronic, non-diarrheal illness. Among persons <21 years of age, the PAR for any reptile or amphibian contact increased to 9.5%; 16% of cases and 9% of controls in this age group reported this exposure.

Campylobacter spp.¹⁰

This case-control study, carried out from 1998 to 1999, involved 1,316 cases and 1,316 age- and residence-matched well controls in seven states. Minnesota contributed 242 cases and 242 controls. Risk factors included having contact with animal stool, having a pet puppy, having contact with farm animals, and drinking raw milk. Many other risk factors, most

involving poultry and other foods of animal origin, also were identified.

Synopsis: Salient Points for the Health Care Provider

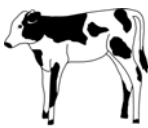




The pathogens discussed in this article are common enteric pathogens in Minnesota¹¹ and thus should always be considered in patients presenting with gastroenteritis. Animal contact is an important route of transmission for these pathogens, so potential animal exposures should be included in the patient history. Table 3 provides a quick reference guide for health care providers for the most frequent or important animal reservoir-pathogen associations observed in Minnesota.

The combination of the patient history and the clinical features of the illness¹²⁻¹⁴ can be extremely helpful in the timely diagnosis and management of gastrointestinal illnesses. For example, *E. coli* O157:H7 is typically characterized by prominent abdominal cramping and a day of watery diarrhea, followed by the development of bloody diarrhea. The primary clinical feature of cryptosporidiosis is watery diarrhea of several days duration; vomiting also commonly occurs, particularly in pediatric patients. Recent exposure to cattle in patients with these clinical histories should elicit a high index of

suspicion for these etiologies. Cattle are the primary reservoir for *E. coli* O157:H7 and *Cryptosporidium parvum*; both of these pathogens are present in the vast majority of cattle herds in Minnesota. Sheep and goats also may carry these pathogens; recent *E. coli* O157:H7 outbreaks in other states attributed to sheep/goat barns or petting zoos at fairs⁴ demonstrate the potential of disease transmission from these species as well.

A high index of suspicion for *E. coli* O157:H7 is important for a number of reasons. First and foremost, this pathogen is the most common cause of post-diarrheal HUS. Acute gastroenteritis possibly due to *E. coli* O157 needs to be managed carefully; antimicrobial treatment should be avoided as it may contribute to the development of HUS. Confirmation of all *E. coli* O157:H7 infections is highly desirable, as submission of isolates to the MDH Public Health Laboratory is critical to the timely detection and control of outbreaks. Finally, since *E. coli* O157:H7 can spread readily from person-to-person, particularly in child care settings, confirmation allows for exclusion of children from child care until they are culture-negative.

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Table 3. Quick Guide to Important Animal-Pathogen Associations in Minnesota		
Animal Reservoir	Top Pathogens to Consider	Pathogens to Also Consider
 Calves	<i>Cryptosporidium</i> <i>E. coli</i> O157:H7	<i>Campylobacter</i> <i>Salmonella</i>
 Reptiles	<i>Salmonella</i>	
 Baby Chicks & Ducklings	<i>Salmonella</i>	<i>Campylobacter</i>
 Adult Poultry	<i>Campylobacter</i>	<i>Salmonella</i>
 Puppies & Kittens (particularly those with diarrhea)	<i>Campylobacter</i>	<i>Salmonella</i>

Testing for *Cryptosporidium* is typically not done when health care providers order an ova and parasite exam on a stool sample. Therefore, providers should ask specifically for a *Cryptosporidium* test if this agent is suspected.

Salmonella and *Campylobacter* are characterized by fever and fecal leukocytes; vomiting and bloody stools can occur. Recent exposure to reptiles or baby chicks should cause you to think about *Salmonella*; these creatures are widely documented sources of *Salmonella* for humans.¹⁵⁻¹⁷ Reptiles in particular are important sources of *Salmonella*, because they are popular pets and 90% of reptiles carry *Salmonella* in their normal flora.

Puppies and kittens may also be the source of enteric pathogens (usually *Campylobacter*). They frequently have had diarrhea recently themselves.

Of course, there are many sources for these pathogens other than animal contact. Foodborne, waterborne, and person-to-person transmission occur to varying degrees, depending on the pathogen. Therefore, absence of recent animal contact should not be used to rule out any of the pathogens discussed here.

Prevention of Enteric Disease Associated with Animal Contact

All animals, animal environments, or animal products are potentially contaminated with pathogens and should be treated as such. The backbone of prevention of enteric disease associated with animal contact is thorough handwashing with soap and water after exposure to these entities. For young children, hand washing should be supervised. In addition, food, drink, and items that promote hand to mouth contact (e.g., pacifiers) should not be permitted in animal contact areas. The food and drink prohibition is critical. Accumulating evidence from recent outbreaks at fairs indicates that *E. coli* O157:H7 can be aerosolized on dried sawdust bedding, causing widespread contamination of environmental surfaces in an animal barn, and possibly also food and clothing of patrons viewing the animals (even in the absence of direct animal contact).

Specific national prevention recommendations have been developed for specific species or settings.¹⁸ The National Association of State Public Health Veterinarians has developed an extensive set of recommendations for the prevention of disease associated with animals in public settings;⁴ these recommendations are updated annually. As demonstrated by the outbreaks associated with educational programs in Minnesota, it is extremely

difficult to prevent infections in children who have close, prolonged contact with young calves. A detailed and comprehensive prevention plan should be created before such a program is undertaken.

Specific recommendations for the prevention of reptile-associated salmonellosis have been developed by the Centers for Disease Control and Prevention (see inset below). Please note that reptiles (lizards, snakes, turtles) should not be allowed in childcare centers or households that include children <5 years of age or immunocompromised persons. The same recommendation has been made for chicks, ducklings, and other young fowl.¹⁶

The MDH Foodborne, Vectorborne, and Zoonotic Diseases Unit (FVZDU) has available two 11 x 17 inch posters that animal exhibit operators can use for the prevention of enteric diseases at public venues (see facing page). Simply fill out the order form and fax it to the indicated number. The FVZDU is happy to consult on prevention plans for educational programs. We also are happy to consult with health care providers on case-patients with specific animal exposures; we can be reached at (612) 676-5414 or 1-877-676-5414 (outstate).

CDC Recommendations to Prevent Reptile-Associated Salmonellosis¹⁵

- Pet-store owners, health-care providers, and veterinarians should provide information to owners and potential purchasers of reptiles and amphibians about the risks for and prevention of salmonellosis from these pets.
- Persons at increased risk for infection or serious complications from salmonellosis (e.g., children aged <5 years and immunocompromised persons) should avoid contact with reptiles and amphibians and any items that have been in contact with reptiles and amphibians.
- Reptiles and amphibians should be kept out of households that include children aged <5 years or immunocompromised persons. A family expecting a child should remove any pet reptile or amphibian from the home before the infant arrives.
- Reptiles and amphibians should not be allowed in childcare centers.
- Persons always should wash their hands thoroughly with soap and water after handling reptiles and amphibians or their cages.
- Reptiles and amphibians should not be allowed to roam freely throughout a home or living area.
- Pet reptiles and amphibians should be kept out of kitchens and other food-preparation areas. Kitchen sinks should not be used to bathe reptiles and amphibians or to wash their dishes, cages, or aquariums. If bathtubs are used for these purposes, they should be cleaned thoroughly and disinfected with bleach.
- Reptiles and amphibians in public settings (e.g., zoos and exhibits) should be kept from direct or indirect contact with patrons except in designated animal-contact areas equipped with adequate hand-washing facilities. Food and drink should not be allowed in animal contact areas.

**Minnesota Department of Health
Poster Order Form**



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 Acute Disease Investigation and Control Section
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The *Disease Control Newsletter* is available on the MDH Acute Disease Investigation and Control (ADIC) Section web site (<http://www.health.state.mn.us/divs/idepc/newsletters/dcn/index.html>).

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