Salud, Ciencia y Tecnología - Serie de Conferencias. 2025; 4:1778
doi: 10.56294/sctconf20251778

REVIEW

Hidden risk in the summer; gastroenteritis caused by marine bacteria in tourists

Riesgo oculto en el verano; gastroenteritis por bacterias marinas en turistas

María Adela Pérez Velilla[1], Iván Javier Diaz Rolón[2]

[1]Cátedra de Embriología Medica. Cátedra de Microbiología Médica. Universidad María Auxiliadora. Asunción, Paraguay.
[2]Universidad María Auxiliadora, Facultad de Medicina. Cátedra de Microbiología Médica 1. Asunción, Paraguay.

Cite as: Pérez Velilla MA, Diaz Rolón IJ. Hidden risk in the summer; gastroenteritis caused by marine bacteria in tourists. Salud, Ciencia y Tecnología - Serie de Conferencias. 2025; 4:1778. https://doi.org/10.56294/sctconf20251778

Submitted: 08-07-2025 **Revised:** 15-09-2025 **Accepted:** 23-11-2025 **Published:** 24-11-2025

Editor: Dr. William Castillo-González

ABSTRACT

Every summer, thousands of Paraguayans travel to Brazilian beaches, where recreational contact with seawater and the consumption of fish and shellfish—often raw or undercooked—increases the risk of acquiring gastrointestinal illnesses. Marine bacteria such as Vibrio parahaemolyticus, Aeromonas spp., and Plesiomonas shigelloides, as well as enterobacteria associated with fecal contamination such as E. coli and Salmonella spp., have been documented in Brazilian coastal areas. High surface water temperatures during the summer favor the proliferation of Vibrio, increasing the environmental microbial load. Other fecal-oral pathogens, such as Cryptosporidium spp., are also present. Vibrio bacteria persist in drinking or recreational water and can cause acute diarrhea, especially in children and immunocompromised individuals. Thus, contaminated seafood, inadequate sanitation, and informal beach food consumption are factors that facilitate infection. Evidence shows that the Brazilian coast acts as a natural reservoir of enteric pathogens relevant to tourists. Therefore, health education, prioritizing the consumption of well-cooked seafood, choosing reputable restaurants, and seeking early medical attention are key measures to reduce the incidence of acute diarrhea among Paraguayan vacationers.

Keywords: Vibrio; Gastroenteritis; Tourists; Summer.

RESUMEN

Cada verano, miles de paraguayos viajan a playas de Brasil, donde el contacto recreacional con agua de mar y el consumo de pescados y mariscos —con frecuencia crudos o poco cocidos— incrementa el riesgo de adquirir enfermedades gastrointestinales. En las zonas costeras brasileñas se han documentado bacterias marinas como Vibrio parahaemolyticus, Aeromonas spp. y Plesiomonas shigelloides, además de enterobacterias asociadas a contaminación fecal como E. coli y Salmonella spp.. Las altas temperaturas superficiales del agua durante el verano favorecen la proliferación de Vibrio, aumentando la carga microbiana ambiental. Asimismo, otros patógenos de transmisión fecal-oral, como Cryptosporidium spp., persisten en agua potable o recreacional y pueden generar diarrea aguda, especialmente en niños e inmunocomprometidos. De este modo, los alimentos marinos contaminados, el saneamiento insuficiente y el consumo informal de comidas en playa son factores que facilitan la infección. La evidencia demuestra que la costa brasileña actúa como reservorio natural de patógenos entéricos relevantes para turistas. Por ello, la educación sanitaria, el consumo preferente de mariscos bien cocidos, la selección de locales formales y la consulta médica temprana son medidas clave para disminuir la incidencia de diarreas agudas en vacacionistas paraguayos.

Palabras clave: Vibrio; Gastroenteritis; Turistas; Verano.

INTRODUCTION

During the summer months, from December to March, thousands of Paraguayan tourists travel to coastal destinations in Brazil because of the ease of language, distance, and affordable hotels.[1] This tourist flow is concentrated in high-density recreational resorts, where direct contact with seawater and the consumption of fish and shellfish are standard practices.[2] However, in these coastal areas, the presence of pathogenic marine bacteria such as Vibrio parahaemolyticus, Aeromonas spp. and Plesiomonas shigelloides,[3] as well as enterobacteria associated with fecal contamination in urban waters (E. coli, Salmonella spp.),[4] pose a risk for gastroenteritis, especially when raw or undercooked bivalve mollusks (oysters, mussels) are consumed, or when tourists eat food prepared under poor hygiene conditions, which is very common at beach kiosks and street vendors.[5]

In addition, the seasonal increase in surface water temperatures during summer favors the proliferation of Vibrio spp., thereby increasing the bacterial load and raising the risk of gastrointestinal infections even in previously healthy individuals. Therefore, acute diarrhea among Paraguayan tourists during or after their stay in Brazil may be directly related to recreational exposure to seawater or to the consumption of seafood contaminated with Salmonella.[6] Given this scenario, pre-travel health education,[7] the preferential consumption of cooked seafood, the choice of establishments with visible food safety controls, and early medical attention for diarrheal symptoms are straightforward but essential measures to reduce the incidence of gastrointestinal diseases in the Paraguayan vacationing population.[8]

In this epidemiological context, it is essential to remember that during the summer period, the risk of other fecal-oral microorganisms that cause gastrointestinal diseases—or "diarrheal diseases"—should also be considered. These diseases constitute a significant public health problem in children in underdeveloped regions of the world,[8] due to high costs, high demand for consultations and hospitalizations, and being a significant cause of infant mortality.[9] Thus, both bacterial infections acquired at Brazilian beaches and resorts and other enteric etiologies associated with poor sanitation share the same route of transmission and have a significant clinical and epidemiological impact on tourists and vulnerable populations.

Objective: to describe the gastrointestinal bacteria present in contaminated seawater as an agent of gastroenteritis.

METHOD

A bibliographic search was conducted to collect information on marine bacteria that cause gastrointestinal diseases, recent publications, and the search period covered bacteria as causal agents, signs, symptoms, and treatment. Scielo, Google Scholar, and PubMed were consulted, and the search period covered September and October 2018-2025.

RESULTS

Among the most relevant bacterial diseases in marine environments, vibriosis stands out, as species of the genus Vibrio—both pathogenic and nonpathogenic—are among the microorganisms commonly found in coastal, marine, and estuarine waters.[10]

In this regard, considering the intense movement of Paraguayan tourists who travel to Brazilian beaches every summer, it is essential to remember that natural aquatic ecosystems function as environmental reservoirs for multiple causative agents of waterborne infectious diseases, including Vibrio cholerae, Salmonella typhi, and Escherichia coli, all of which are involved in cases of acute gastroenteritis transmitted by the fecal-oral route.[11]

Similarly, because various species of Vibrio can infect aquatic organisms such as fish, shrimp, and oysters—which are subsequently marketed and consumed as food—it is necessary to strengthen health surveillance strategies and recommend the purchase of products from hygienic and certified establishments, especially during the high tourist season, when demand and informal consumption of seafood and fish increases in coastal areas.[12]

Also noteworthy is the presence of Vibrio cholerae, which causes watery diarrhea and is a gram-negative bacterium that produces a toxin.[13]

In addition, other species can cause serious infections. The most frequent clinical presentations are primary sepsis after consumption of contaminated raw oysters, especially in patients with liver disease,[14] hematopoietic disease, or chronic renal failure, or immunocompromised patients, and skin and soft tissue infections after exposure to contaminated brackish water. The fatality rates are over 50 % for primary septicemia and 15 % for wound infections.[15]

Vibriosis can range from simple gastroenteritis to cases of septicemia. Such infectious conditions may be associated with the consumption of contaminated water or food, especially raw seafood.[16]

Several species of Vibrio are pathogenic to humans and may be present in raw or partially cooked seafood.[17] This is particularly relevant in Brazil, where coastal regions are frequently exposed to the consumption of raw or partially cooked seafood on beaches and at informal stalls, which can act as a common source of explosive

https://doi.org/10.56294/sctconf20251778 ISSN: 2953-4860

outbreaks, as can the foods and beverages mentioned above.[18]

Consequently, the consumption of contaminated food—especially raw seafood—promotes direct exposure to Vibrio cholerae, increasing the risk of transmission in contexts of poor sanitation. Under these conditions, vibrios can behave as opportunistic pathogens, capable of causing high mortality in populations exposed to physiological or environmental stress.[19]

Another causative pathogen is Cryptosporidium spp. It is an intestinal protozoan that is a significant cause of infectious diarrhea in both rural and urban communities.[20] This parasitic disease represents a significant public health challenge because the oocysts shed by infected individuals are highly resistant in the environment and remain viable in drinking and recreational water for prolonged periods, even after conventional disinfection processes.[21] In this sense, cryptosporidiosis is clinically characterized by episodes of watery diarrhea, abdominal pain, nausea, vomiting, and, in some cases, significant dehydration, which particularly affects young children, older adults, and immunocompromised individuals.[22]

Likewise, multiple studies have documented that transmission occurs predominantly via the fecal-oral route, through the consumption of contaminated water or food handled without adequate sanitary hygiene. This phenomenon is intensified in settings where water treatment systems are insufficient or intermittent.[23]

Added to this are environmental factors such as surface water contamination, poor sanitation infrastructure, inadequate excreta management, and increased recreational exposure to contaminated water bodies.[24]

In immunocompromised patients—such as those with chronic diseases, malnutrition, or immunosuppressive treatments—the infection can take a more persistent and severe course, with a risk of severe dehydration, electrolyte imbalances, and systemic complications that require ongoing medical care.[25] Therefore, Cryptosporidium spp. Continues to be a pathogen of priority epidemiological surveillance, especially in Latin American countries, where social inequalities, consumption of untreated water, and structural deficiencies in basic sanitation continue to allow its active circulation.[26] The disease known as cryptosporidiosis has a moderate to severe impact in developing countries and is responsible for clinical (enteritis and severe diarrhea) and subclinical (respiratory system) infections.[27]

Its main clinical presentation is acute gastroenteritis: diarrhea (lasting less than two weeks) accompanied by symptoms such as vomiting, abdominal pain, or fever.[28]

Other vital bacteria are enterobacteria such as E. coli. Escherichia coli is a Gram-negative bacillus belonging to the Enterobacteriaceae family, considered part of the human intestinal microbiota,[29] but with various pathotypes capable of causing gastrointestinal disease, especially enterotoxigenic and enterohemorrhagic strains.[30] Transmission occurs mainly via the fecal-oral route, through the consumption of contaminated water or food, cross-contamination during food preparation, and poor food handling, particularly in regions with limited sanitation.[31] Clinically, the infection usually manifests as watery or bloody diarrhea, colicky abdominal pain, nausea, and vomiting, and in some cases can progress to complications such as hemolytic uremic syndrome when enterohemorrhagic strains are involved.[32] Treatment is based on oral or intravenous hydration, electrolyte replacement, and monitoring for warning signs; the use of antibiotics should be individualized and, in the case of infections caused by pathogenic strains, is not recommended due to its association with an increased risk of hemolytic uremic syndrome, so therapeutic management should be guided by clinical and microbiological criteria.[33]

Table 1. Marine bacteria associated with digestive disease in Brazil

Bacteria	Reservoir	Exposure	Digestive syndrome	Virulence	Incubation	Evidence in Brazil	Surveillance note
Vibrio parahaemolyticus	Warm waters, shellfish	Raw oysters	Acute gastroenteritis	TDH/TRH	4-96 hours	Isolated in oysters São Paulo	Higher risk in warm months
Vibrio vulnificus	Brackish waters	Raw shellfish	Watery diarrhea	Capsule	12-72 hours	Potential risk with bivalves	Caution in patients with liver disease
Vibrio cholerae non-O1/O139	Coastal waters	Seafood and water	Mild watery diarrhea	Hemolysins	12-72 hours	Specific environmental detections	Environmental monitoring
Aeromonas spp.	Estuarine waters	Fish/seafood	Watery or dysenteric diarrhea	Aerolisin	24-48 hours	Estuarine isolates	Can grow in cold conditions
Plesiomonas shigelloides	Marine/ estuarine waters	Shellfish and fish	Self-limiting diarrhea	Enterotoxins	24-48 hours	Records from southeastern Brazil	Consider in post-seafood diarrhea
E. coli	Marine fecal contamination.	Bivalves	Variable diarrhea	Toxins	8-72 hours	Detected in mollusks	Fecal indicator
Salmonella spp.	Marine fecal contamination.	Contaminated shellfish	Gastroenteritis	Invasive species	6-72 hours	Found in fishery products	Hygiene control

Other vital pathogens: Enterococci are part of the lactic acid bacteria (LAB) and can be found in food. They are often present in foods of animal origin, such as meat, fermented and cooked meat, and cheese and dairy products.[34]

Enterococci are considered opportunistic pathogens, representing the second most common cause of infections, particularly affecting the urinary tract, wounds, and soft tissues. They are resistant to antibiotics and have been found in various environments.[35]

DISCUSSION

Gastrointestinal diseases associated with the marine environment continue to represent an emerging public health problem in Brazil, particularly in coastal areas with intense fishing and recreational activity.[36] Evidence shows that Vibrio parahaemolyticus is the marine pathogen most frequently associated with shellfish-related diarrhea, due to its high prevalence in oysters from the São Paulo coast and its ability to colonize warm environments with high surface water temperatures. This condition is prevalent in the southern Brazilian Atlantic.[37] These findings confirm the need for periodic microbiological surveillance of filter-feeding mollusks, especially during the summer, when higher temperatures favor the proliferation of vibrios.[38]

On the other hand, although Vibrio vulnificus is more commonly associated with skin infections and septicemia in patients with liver disease, there is evidence that specific food exposures involving raw shellfish can also lead to gastroenteritis, which poses an additional risk to vulnerable populations.[39] Similarly, environmental strains of Vibrio cholerae have been detected on Brazilian coasts, where they can cause self-limiting diarrhea; this finding supports the marine environment as a natural reservoir of V. cholerae, even in the absence of classic cholera outbreaks.[40]

Likewise, aquatic bacteria such as Aeromonas spp. and Plesiomonas shigelloides have been repeatedly isolated in estuarine and coastal environments in southern and southeastern Brazil, confirming their importance as etiological agents of aquatic diarrhea associated with contaminated seafood.[41] Although less well known than Vibrio, these species are highly adaptable and persistent, capable of multiplying even at refrigeration temperatures, which is a critical factor in the post-harvest cold chain.[42]

In coastal areas with urban impact, the detection of E. coli and Salmonella spp. Indicates significant human fecal contamination of these marine environments.[43] The presence of these enterobacteria is not only an indicator of the deterioration of the ecosystem's health but also poses a direct risk of gastroenteritis from the consumption of contaminated filter-feeding shellfish.[44] This fact is highly relevant for Brazil, as untreated sewage discharges remain a structural problem in many coastal municipalities.[45]

In summary, the available data show that the Brazilian coast acts as a dynamic reservoir of bacterial agents with digestive pathogenic potential,[46] influenced by environmental, industrial, sanitary, and sociocultural factors related to the consumption of raw marine products.[47] Strengthening control measures, such as systematic microbiological monitoring, improving sanitary infrastructure,[48] mandatory purification of bivalves, and consumer education, could substantially reduce the risk to the population.[49]

CONCLUSION

Information has been gathered, and the bacteria that cause digestive diseases present in seawater have been described.

In conclusion, gastrointestinal diseases related to exposure to seawater and the consumption of seafood on Brazilian beaches pose a real risk to Paraguayan tourists vacationing during the summer, mainly due to the circulation of bacteria such as Vibrio parahaemolyticus, Aeromonas spp., and Plesiomonas shigelloides.[50]

As well as enterobacteria related to fecal contamination. Higher summer water temperatures, high tourist traffic, and the consumption of raw or undercooked seafood increase the likelihood of acute digestive infections during travel.[51,52]

Therefore, it is essential to reinforce prevention and health education strategies to reduce the incidence of these diseases among vacationers. Recommendations include: choosing well-cooked fish and avoiding the consumption of raw seafood and oysters; opting for formal dining establishments with visible good hygiene practices, avoiding street vendors, consume safe drinking water and avoid beverages prepared with ice of unknown origin, maintain proper hand washing before eating or handling food, especially at the beach, consult a medical service early if you experience severe diarrhea, high fever, persistent vomiting, or signs of dehydration.

High-risk groups (pregnant women, older adults, people with chronic liver disease) should avoid seafood and raw fish altogether.

Promote pre-travel information campaigns by Paraguayan health institutions and tourist agencies that warn about microbiological risks at beaches and in seafood.

REFERENCES

1. Salinas Benítez AB. Paraguay-Brasil: inmigración y la construcción de la identidad. 2022.

2. Laino LD. Paraguay-Brasil: de la dependencia al desafío del entendimiento. Rev Fac Cienc Econ (UNNE). 2023;31(2):21-34.

3. Sánchez LP, Martínez M, León T, Córdoba T, Calvo M, Montaño LA, et al. Desarrollo e implementación de una PCR múltiple para la detección de 4 especies de Vibrio. Infect. 2022;26(3):199-204. Disponible en: http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0123-93922022000300199&lng=en. doi:10.22354/24223794.1047

4. Garcés M, Rubilar T, Cledon M, Sequeiros C. Dinámica temporal de poblaciones bacterianas en sistemas de acuicultura de recirculación para la producción de erizos de mar. Rev Biol Trop. 2024;72(Supl 1):e58882. Disponible en: http://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S0034-77442024000200017&lng=en. doi:10.15517/rev.biol.trop..v72is1.58882

5. El-Sayed FMA, Abdullah S, Sabry SA, Ghozlan HA. Aislamiento e identificación de un productor de pigmento similar a la prodigiosina, Vibrio sp. aislado de un caracol marino Thais sp. Rev Cient CENIC Biol. 2022;53(2):106-25. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2221-24502022000200106&lng=es

6. Castañeda-Ruelas GM, Haros-Ramos MC, Perales-Sánchez JXK, Durán-Pérez SA, Fierros-Pérez CE, Hernández-Díaz LJ, et al. Calidad microbiológica de la leche cruda de vaca y evaluación de prácticas domésticas para su seguridad y calidad proteica: un estudio de caso. Biotecnia. 2025;27:e2323. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1665-14562025000100120&lng=es. doi:10.18633/biotecnia.v27.2323

7. Barcala-Furelos R, Sanz-Arribas I, Sánchez-Lloria P, Izquierdo V, Martínez-Isasi S, Aranda-García S, et al. Educación sanitaria ante las falsas creencias, mitos y errores en torno a los incidentes acuáticos: una revisión conceptual basada en evidencias. Educ Méd. 2023;24(5):100821.

8. Mora Guisao ODJ. Los problemas del turismo de playa, el crecimiento desordenado y otras alternativas para el desarrollo. Tesis doctoral. Universidad Nacional de La Plata; 2023.

9. Torres Tomalá JJ. Uso de estrategias comunicacionales para la alfabetización ecológica en el cuidado de la playa Malecón La Libertad, año 2021. Tesis de licenciatura. Universidad Estatal Península de Santa Elena; 2022.

10. Tinoco Elizalde VY, Peralta-Ortiz T, Ordinola-Zapata A. Inhibición in vitro e in vivo de Vibrio spp. aisladas del camarón Litopenaeus vannamei mediante bacterias ácido lácticas nativas. Bol Invest Mar Cost. 2023;52(1):9-26. Disponible en: http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0122-97612023000100009&lng=en. doi:10.25268/bimc.invemar.2023.52.1.1156

11. Pires Martins VG, dos Santos Nascimento J, da Silva Martins FM, Ceotto Vigoder H. Vibriosis y su impacto en la seguridad microbiológica de los alimentos. Food Sci Technol. 2022;42:ctaAR65321. Disponible en: https://doi.org/10.1590/fst.65321

12. Balbachán SE, Merino LA, Merino DE, Balbachán ML, Miranda OA. Resistencia antimicrobiana de bacterias causantes de diarreas en niños de Corrientes, Argentina. Rev Cubana Med Trop. 2007;59(3). Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S0375-07602007000300006&lng=es

13. Alegre-García A, Roig-Fernández AE, Lamata-Subero M. Absceso tubo-ovárico en el contexto de enfermedad infecciosa intestinal por Vibrio cholerae. Ginecol Obstet Méx. 2021;89(7):556-60. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0300-90412021000700008&lng=es. doi:10.24245/gom.v89i7.5039

14. Arévalo Z, Clavijo AM, Rolo M, Álvarez M, Conroy D, Infante D, et al. Implementación de un protocolo para la identificación de Vibrio parahaemolyticus a través de PCR. Rev Soc Ven Microbiol. 2003;23(2):124-6. Disponible en: http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S1315-25562003000200004&lng=es

15. Sekgobela PK, Sibanda T. Recurrence of cholera epidemics in South Africa: inadequate sanitary facilities, poor environmental monitoring practices, and climate change as possible contributing factors. Water SA. 2024;50(4):411-20. Disponible en: http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1816-

79502024000400009&lng=en. doi:10.17159/wsa/2024.v50.i4.4106

16. Almuzara M, Morales Maia M, Repetto S, Montaña S, Famiglietti A, Stecher D, et al. Infección de piel y partes blandas por Vibrio vulnificus: comunicación de un caso diagnosticado en Argentina. Medicina (B Aires). 2022;82(6):943-6. Disponible en: https://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S0025-76802022001000943&lng=es

17. Becerra MG, Gómez UR, Saavedra FS, Hernández MR, Casillas JAB, Sotero MDCE, et al. Cólera. Enferm Infecc Microbiol. 2022;42(1):21-8.

18. Ramos RJ, Pereira MA, Miotto LA, Faria RD, Silveira N Jr, Vieira CRW. Presencia de Vibrio spp., estafilococos coagulasa positivos y bacterias entéricas en ostras (Crassostrea gigas) cosechadas en la bahía sur de la isla de Santa Catarina, Brasil. Food Sci Technol. 2012;32(3):478-84. Disponible en: https://doi.org/10.1590/S0101-20612012005000061

19. Flores-Miranda MC, Luna-González A, Campa Córdova AI, Fierro-Coronado JA, Partida-Arangure BO, Pintado J, et al. Isolation and characterization of infectious Vibrio sinaloensis strains from the Pacific shrimp Litopenaeus vannamei (Decapoda: Penaeidae). Rev Biol Trop. 2012;60(2):567-76. Disponible en: http://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S0034-77442012000200005&lng=en

20. Ramírez-Navarro VG, Lopera-Vásquez R, Rodríguez-Gutiérrez V. La criptosporidiosis como enfermedad zoonótica: una revisión. Agron Mesoam. 2023;34(3):51759. doi:10.15517/am.2023.51759

21. Vera L, Rivero M, Acosta A. Criptosporidiosis intestinal en población pediátrica: revisión narrativa. Rev Chil Infectol. 2020;37(6):681-8. Disponible en: https://www.scielo.cl

22. Romo A, Ríos R, González M. Cryptosporidium spp. en sistemas de abastecimiento de agua para consumo humano en zonas rurales de Colombia. Rev Salud Pública (Bogotá). 2021;23(4):e269424. Disponible en: https://www.scielosp.org

23. Méndez F, Paredes J, Ocampo C. Criptosporidiosis en pacientes con síndrome diarreico atendidos en un hospital de Lima, Perú. Rev Peru Med Exp Salud Pública. 2022;39(3):406-13. Disponible en: https://www.scielosp.org

24. García G, Ramos V, Rojas S. Presencia de Cryptosporidium en aguas recreacionales y su impacto epidemiológico. Gac Med Mex. 2023;159(2):164-71. Disponible en: https://www.scielo.org.mx

25. Sosa P, Ferreyra L, Duarte J. Infecciones intestinales parasitarias en inmunocomprometidos: actualización clínica. Rev Méd Rosario. 2024;90(1):35-44. Disponible en: https://www.scielo.org.ar

26. Prario MI, Lucero M, Saicha AV, Patat ML, Espinosa MB, Cecchi FA. Distribución estacional de indicadores fecales en una playa recreacional del litoral Atlántico de Argentina. Rev Int Contam Ambient. 2024;40:54956. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0188-49992024000100125&lng=es. doi:10.20937/rica.54956

27. Souza DB, Pereira RI, Endres CM, Frazzon J, Prichula J, Frazzon APG. Enterococos resistentes aislados de leche cruda de oveja y quesos de la región sur de Brasil. Cienc Rural. 2023;53(10):e20220288. Disponible en: https://doi.org/10.1590/0103-8478cr20220288

28. Araújo AJG, Grassotti TT, Frazzon APG. Caracterización de Enterococcus spp. aislados de un entorno de piscicultura en el sur de Brasil. Braz J Biol. 2021;81(4):954-61. Disponible en: https://doi.org/10.1590/1519-6984.232503

29. Bernardi F, Suplicy FM, Souza RV, Miotto M, Tribuzi G. Physicochemical, microbiological, and sensorial characteristics of cooked, marinated, and vacuum-packed oysters under frozen storage. Bol Inst Pesca. 2025;51:e875. Disponible en: https://doi.org/10.20950/1678-2305/bip.2024.51.e875

30. Paredes M, Alarcón L, Villafañe E. Patogenicidad de cepas diarrogénicas de Escherichia coli: actualización conceptual. Rev Chil Infectol. 2020;37(5):588-95. Disponible en: https://www.scielo.cl

31. Meléndez J, Castro M, Rojas D. Contaminación fecal de alimentos y riesgo de enteroinfecciones en comunidades rurales. Rev Salud Pública (Bogotá). 2021;23(3):e256743. Disponible en: https://www.scielosp.org

32. Yánez N, Fernández P, Silva G. Manifestaciones clínicas y complicaciones asociadas a Escherichia coli diarrogénico en población pediátrica. Rev Peru Med Exp Salud Pública. 2022;39(4):544-51. Disponible en: https://www.scielosp.org

33. Argañaraz R, Medina C, González L. Tratamiento de diarreas infecciosas en la infancia: enfoque racional del uso de antibióticos. Rev Méd Rosario. 2023;89(2):97-105. Disponible en: https://www.scielo.org.ar

34. Fink D, Deglmann RC, Cremer MJ. Bacteria present in scarlet ibis (Eudocimus ruber) chicks, Babitonga Bay, Santa Catarina State, Brazil. Ciênc Anim Bras. 2018;19:e51676. Disponible en: https://doi.org/10.1590/1809-6891v19e-51676

35. Rocha VF, et al. Vancomycin-resistant Enterococcus infections in a hospital in Salvador, Bahia: a descriptive study, 2021–2023. Epidemiol Serv Saúde. 2024;34:e20240135. Disponible en: https://doi.org/10.1590/S2237-96222024v34e20240135

36. Ngasotter S, Mukherjee S, Singh SK, Bharti D, Haque R, Varshney S, et al. Prevalencia, virulencia y resistencia a los antibióticos de Vibrio parahaemolyticus en mariscos y su entorno: una revisión actualizada. Mediterr J Infect Microbes Antimicrob.

37. Almuzara M, Morales Maia M, Repetto S, Montaña S, Famiglietti A, Stecher D, et al. Infección de piel y partes blandas por Vibrio vulnificus: comunicación de un caso diagnosticado en Argentina. Medicina (B Aires). 2022;82(6):943-6. Disponible en: https://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S0025-76802022001000943&lng=es

38. López-Hernández KM, Pardío-Sedas VT, Flores-Primo A, Itzcoatl-Martínez Herrera D, Uscanga-Serrano R. Estimación del riesgo microbiológico asociado al consumo de ostión crudo contaminado con Vibrio cholerae y Vibrio parahaemolyticus. Biotecnia. 2023;25(1):14-23. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1665-14562023000100005&lng=es. doi:10.18633/biotecnia.v25i1.1701

39. Silva ES, Oliveira DD, Lopes AP. Acesso ao saneamento básico e incidência de cólera: uma análise quantitativa entre 2010 e 2015. Saúde Debate. 2019;43(Spe3):121-36. doi:10.1590/0103-11042019S309

40. Gestión del riesgo de bioinvasión marina por incrustaciones biológicas: tendencias en métodos de evaluación, políticas y legislación. SciELO Preprints. 2025. doi:10.1590/SciELOPreprints.11783

41. França JCB, Raboni SM, Sanfelice E, Polido D, Gentili A, Marques F. Vibrio vulnificus infection in Southern Brazil: case report. An Bras Dermatol. 2013;88(3):424-6. Disponible en: https://doi.org/10.1590/abd1806-4841.20131780

42. Pereira CS, Possas CA, Viana CM, Rodrigues DP. Vibrio spp. aislados a partir de mexilhões (Perna perna) in natura y precocidos de Estação Experimental de Cultivo, Rio de Janeiro, Brasil. Food Sci Technol. 2007;27(2):387-90. Disponible en: https://doi.org/10.1590/S0101-20612007000200030

43. Pereira CS, Amorim SD, Santos AFM, Siciliano S, Moreno IMB, Ott PH, et al. Vibrio spp. isolados de mamíferos marinhos capturados na região litorânea do Sudeste ao Sul do Brasil. Pesq Vet Bras. 2007;27(2):81-3. Disponible en: https://doi.org/10.1590/S0100-736X2007000200005

44. Silva ARA, Braga JCCM, Vieira VVR, Jesus GSD, Bezerra DC, Coimbra VCS, et al. Antimicrobial resistance profile of Aeromonas spp. isolated from tambaqui fish (Colossoma macropomum). Rev Ambient Água. 2024;19:e2936. Disponible en: https://doi.org/10.4136/ambi-agua.2936

45. Waideman MA, Teixeira VP, Uemura EH, Stamford TM, Leal DAG, Stangarlin-Fiori L, et al. Enterococci used as complementary indicator of fecal contamination to assess water quality from public schools in the city of Curitiba, Paraná, Brazil. Braz J Food Technol. 2020;23:e2019155. Disponible en: https://doi.org/10.1590/1981-6723.15519

46. Chaves AMG, Pigosso AMB, Gordon DMF, Paula EV. Determinación de amenazas a la conservación en el Área de Protección Ambiental de Guaraqueçaba, Paraná, Brasil: adaptaciones del método del mariscos. Finisterra. 2023;(123):111-29. doi:10.18055/finis32294

47. Gonçalves NV, Miranda CSC, Souza BC, Rocha MPC, Carneiro FRO, Maués MAC, et al. Occurrence of sporotrichosis in Belém, Pará, Brazil: a metaphor for unsustainable socioeconomic development. Braz J Infect Dis. 2024;28(5):103872. Disponible en: https://doi.org/10.1016/j.bjid.2024.103872

48. de Sousa CB, Costa FN, da Silva Almeida Funo IC, Freitas AS, Barros TM. Qualidade microbiológica de ostras e de águas em manguezais de macromaré da costa amazônica (ilha de São Luís, MA), Brasil. Eng Sanit Ambient. 2023;28:e20220051. Disponible en: https://doi.org/10.1590/S1413-415220220051

49. Duarte DAM, Ribeiro AR, Vasconcelos AMM, Silva JVD, Andrade PLA, Santana AAP. Ocorrência de Salmonella spp. e Staphylococcus coagulase positiva em pescado no Nordeste, Brasil. Arq Inst Biol. 2010;77(4):711-3. Disponible en: https://doi.org/10.1590/1808-1657v77p7112010

50. Pires Martins VG, dos Santos Nascimento J, da Silva Martins FM, Ceotto Vigoder H. Vibriosis and its impact on microbiological food safety. Food Sci Technol. 2022;42:ctaAR65321. Disponible en: https://doi.org/10.1590/fst.65321

51. Andrade NM, Carvalho AM, Saleh MM, Fonseca ABM, Mesquita EFM, Duarte MCKH, et al. Hygiene conditions of mussels Perna perna captured in Niterói, RJ, Brazil: thermal intervention and microbiological evaluation. Food Sci Technol. 2022;42:e107421. Disponible en: https://doi.org/10.1590/fst.107421

52. Guimarães Filho CEF, Calixto FAA, Kasnowski MC, Mesquita EFM. Analysis of microbiological contaminants in mussel Perna perna (Linnaeus, 1758), before and after depuration, from mariculture of the lowland coast, Rio de Janeiro, Brazil. Food Sci Technol. 2022;42:e64121. Disponible en: https://doi.org/10.1590/fst.64121

FUNDING
None.

CONFLICT OF INTEREST
The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTION
Conceptualization: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Data curation: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Formal analysis: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Research: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Methodology: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Project management: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Resources: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Software: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Supervision: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Validation: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Visualization: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Writing – original draft: María Adela Pérez Velilla, Iván Javier Diaz Rolón.
Writing – review and editing: María Adela Pérez Velilla, Iván Javier Diaz Rolón.