

**International Journal of Biomedicine | June 2021 - Volume 11, Issue Suppl_1:
Abstracts from the Third Russian International Conference "Cryo-electron
microscopy 2021: achievements and prospects"**

ORAL ABSTRACT PRESENTATIONS

SESSION TITLE: EM RESEARCH RELATED TO MEDICINE

DOI: 10.21103/IJBM.11.Suppl_1.OR5

Abstract OR-5: *Helicobacter pylori* Surface Structures

Vladimir G. Zhukhovitsky, Tat'yana A. Smirnova, Nataliya V. Shevlyagina

*National Gamaleya National Research Centre for Epidemiology &
Microbiology, Moscow, Russia*

Background: *Helicobacter pylori*, which infects at least half of the human population, is an etiopathogenetic factor in the development of chronic gastritis (CG), gastric and duodenal ulcer disease (UD), and is also considered a risk factor in the occurrence of some forms of stomach cancer. Various surface structures of *H. pylori* are important pathogenic factors.

Methods: Reference (NCTC 11637, NCTC 11639) and freshly isolated *H. pylori* strains as well as samples of the gastric mucosa were examined using transmission (TEM) and scanning electron microscopy (SEM) by means of "JEM-100 B" (JEOL, Japan) and "Quanta 200 3D" (FEI Company, USA) systems, respectively. Samples for SEM fixed with formalin and not subjected to dehydration were sprayed with an electrically conductive layer of gold. Samples for TEM were prepared using negative contrast (NC) with ammonium molybdate and ultrathin sections (US) contrasted by Reynolds; fixation by Ito-Karnovsky was used in both cases. Accelerating voltage at TEM and SEM was 80 and 10 kV, respectively.

Results: Three types of *H. pylori* surface structures were found: flagella, fimbria, and vesicles. Flagella were found both in the material of cultures maintained *in vitro* and in each native sample of the gastric mucosa. SEM images suggest the involvement of flagella in biofilm formation. On longitudinal sections of the flagellum, the outer electron-dense layer and the inner content in the form of a filament were visualized; on cross sections, the flagellum looked like an annular structure with a centrally located point accumulation of electron-dense matter. Paradoxically, the *H. pylori* forms with a defective cell wall also possessed flagella. Freely located flagellar sheaths without central filament were often found *in vitro* only. Fimbriae were found exclusively in negatively contrasted pure bacterial cultures material. In addition, vesicles detaching from

the surface of bacterial cells were found both in the material of aging *H. pylori* pure cultures and in native samples of the gastric mucosa under CG and UD. A small part of the vesicles retains their connection with the cell wall, while detached vesicles are present in excess in the surrounding space. Massive detachment of vesicles leads to the formation of spheroplasts, devoid of an outer membrane.

Conclusion: *H. pylori* has a representative set of surface structures that play an important role in the onset and development of the infectious process in the gastroduodenal area.

Key Words: *Helicobacter pylori* • flagella • fimbriae • vesicles

**Corresponding author: Vladimir G. Zhukhovitsky. E-mail: zhukhovitsky@rambler.ru*

International Journal of Biomedicine. 2021;11 Suppl 1: S9.

doi: 10.21103/IJBM.11.Suppl_1.OR5

©2021 International Medical Research and Development Corporation