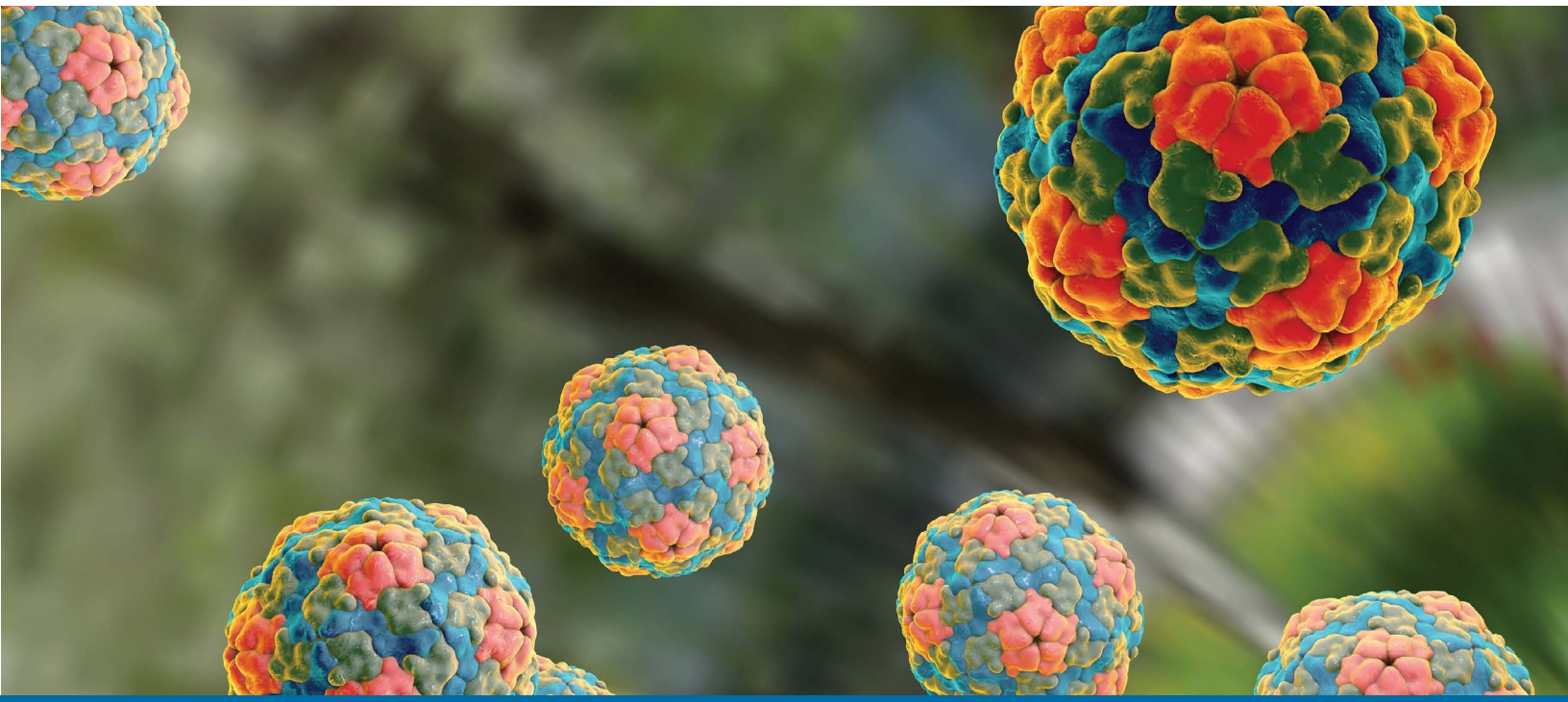
HEPATITIS A VIRUS: A SIGNIFICANT FOODBORNE PATHOGEN

What you should know to protect your establishment, customers and staff from the virus.



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INTRODUCTION

Descriptions reminiscent of hepatitis A have appeared in ancient European and Chinese literature, often coinciding with wars and social disruptions. Hepatitis A virus (HAV), the cause of the disease, was found only some 50 years ago and visualized under the electron microscope soon after.[1 2]

HAV is one of five viral causes of hepatitis, a liver infection. Unlike hepatitis B and C, HAV causes an acute (short-lived) condition with no risk of liver cirrhosis or liver cancer. HAV can cause epidemics as well as sporadic cases, being more common under conditions of poor personal and environmental hygiene. Globally, HAV is estimated to infect around 1.4 million/year, and in 2015, it caused over 11,000 fatalities.

In the U.S., some 30,000 cases of the infection were recorded in 1997. Vaccination, education campaigns and better environmental hygiene has been reduced its annual number to <2,000 by 2014; since then, there has been an apparent reversal in the trend (Figure 1). The reasons for this increase are not yet fully understood.

Recently, several states in the U.S. have experienced significant outbreaks of hepatitis A. For example, the Southern California outbreak, which began nearly two years ago, has led to over 700 cases with 21 deaths (https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/Hepatitis-A-Outbreak.aspx). These recent outbreaks are a stark reminder of the continuing threat from the virus. Since 2003, alone foodborne HAV outbreaks of significant gravity have also been recorded in developed countries such as Australia and Canada.

WHAT ARE THE SIGNS AND SYMPTOMS OF HEPATITIS A?

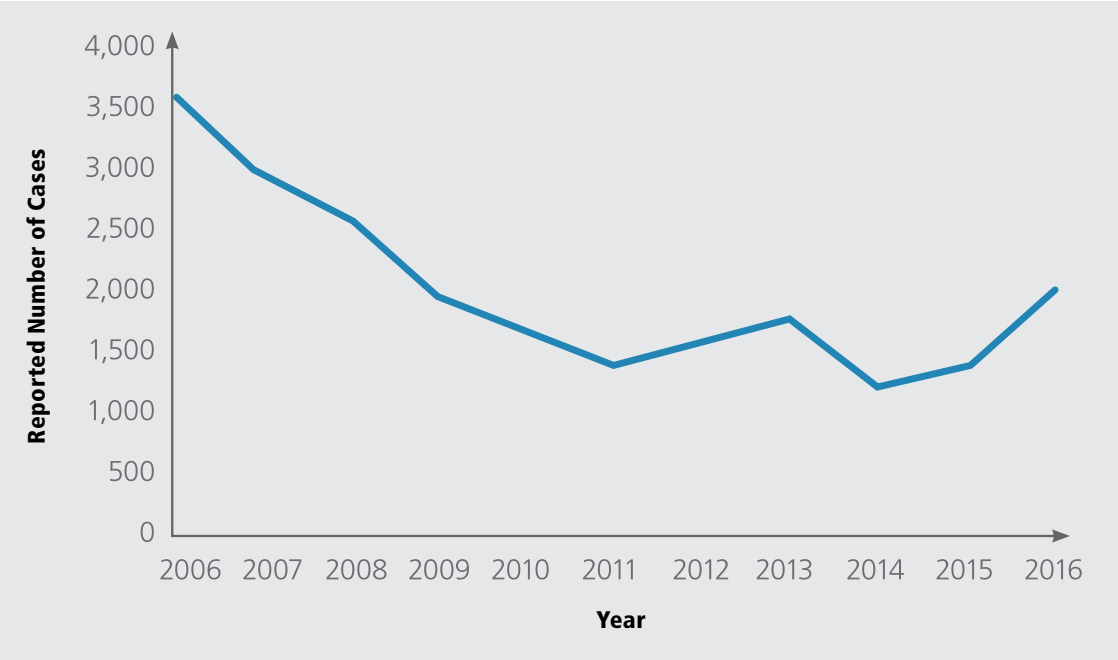
A telltale sign of hepatitis in general is jaundice, the yellowing of the skin and the whites of the eyes. The infection is 'subclinical' (with no apparent signs and symptoms) in 10–15% of adults and most children. Such cases can 'silently' spread the virus to others, presenting a formidable challenge for infection prevention and control. A typical 'clinical' case shows mild fever, fatigue, appetite loss, abdominal pain, aching joints, nausea and vomiting, dark urine and diarrhea. Hepatitis A is rarely fatal, and does not spread by air.

Jaundice appears about a month (incubation period) after exposure to the virus, and recovery normally takes nearly two months.

AN INFECTED PERSON POSES THE HIGHEST RISK OF SPREADING THE INFECTION TO OTHERS DURING THE 2 WEEKS BEFORE THE APPEARANCE OF CLINICAL SIGNS AND SYMPTOMS AND FOR AT LEAST A MONTH AFTER RECOVERY.

During this period, virus circulates in the blood (viremia[a]), and can end up in donated blood and serum or can be transmitted with needle sharing.

Figure 1: Incidence of hepatitis A in U.S. (2006–2016)



Source: U.S. Centers for Disease Control & Prevention, Atlanta, GA.

WHAT IS HAV?

It is a small (~30 nm[b] in diameter) RNA virus in the genus Hepatovirus of the family Picornaviridae. It is roughly spherical in shape and devoid of an outer membrane (non-enveloped). Table 1 summarizes the salient features of the virus.

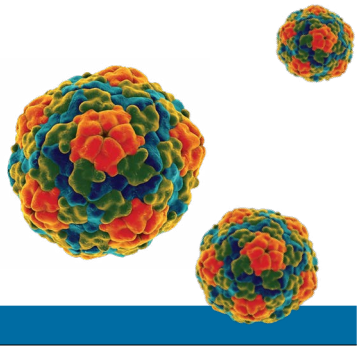


Table 1: Summary of the salient features of HAV

Feature	Comments
Virus particles	Virus particles roughly spherical in shape with a diameter of about 30 nm; non-enveloped
Virus genome	Genome has single-stranded, positive-sense RNA
Classification	Belong to the genus Hepatovirus in the family Picornaviridae
Stability	Shows higher environmental stability than other picornaviruses
Disinfectant resistance	One of the most resistant enteric viruses to chemical disinfectants and antiseptic active ingredients
Natural hosts	Humans are the only known host
Immunity	Life-long immunity after surviving an infection or from vaccination
Vaccination	Two types of safe and effective vaccines available
Treatment	No known drugs
Virus spread	Person-to-person contact and by ingestion of fecally-contaminated food and water; can cause sporadic cases or epidemics
Virus in blood & serum	During viremia, infectious virus in blood with risk of spread from donated blood or serum and by needle-sharing
Airborne spread	Not known to spread by air

HOW DOES HAV SPREAD?

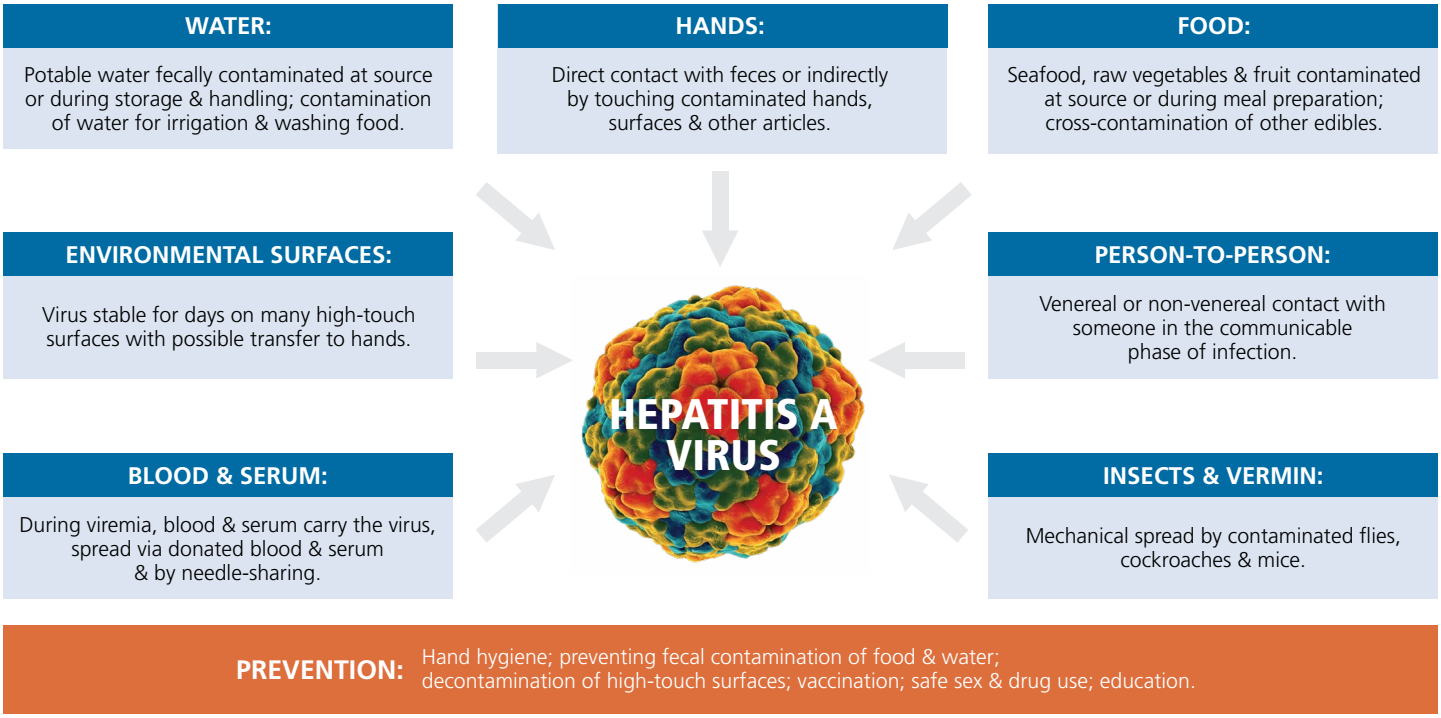
HAV spreads predominantly from virus-contaminated feces upon direct person-to-person contact or indirectly via vehicles such as hands, food, water and environmental surfaces[5] (Figure 2). Less frequently, it can spread through tainted blood or serum or upon needle-sharing. HAV is among the more environmentally-stable and microbicide[c]-resistant picornaviruses known[6].

The key to its prevention is to avoid ingesting fecally-contaminated water, or eating raw or undercooked seafood and salad greens grown in or rinsed with contaminated water (e.g. sewage polluted). Sharing drug-use equipment, or having unprotected sex with an infected person are also high-risk activites.

Antibodies in response to HAV infection last for life and protect against reinfection. Prophylactic vaccination is, thus, the best and safest means of protection against hepatitis A. In particular, get vaccinated before travel to the developing world (endemic[d] areas) for personal protection, and to avoid bringing the virus back.

b. There are a billion nanometers (nm) in a meter.
c. Refers to chemical disinfectants and antiseptics together.
d. Where low levels of infection occur all year round.

Figure 2: Vehicles for the spread of HAV & preventative strategies



WHY SHOULD FOODSERVICE ESTABLISHMENTS BE CONCERNED ABOUT HAV?

While public health agencies, such as the U.S. Centers for Disease Control & Prevention (CDC), do not recommend routine vaccination of commercial foodhandlers against HAV, other generic precautions can reduce the risk of spread of the virus via foodservice establishments. Commercial foodservices together serve many millions of a variety of meals daily, often using home-grown or imported fruit and vegetables served raw or lightly cooked. Such material may be contaminated at source or during shipment/storage; at meal preparation, contaminated articles can pass the virus on to other edibles and inadvertently to the customer, even with meticulous hand hygiene. Even though this scenario is frequently responsible for widespread outbreaks of foodborne HAV and other infections, preempting such spread is beyond the purview of an average foodhandler. The general management of foodservice establishments must ensure that the food items purchased come from credible sources meeting the required standards of cultivation, handling, and transportation.

The other key responsibility of the management is to give their foodhandlers the needed training in food safety while also providing a safe work environment with the required and conveniently located facilities for hand hygiene and environmental cleaning. It is then incumbent upon the individual foodhandler to use the general facilities optimally with particular emphasis on hand hygiene. The importance of proper and frequent hand washing and hand sanitizing with well formulated products cannot be overemphasized as a critical means of protecting the foodhandler as well as the food being served. An employee with a stomach ailment (diarrhea, vomiting) should seek time off from work until full recovery. If not possible, such an employee should be assigned tasks other than the direct handling of food.

WHAT CAN FOOD SERVICE FACILITIES DO TO REDUCE THE RISK OF HAV SPREAD?

Develop policies based on best practices, for example:

1 Personal Hygiene

Foodhandlers in domestic and community settings must also practice proper hand hygiene before handling and serving food while also protecting the food from insects and vermin.

2 Food Supply Chain

Shellfish (e.g., oysters) harvested from sewage-polluted waters often harbor HAV and other enteric pathogens and are a common cause of foodborne outbreaks when consumed raw or partially cooked. Food service establishments, as well as the public, need frequent reminders in this context to forestall such HAV transmission.

3 Vaccination

Certain jurisdictions is the U.S. (e.g., Clark County, Las Vegas, NV), require HAV vaccination for foodhandlers and childcare workers via regulatory efforts (http://www.southernnevadahealthdistrict.org/health-topics/hep-a.php).

WHAT CAN FOOD SERVICE MANAGERS DO TO PREVENT HAV SPREAD IN THEIR FACILITIES?

Include HAV with other foodborne pathogens in your food safety plan, with particular emphasis on:

- Develop and implement written and **easy-to-follow guidelines for the staff** to cleanup vomiting or diarrhea episodes in the facility.
- Ensure that all employees responsible for the maintenance and cleanup of washrooms in particular are well-trained in the use of personal protective equipment (PPE), preparation and application of the disinfectant(s) being used, and the importance of precleaning prior to disinfection[8].
- A typical food service establishment is a site with simultaneous and multifarious activities in the kitchen and food serving areas along with the constant flow of customers. This requires **regular cleaning and decontamination** of frequently-touched environmental surfaces in particular.
- The relative resistance of HAV to microbicides in general requires a careful selection of disinfectants and hand hygiene agents[9].
- Remember, when selecting environmental surface disinfectants, that HAV is among the more resistant enteric viruses. **Select a surface sanitizer that is effective at killing Hepatitis A** with quick, practical kill times (1 minute or less); and ideally food contact safe with no rinse required.
- Conveniently located and well-stocked handwashing stations; establish a program with assigned duties for proper and **frequent cleaning and maintenance** of such facilities.
- **Educate the staff** in general and proper food safety; staff certification in food safety is a good measure to forestall foodborne spread of infections.
- Allow employees, especially those with upset stomach, to stay away from work for at least 24 hours after their symptoms have resolved. The Food Code from the U.S. Food and Drug Administration (FDA) provides further guidance in the matter.
- Encouraging employees to report sickness and providing them with paid sick leave can also contribute to food safety.
- In case an employee cannot get time off, temporarily reassign that person duties where no direct contact with food is required.

WHAT CAN FOOD HANDLERS DO TO PREVENT THE SPREAD OF HAV?

Every foodhandler has a key role to play in preventing the spread of HAV and other foodborne infections by adopting the following measures:

- Report any upset stomach to the management and request time off from work for 24–48 hours from the time any diarrhea and vomiting have ended.
- Proper and regular handwashing by foodhandlers is the single most important means of preventing the spread of HAV and other foodborne pathogens. Follow the FDA guideline[10] or that from the World Health Organization[11] on how to perform hand hygiene. Wash hands with soap and clean running water for at least 20 seconds of vigorous rubbing of the entire surface of the hands. Rinse the washed hands thoroughly with water and then dry them properly.
- Do not handle ready-to-eat food with bare-hands. Always wear clean gloves and change them once contaminated; wash hands well before gloving as well as after removing the gloves.
- ALWAYS wash hands after using the restroom! NO EXCEPTIONS!
- Clean and sanitize utensils and work surfaces properly and regularly with a surface sanitizer that is proven to be effective at killing Hepatitis A with practical contact times.

THE FUTURE

HAV will remain a threat to our health for the foreseeable future. Indeed, the risk from it may increase due to the increasing population, changing demographics[12], faster and more frequent international travel and movement of edibles, enhanced importation of fruit and vegetables from developing countries, climate change causing higher levels of water pollution as well as ever larger and centralized food manufacture and distribution.

In the continuing absence of safe and effective drugs against hepatitis A, the best option is wide-spread vaccination of children, travelers and the most vulnerable to create an increasing larger pool of the immunized. As a part of the Sustainable Development Goals, the World Health Organization's target is to reduce the number of new viral hepatitis infections in general by 90% while cutting down the number of viral hepatitis-related deaths to 65% by 2030[13].

Research and development should continue the effort to create more effective interventions at reducing HAV transmission. Areas of particular relevance for further studies are the effect of formulation (synergistic combinations) and contact times and wipe substrates on product/process efficacy, as well as the mechanism of action (capsid destruction).

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MEET THE AUTHORS

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Dr. Sattar is Professor Emeritus of Microbiology, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada. He is also Chief Scientific Officer at CREM Co Labs, Mississauga, Ontario, Canada. His studies the fate of pathogens in the environment as well as ways to interrupt the spread of infections via safe and effective hand hygiene and environmental decontamination. He has published over 230 papers and book chapters, and delivered more than 360 invited lectures in 35 countries worldwide. He is co-editor of the 5th edition of the reference text Principles and Practice of Disinfection, Preservation and Sterilization published by Wiley-Blackwell.

He is a Registered Microbiologist of the Canadian College of Microbiologists and a Fellow of the American Academy of Microbiologists. Notable among his numerous international awards and fellowships are: the M. S. Favero Lectureship (2007), the OCRI Award (2007) and the Hygieia Gold Medal of the Rudolf Schülke Foundation (2009) of Germany, Queen Elizabeth Diamond Jubilee Medal (2012), 'Distinguished Microbiologist' award of the Canadian College of Microbiologists (2014), and ASTM International's Award of Merit (2017).

Dr. Sattar has been an advisor to the Canadian and U.S. governments and numerous public and private organizations. He is a member of: World Health Organization's expert group on hand hygiene, Organization for Economic Cooperation and Development's task force on international harmonization of test protocols for testing environmental surface disinfectants, International Organization for Standardization's technical committee on developing standards for testing hand hygiene agents.

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James W. Arbogast, Ph.D. joined GOJO Industries, Inc. in 2002, and became the Vice President of Hygiene Sciences and Public Health Advancements in 2014, after a variety of technical leadership roles in Skin Care Science, Product Development and New Technology. Dr. Arbogast entered the field of consumer product development after receiving his Ph.D. in Organic Chemistry from the University of California at Los Angeles in March of 1992. Prior to joining GOJO, he gained experience in the consumer products industry with Clorox and Dial.

Dr. Arbogast has been directly involved in the formulation and national launch of hundreds of products in the laundry, air freshening, hair care, skin care, and hand hygiene markets. Under his leadership, the Skin Care Science team has conducted numerous field outcome studies with hand hygiene products to determine their real-world effect on skin condition and infection related rates. Additionally, there have been many contributions to advancing the science of hand hygiene around microbiology, clinical studies, analytical chemistry, drug stability and new product development.

Dr. Arbogast has made numerous presentations at major scientific conferences, popular press articles, has been an inventor on 81 patents and co-authored 26 manuscripts published in peer-reviewed literature. He has 25 years of experience in consumer product development with more than the last 17 years focused on skin care and hand hygiene. He resides in Bath, Ohio with his wife and three children.