

Norovirus structures could help develop treatments for food poisoning

Date: June 12, 2019

Source: Cold Spring Harbor Laboratory

Summary: Researchers have used cryo-EM and computational tools to reconstruct the shell structures of four different strains of human noroviruses. Deciphering this can help inform future vaccine developments against the virus.

FULL STORY

Noroviruses are a leading cause of food-borne illness outbreaks, accounting for 58% of all outbreaks and cause 685 million cases worldwide each year. There is no effective therapeutic against them. Having knowledge of the intricate structure of the outer layer of noroviruses, the capsid, which allows the virus to attach to its human host, could help in vaccine development.

In vaccines, specific antibodies recognize the capsids and bind to them so they can no longer interact with human cells. "We need to understand what the norovirus capsid shapes actually look like, and the shape differences between different strains," said James Jung, a postdoctoral fellow in Dr. Leemor Joshua-Tor's lab at Cold Spring Harbor Laboratory (CSHL).

Jung and Joshua-Tor led a team to solve the high-resolution structures of four different strains of noroviruses using a cryo-electron microscope. This allowed them to see the intricate architecture of virus shells in high-definition. Their findings are published in the journal *PNAS*.

Jung gleaned new insights that could help in guiding the development of therapeutics to fight norovirus infection. "Previously, it was thought that the norovirus shells exist in single-sized assemblies consisting of 180 building blocks and 90 surface spikes. What we found was an unexpected mixture of different shell sizes and shapes. We found a smaller form, which consists of just 60 building blocks with 30 surface spikes placed further apart. We also found larger shells made out of 240 building blocks with 120 surface spikes that are lifted significantly above the base of the shell and form a two-layered architecture that could interact differently with the human cells," he said.

The spikes on the shell interact with the host. Jung found that the distance and orientation of the spikes varied across the different strains of noroviruses. "That means each strain will interact differently with human cells," Jung explained. "The way the antibodies bind is also going to be different. Vaccines should be formulated to take into account the variations across strains and structural forms."

Story Source:

Materials provided by **Cold Spring Harbor Laboratory**. *Note: Content may be edited for style and length.*

Journal Reference:

1. James Jung, Timothy Grant, Dennis R. Thomas, Chris W. Diehnelt, Nikolaus Grigorieff, Leemor Joshua-Tor. **High-resolution cryo-EM structures of outbreak strain human norovirus shells reveal size variations.** *Proceedings of the National Academy of Sciences*, 2019; 201903562 DOI: 10.1073/pnas.1903562116

Cite This Page:

MLA APA Chicago

Cold Spring Harbor Laboratory. "Norovirus structures could help develop treatments for food poisoning." ScienceDaily. ScienceDaily, 12 June 2019. <www.sciencedaily.com/releases/2019/06/190612162907.htm>.

RELATED STORIES**New Vaccine Production Could Improve Flu Shot Accuracy**

July 24, 2017 — For decades, vaccine manufacturers have used chicken eggs to grow the flu virus strains included in the seasonal vaccine. But because these human strains frequently mutate to adapt to their new ... **read more »**

Cryo-Electron Microscopy Achieves Unprecedented Resolution Using New Computational Methods

Mar. 23, 2017 — Cryo-electron microscopy (cryo-EM) -- which enables the visualization of viruses, proteins, and other biological structures at the molecular level -- is a critical tool used to advance biochemical ... **read more »**

Researchers Discover How to Cultivate Norovirus in Human Cells

Nov. 7, 2014 — Noroviruses are pernicious intestinal viruses. They cause violent vomiting and diarrhea, and people ill with the virus remain contagious up to three days after they seem to recover. Although a ... **read more »**

Surprising Diversity of Antibody Family Provides Clues for HIV Vaccine Design

Sep. 25, 2014 — Scientists have described how a single family of antibodies that broadly neutralizes different strains of HIV has evolved remarkably diverse structures to attack a vulnerable site on the virus. The ... **read more »**