Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Departement des Innern EDI
Bundesamt für Lebensmittelsicherheit und Veterinärwesen BLV
Wissensgrundlagen

RISK PROFILES OF FOOD-BORNE PATHOGENS
ASTROVIRUS

Astrovirus is an emerging foodborne concern linked to acute gastroenteritis, particularly in children, older adults and immunocompromised individuals. Transmission occurs mainly via the fecal-oral route, including contaminated water, surfaces and foods such as raw shellfish, leafy greens and berries. Although most infections are self-limiting, severe extraintestinal disease has been reported in vulnerable individuals. Foodborne outbreaks are rarely documented and likely underreported; targeted hygiene measures and testing in norovirus-negative outbreaks may support future risk assessment.

Hazard Identification

Types and Strains: Astroviruses are single-stranded positive-sense RNA viruses of the family *Astroviridae*, divided into the genera *Mamastrovirus* (mammals, including humans) and *Avastrovirus* (birds) [1]. Human astroviruses comprise classical genotypes (HAstV 1–8) and genetically distinct novel groups (MLB and VA/HMO), the latter increasingly associated with a broader clinical spectrum, spread to the central nervous system, leading to severe outcomes such as fatal encephalitis and meningitis in immunocompromised patients [2]. Astroviruses show high genetic diversity and a broad host range across mammals, birds and other species, with increasing evidence of cross-species transmission [3], [4]. While classical HAstV-1 is the most frequently detected genotype in humans, the epidemiological relevance of non-classical strains is growing [1], [2], [5]. Astrovirus infections frequently occur as co-infections with other enteric pathogens, most commonly rotavirus, but also norovirus, adenovirus and sapovirus. Co-infection rates have been reported in 41% to 77% of human astrovirus cases [6].

Table 1: Characteristics of the virus

Characteristics of the virus	
Family/Genus	Astroviridae / *Mamastrovirus*
Envelopment	Non-enveloped
Genome-Type	Single-stranded positive-sense RNA (ssRNA(+)) [7]
Size	6.8 - 7.9 kb [7]
Diameter	28-30 nm [7]
Main Genotypes (GT)	HAstV-1 to -8 (classical; HAstV-1 most prevalent); additional novel groups (MLB, VA/HMO). [2]
Replication	Primarily in intestinal epithelial cells of the host. No replication in the environment.

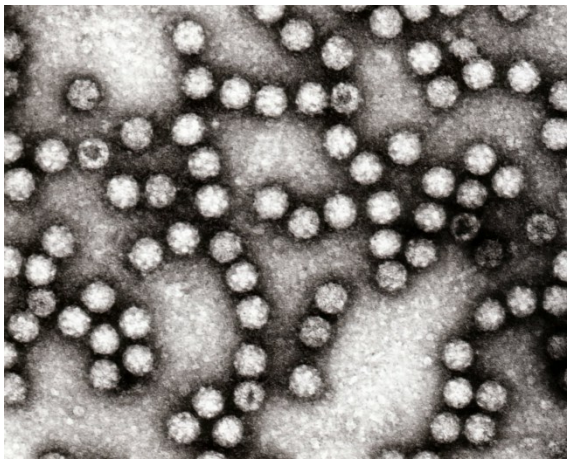

Figure 1: Illustration of the Astrovirus
Source: Wikimedia; Photo by *Graham Beards*

Stability and inactivation: Astroviruses are non-enveloped viruses with high environmental stability. Available data indicate resistance to acidic conditions, detergents, alcohols, heat treatment, and several commonly used disinfectants [8], [9]. Astroviruses can remain infectious on dry, inanimate surfaces (fomites) for up to 90 days. Human astroviruses have been reported to persist for prolonged periods in marine and tap water, particularly at lower temperatures. Data specifically addressing inactivation of human astroviruses in food matrices are limited. Evidence from avian astrovirus studies suggests that effective inactivation may require specific agents such as formaldehyde, β-propiolactone, or peroxymonosulfate-based disinfectants [8], [10].

Table 2: Inactivation and Stability of Astrovirus

Stability and Inactivation	
Heat	Human astroviruses have been reported to resist moderate heat treatment, including 50°C for 1 h and 60°C for 5 min [8].
pH	Astroviruses are resistant to acidic conditions. In an avian astrovirus study, exposure to pH 3 for 48 h only partially reduced infectivity [10].
Drying	Astrovirus is highly resilient to drying [8]
Persistence	Highly persistent in the environment. Astrovirus can remain infectious on dry, inanimate surfaces (fomites) for up to 90 days [8], [9].
Disinfection	Evidence from avian astrovirus studies suggests that effective inactivation may require specific agents such as formaldehyde, β-propiolactone, or peroxymonosulfate-based disinfectants [8], [10].

Hazard Characterisation

Disease Characteristics: Astrovirus infection primarily affects the gastrointestinal tract, causing mild, self-limiting gastroenteritis with an incubation period of 2–4 days [11]. Symptoms typically include diarrhea, fever, nausea, vomiting and abdominal discomfort, while asymptomatic infections are common [12]. The disease usually resolves within a few days, but prolonged or more severe courses may occur in young children, elderly and immunocompromised individuals [13]. In rare cases, extraintestinal manifestations involving the central nervous system, such as fatal encephalitis and meningitis, have been reported [14], [15]. Viral shedding can persist for several days to weeks, including in asymptomatic individuals [2].

Table 3: Disease Characteristics

Disease Characteristics	
Incubation Period	2 - 4 days [16]
Mode of actions	Astrovirus primarily targets epithelial cells of the intestines, causing inflammation [17]
Symptoms	Symptoms typically include diarrhea, fever, nausea, vomiting and abdominal discomfort, while asymptomatic infections are common [12].
Progression	Typically self-limiting, with recovery within 2–4 days. In severe cases, extraintestinal manifestations such as encephalitis or meningitis may occur, particularly in immunocompromised individuals [14], [15].
Infectious period (shedding)	On average 5 days of shedding, but prolonged infection periods have been described for several weeks [6], [18]
Vulnerable populations	Young children under 5 years of age, elderly and immunocompromised individuals [6].
Dose-Response Relationship	The relative infectivity of human astroviruses is not known but is considered to be high [19]. Most enteric viruses have a low infectious dose (approximately 10–100 viral particles) [20].
Prophylaxis	No vaccine is currently available against Astroviruses.

Occurrence: Astroviruses are globally distributed and represent one of the most common causes of viral gastroenteritis, particularly in children [7]. However, the overall disease burden is likely underestimated due to underdiagnosis and limited routine surveillance. A meta-analysis estimated the prevalence among gastroenteritis patients from 69 different countries to be 3.5% [21]. No systematic surveillance data are available for astrovirus infections in Switzerland. Astrovirus infections are not notifiable as single cases and are therefore only captured in the context of outbreaks, leading to likely underestimation of their occurrence. (see Table 4).

Table 4: Epidemiological Situation in Switzerland

Epidemiological Situation in Switzerland	
Annual reported cases	No systematic surveillance data on astrovirus infections are currently available in Switzerland.
Mandatory reportable disease	No

Exposure Assessment

Transmission: Transmission occurs via the fecal-oral route through direct person-to-person contact, contaminated surfaces, food, and water. Foodborne outbreaks have mainly been associated with raw shellfish, leafy greens, and berries contaminated during cultivation, harvesting, or irrigation. Water is considered an important environmental transmission route [2], [22]. However, the epidemiological evidence linking human astroviruses to foodborne transmission remains limited due to the lack of outbreak data.

Sources and Reservoirs: The Primary reservoir are infected humans that shed astroviruses in feces, including asymptomatic individuals [1]. In addition, Astroviruses have also been identified in more than 80 bird and

mammalian species [3]. Although zoonotic transmission has not been conclusively demonstrated, the zoonotic potential of astroviruses cannot be excluded [2].

Astroviruses have been detected in wastewater, surface water, irrigation water, indicating environmental persistence and potential contamination of the food chain [4], [19].

Outbreaks: Although human astroviruses are considered important pathogens causing sporadic cases and occasional outbreaks of acute gastroenteritis [13], [23], reported outbreaks remain relatively uncommon, likely due to the lack of diagnostic methods for foodborne viral infections [23], [24]. According to a systematic review, 32 astrovirus outbreaks reported between 1978 and 2021 were identified worldwide, with increased reporting after 2000 likely reflecting improved diagnostics and surveillance [23]. The outbreaks were mainly associated with acute gastroenteritis in childcare facilities, hospitals, schools, and nursing homes. Food- and waterborne outbreaks have been linked to contaminated food products and water sources, although the number of confirmed foodborne outbreaks remains limited [23].

A major outbreak occurred in Japan in 1994, affecting approximately 4,700 students and teachers. The outbreak was associated with a contaminated food product distributed to several school canteens and was likely linked to the consumption of raw mussels [25]. No astrovirus associated foodborne outbreaks were officially reported in Switzerland between 2016 and 2023. Nevertheless, the absence of reports should be interpreted with caution, as astrovirus infections are not mandatorily notifiable and routine testing is not commonly conducted.

In a systematic review from Asia, the pooled prevalence of HAstV in hospitalized pediatric patients due to acute gastroenteritis was 2.39% [26]. According to CDC estimates from the United States, enteric viruses account for approximately 59% of foodborne viral disease outbreaks, of which around 0.16% are attributed to astroviruses [27].

Table 5: Main Sources and Transmission Routes in Switzerland

Main Sources and Transmission Routes in Switzerland	
Main Reservoir	Humans; zoonotic transmission cannot be excluded.
Transmission	Most common: fecal-oral transmission via person-to-person, contaminated surfaces, food, and water [1].
Main source of infection	Contaminated food and water, as well as direct contact with infected individuals. Asymptomatic shedders may contribute to transmission, particularly during food handling operations.
High risk food items	Raw shellfish, leafy greens, berries, and other ready-to-eat products contaminated during cultivation, harvesting, or irrigation with contaminated water [2], [4].
Secondary spread	Reported via person-to-person transmission in community and institutional settings [23].
Populations at elevated risk for infection	Young children, elderly individuals, and immunocompromised persons [13].
Major Outbreaks	No major astrovirus outbreaks have been officially reported in Switzerland.

Regulatory Aspects

Regulation: While general food hygiene regulations apply to all food production and handling processes to minimize contamination risks, there are currently no specific Food Safety Criteria established for foodborne viruses, including Astroviruses, in the EU and in Switzerland.

Detection: There is currently no validated ISO method available for the detection of human astroviruses in foodstuffs. Existing detection approaches are mainly based on molecular methods such as RT-PCR targeting classical human astroviruses, while validated routine methods for food testing remain limited. However, a recent study demonstrated that a modified immunofluorescence assay (IF assay) improved reproducibility and signal clarity and was successfully applied for the detection of infectious human astrovirus type 1 (HAstV-1) in oyster matrices [28].

RESOURCES

- Website of the Federal Food Safety and Veterinary Office: https://www.blv.admin.ch/blv/en/home/lebensmittel-und-ernaehrung.html
- Infectious Diseases Dashboard (IDD) of the Federal Office of Public Health: https://www.idd.bag.admin.ch/
- A literature review on Astroviruses, 02.02.2026, P. Le Donne, Federal Food Safety and Veterinary Office (FSVO) unpublished.

CONTACTS

About information on this data sheet
Federal Food Safety and Veterinary Office FSVO
Fachbereich Risikobewertung
Tel: 058 463 30 33
info@blv.admin.ch

REFERENCES

[1] A. Bosch, R. M. Pintó, and S. Guix, "Human astroviruses," *Clin. Microbiol. Rev.*, vol. 27, no. 4, pp. 1048–1074, Oct. 2014, doi: 10.1128/CMR.00013-14.

[2] D. L. Vu, A. Bosch, R. M. Pintó, and S. Guix, "Epidemiology of Classic and Novel Human Astrovirus: Gastroenteritis and Beyond," *Viruses*, vol. 9, no. 2, p. 33, Feb. 2017, doi: 10.3390/V9020033.

[3] I. H. Mendenhall, G. J. D. Smith, and D. Vijaykrishna, "Ecological Drivers of Virus Evolution: Astrovirus as a Case Study," *J. Virol.*, vol. 89, no. 14, p. 6978, Jul. 2015, doi: 10.1128/JVI.02971-14.

[4] G. R. Takuissu *et al.*, "Assessing the Prevalence of Astroviruses in Water Environments: A Systematic Review and Meta-analysis," *ACS ES&T water*, vol. 3, no. 12, pp. 3782–3789, Dec. 2023, doi: 10.1021/ACSESTWATER.3C00415.

[5] A. Pexara and A. Govaris, "Foodborne Viruses and Innovative Non-Thermal Food-Processing Technologies," *Foods*, vol. 9, no. 11, Oct. 2020, doi: 10.3390/FOODS9111520.

[6] A. E. Davis *et al.*, "Astrovirus and norovirus infections and their association with diarrheal symptoms in immunocompromised children," *Emerg. Microbes Infect.*, vol. 15, no. 1, p. 2616946, Dec. 2026, doi: 10.1080/22221751.2026.2616946.

[7] G. E. Greening and J. L. Cannon, "Human and Animal Viruses in Food (Including Taxonomy of Enteric Viruses)," *Viruses in Foods*, p. 5, 2016, doi: 10.1007/978-3-319-30723-7_2.

[8] L. Moser and S. Schultz-Cherry, "Astroviruses," *Encyclopedia of Virology*, vol. 1–5, p. 204, Jan. 2008, doi: 10.1016/B978-012374410-4.00348-4.

[9] S. Schultz-Cherry, "Astroviruses," *Reference Module in Biomedical Sciences*, pp. B978-0-12-801238-3.02539-3, 2014, doi: 10.1016/B978-0-12-801238-3.02539-3.

[10] S. Schultz-Cherry, D. J. King, and M. D. Koci, "Inactivation of an astrovirus associated with poult enteritis mortality syndrome," *Avian Dis.*, vol. 45, no. 1, pp. 76–82, 2001, doi: 10.2307/1593014.

[11] S. Niendorf, A. Mas Marques, C. T. Bock, and S. Jacobsen, "Diversity of human astroviruses in Germany 2018 and 2019," *Virol. J.*, vol. 19, no. 1, Dec. 2022, doi: 10.1186/s12985-022-01955-3

[12] M. Mehdipour Dalivand, M. Ali, and R. Yee, "Prevalence and Clinical Manifestation of Astrovirus Gastroenteritis in Adults: A Seven-Year Study in Washington D.C., USA," *Viruses 2025, Vol. 17, Page 730*, vol. 17, no. 5, p. 730, May 2025, doi: 10.3390/V17050730.

[13] C. Johnson, V. Hargest, V. Cortez, V. A. Meliopoulos, and S. Schultz-Cherry, "Astrovirus Pathogenesis," *Viruses*, vol. 9, no. 1, p. 22, Jan. 2017, doi: 10.3390/V9010022.

[14] S. Cordey *et al.*, "Astrovirus MLB2, a New Gastroenteric Virus Associated with Meningitis and Disseminated Infection," *Emerg. Infect. Dis.*, vol. 22, no. 5, p. 846, May 2016, doi: 10.3201/EID2205.151807.

[15] P. L. Quan *et al.*, "Astrovirus Encephalitis in Boy with X-linked Agammaglobulinemia," *Emerg. Infect. Dis.*, vol. 16, no. 6, p. 918, Jun. 2010, doi: 10.3201/EID1606.091536.

[16] R. M. Lee *et al.*, "Incubation periods of viral gastroenteritis: A systematic review," *BMC Infect. Dis.*, vol. 13, no. 1, pp. 446-, Sep. 2013, doi: 10.1186/1471-2334-13-446/FIGURES/3.

[17] A. O. Kolawole *et al.*, "Astrovirus replication in human intestinal enteroids reveals multi-cellular tropism and an intricate host innate immune landscape," *PLoS Pathog.*, vol. 15, no. 10, 2019, doi: 10.1371/JOURNAL.PPAT.1008057.

[18] V. Cortez, P. Freiden, Z. Gu, E. Adderson, R. Hayden, and S. Schultz-Cherry, "Persistent Infections with Diverse Co-Circulating Astroviruses in Pediatric Oncology Patients, Memphis, Tennessee, USA," *Emerg. Infect. Dis.*, vol. 23, no. 2, p. 288, Feb. 2017, doi: 10.3201/EID2302.161436.

[19] "Astroviruses: background document for the WHO guidelines for drinking-water quality and the WHO guidelines on sanitation and health." Accessed: May 05, 2026. [Online]. Available: https://iris.who.int/items/e06cec39-5c23-4ae6-a50d-987c30e62b18

[20] G. E. Greening and J. L. Cannon, "Human and Animal Viruses in Food (Including Taxonomy of Enteric Viruses)," *Viruses in Foods*, p. 5, 2016, doi: 10.1007/978-3-319-30723-7_2.

[21] M. Farahmand *et al.*, "Worldwide prevalence and genotype distribution of human astrovirus in gastroenteritis patients: A systematic review and meta-analysis," *Microb. Pathog.*, vol. 181, p. 106209, Aug. 2023, doi: 10.1016/J.MICPATH.2023.106209.

[22] E. C. D. Todd, J. D. Greig, C. A. Bartleson, and B. S. Michaels, "Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 3. Factors contributing to outbreaks and description of outbreak categories," *J. Food Prot.*, vol. 70, no. 9, pp. 2199–2217, 2007, doi: 10.4315/0362-028X-70.9.2199.

[23] J. Fu *et al.*, "Acute gastroenteritis outbreaks caused by human astrovirus, 1978-2021: A systematic review," *Biosaf. Health*, vol. 5, no. 2, pp. 120–125, Apr. 2023, doi: 10.1016/J.BSHEAL.2023.02.004.

[24] M. Höhne and E. Schreier, "Lebensmittelassoziierte Virusinfektionen," *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*, vol. 43, no. 10, pp. 770–776, Oct. 2000, doi: 10.1007/S001030050354.

[25] I. Oishi *et al.*, "A large outbreak of acute gastroenteritis associated with astrovirus among students and teachers in Osaka, Japan," *J. Infect. Dis.*, vol. 170, no. 2, pp. 439–443, 1994, doi: 10.1093/INFDIS/170.2.439.

[26] B. Prajapati *et al.*, "Prevalence of astrovirus-associated gastroenteritis among hospitalized pediatric patients in Asia: A systematic review and meta-analysis," *Indian Journal of Gastroenterology*, 2026, doi: 10.1007/S12664-025-01951-9.

[27] E. Scallan *et al.*, "Foodborne Illness Acquired in the United States—Major Pathogens," *Emerg. Infect. Dis.*, vol. 17, no. 1, p. 7, Jan. 2011, doi: 10.3201/EID1701.P11101.

[28] H. Song, S. Han, H. Lee, Y. I. Moon, S. H. Park, and S. Do Ha, "Immunofluorescence-assisted investigation of Human Astrovirus-1 in oyster processing and production," *Food Microbiol.*, vol. 138, Sep. 2026, doi: 10.1016/J.FM.2026.105078.