Waterborne Zoonoses

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Waterborne Zoonoses

Identification, Causes, and Control

Edited by
J.A. Cotruvo, A. Dufour, G. Rees, J. Bartram,
R. Carr, D.O. Cliver, G.F. Craun, R. Fayer and
V.P.J. Gannon

World Health Organization

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Preface

Investigating important emerging issues in water and infectious disease and communicating discoveries create challenges, which are addressed by an initiative being undertaken by the World Health Organization (WHO) Water Sanitation and Health Unit, the US Environmental Protection Agency (US EPA) Office of Research and Development, and other collaborators. The initiative seeks to accelerate the identification of actual and perceived issues, to bring together information and knowledge in critical areas, and to disseminate information to policy-makers and practitioners in a timely fashion. This initiative has resulted in the publication of several cutting-edge documents that critically analyse emerging issues in water and infectious disease and present balanced assessments of how these will impact disease transmission through water with emphasis on management options for preventing and controlling waterborne disease.

Other issues dealt with in the Emerging Issues in Water and Infectious Disease initiative include:

- heterotrophic plate counts and drinking-water safety;
- pathogenic mycobacteria in water;
- the H_2S method for the detection of faecal contamination of drinking-water;
- water recreation and disease;
- respiratory transmission of faecally excreted viruses; and
- toxic cyanobacteria in water.

This publication was developed from the workshop on "Zoonosis and Waterborne Disease," held in Annapolis, Maryland, USA, on 2–4 September 2003. The workshop was sponsored by the WHO units dealing with Water, Sanitation and Health and with Strategy Development and Monitoring of Zoonoses, Foodborne Disease and Kinetoplastidae, working with US EPA's Office of Research and Development and Office of Ground Water and Drinking Water. Twenty-nine experts from 14 countries and diverse disciplines, including sanitary and veterinary microbiology, animal health, agriculture, animal waste management, public health, water epidemiology, medicine, sanitary engineering, food safety, and regulatory policy, attended the workshop. They examined the roles of zoonoses in current and future waterborne disease and prepared the chapters published here.

Participants at the workshop were asked to:

- review current waterborne zoonotic disease threats;
- identify new disease candidates based on disease agent characteristics; and
- evaluate current control strategies to identify agents that might fall outside of the current control envelope.

The workshop participants reviewed information on zoonotic organisms linked to waterborne diseases in humans and focused on the organism characteristics, human activities, and environmental conditions that could lead to future concerns from evolving or emerging organisms. Animal vector factors discussed included feral/wild animals, domestic animals, intensive grazing, feedlots, abattoirs, and other elements. Emergence related to translocation of microorganisms resulting from human and animal movement, food production, irrigation, food handling, distribution from distant areas, climate change, and other appropriate contributing factors was discussed.

This publication was developed from technical inputs to the workshop, workshop deliberations and revisions to the technical materials based on the suggestions of expert technical reviewers.

The goal of this publication is to provide guidance to agencies concerned with human and animal health and water and wastewater service providers worldwide to anticipate potential future waterborne zoonotic disease problems

and to determine whether current practices will be protective or whether new approaches need to be developed or deployed to protect health. This publication presents information on how zoonotic pathogens can be best managed at the source (i.e., through animal management practices, treatment of animal wastes, runoff management); through water treatment (wastewater and drinking-water); or through a combination of multiple barriers.

We hope that this publication provides useful information in describing the significance of zoonotic microorganisms as threats to the quality of ambient water and drinking-water and to public health throughout the world. We hope that this will facilitate the development of cross-sectoral initiatives to manage current health threats and to anticipate and manage health threats from emerging waterborne zoonotic pathogens.

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List of acronyms and abbreviations

A/EEC	attaching and effacing *E. coli*
AFLP	amplified fragment length polymorphism
AFO	animal feeding operation
AGI	acute gastrointestinal illness of unknown origin
AIDS	acquired immunodeficiency syndrome
ARCC	average rate of correct classification
ATP	adenosine triphosphate
BFP	bundle-forming pilus
BSE	bovine spongiform encephalopathy
CAFO	concentrated animal feeding operation
CDSC	Communicable Disease Surveillance Centre (England and Wales)
CFU	colony-forming unit
CI	confidence interval
CJD	Creutzfeldt-Jakob disease
CUP	carbon-source utilization
CWD	chronic wasting disease
DAEC	diffuse adherent *E. coli*
DALY	disability-adjusted life year

DBP	disinfection by-product
DEC	diarrhoeagenic *E. coli*
DNA	deoxyribonucleic acid
DT	definitive phage type
EAEC	enteroadherent *E. coli*
EAggEC	enteroaggregative *E. coli*
EHEC	enterohaemorrhagic *E. coli*
EIEC	enteroinvasive *E. coli*
EPA	Environmental Protection Agency (USA)
EPEC	enteropathogenic *E. coli*
epg	eggs per gram of faeces
ESWTR	Enhanced Surface Water Treatment Rule (USA)
ETEC	enterotoxigenic *E. coli*
HACCP	hazard analysis and critical control points
HAV	hepatitis A virus
HBV	hepatitis B virus
HEV	hepatitis E virus
HIV	human immunodeficiency virus
HUS	haemolytic uraemic syndrome
ID	infective dose
ID_{50}	median infective dose
Ig	immunoglobulin
IID	infectious intestinal disease
IPCC	Intergovernmental Panel on Climate Change
LEE	locus of enterocyte effacement
LH-PCR	length heterogeneity polymerase chain reaction
LT	heat-labile enterotoxin
LU	livestock unit
MAP	*Mycobacterium avium* (ssp. *paratuberculosis*)
MAR	multiple antibiotic resistance
MBM	meat and bone meal
MCL	Maximum Contaminant Level (USA)
MCLG	Maximum Contaminant Level Goal (USA)
MOR	matched odds ratio
MPN	most probable number
mRNA	messenger ribonucleic acid
MST	microbiological source tracking
NASBA	nucleic acid sequence-based amplification
NPDES	National Pollutant Discharge Elimination System (USA)
NTU	nephelometric turbidity unit

OIE	Office International des Epizooties (World Organization for Animal Health)
PCR	polymerase chain reaction
PEAS	possible estuary-associated syndrome
PFGE	pulsed-field gel electrophoresis
PT	phage type
QMRA	quantitative microbial risk assessment
QRA	quantitative risk assessment
rDNA	ribosomal deoxyribonucleic acid
REP-PCR	repetitive extragenic palindromic polymerase chain reaction
RFLP	restriction fragment length polymorphism
RNA	ribonucleic acid
rRNA	ribosomal ribonucleic acid
SARS	severe acute respiratory syndrome
SCCWRP	Southern California Coastal Water Research Project (USA)
SMX	sulfamethoxazole
STEC	Shiga toxin-producing *E. coli*
STh	heat-stable enterotoxin (human)
STp	heat-stable enterotoxin (porcine)
TMDL	total maximum daily load
TMP	trimethoprim
T-RFLP	terminal restriction fragment length polymorphism
TSE	transmissible spongiform encephalopathy
UDG	uracil-D-glycosylase
USA	United States of America
US EPA	United States Environmental Protection Agency
UV	ultraviolet
VBNC	viable but non-culturable
vCJD	variant Creutzfeldt-Jakob disease
VTEC	verocytotoxin-producing *E. coli*
WHO	World Health Organization
WSP	water safety plan
YLD	years lived with a disability
YLL	years of life lost to premature death

Waterborne Zoonoses: Identification, Causes and Control By Jamie Bartram, R. Carr, Dean O. Cliver, J. Cotruvo, Gunther F. Craun 2004 | 523 Pages | ISBN: 9241562730 , 1843390582 | PDF | 5 MB. A significant number of emerging and re-emerging waterborne zoonotic pathogens have been recognized over recent decades. SARS, E. coli O157:H7, and Cryptosporidium provide examples of zoonoses with waterborne routes of transmission. Developed from an expert workshop of 29 scientists, this book provides a critical assessment of current knowledge about waterborne zoonoses and identifies strategies and resear Request PDF on ResearchGate | On Sep 1, 2013, J.A. Cotruvo and others published Waterborne Zoonoses: Identification, Causes and Control.Â Many different viruses are excreted by humans and animals and are frequently detected in fecal contaminated waters causing public health concerns. Classical bacterial indicator such as E. coli and enterococci could fail to predict the risk for waterborne pathogens such as viruses. Moreover, the presence and levels of bacterial indicators do not always correlate with the presence and concentration of viruses, especially when these indicators are present in low concentrations. PDF | On Jan 1, 2004, Jamie Bartram and others published Waterborne Zoonoses: Identification, causes and control.Â Fasciolosis an economically important global disease of ruminants in the temperate and tropical regions, caused by Fasciola hepatica and F. gigantica, respectively, also poses a potential zoonotic threat. In India alone it causes huge losses to stakeholders. Anthelmintics including triclabendazole have been used to control this menace but the emerging resistance against the available compounds necessitates identification of novel and alternative therapeutic measures involving plant derived natural compounds for their anthelmintic potential.