

UNIVERZITET U SARAJEVU – VETERINARSKI FAKULTET



Norovirusi u prehrambenom lancu – značaj, prijenos i prevencija

Završni rad

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Noroviruses in the food chain – significance, transmission and prevention

Diploma Thesis

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Sažetak

Norovirusi (NoV) su vodeći uzročnici virusnih gastroenteritisa koji se prenose hranom. Otkriveni su nakon epidemije u Norwalku (Ohio) 1968. godine pomoću elektronske mikroskopije. Njihov epidemiološki značaj je veliki obzirom da uzrokuju preko 267 miliona infekcija godišnje i oko 200.000 smrtnih slučajeva kod djece u zemljama u razvoju.

Norovirusi predstavljaju genetski izrazito heterogenu grupu virusa. Prema savremenoj klasifikaciji, na osnovu aminokiselinske sekvence glavnog kapsidnog proteina VP1 razvrstavaju se u više genogrupa, od kojih su GI, GII, GIV, GVIII i GIX povezane s infekcijama kod ljudi, dok najveći broj humanih infekcija pripada genogrupama GI i GII. Unutar genogrupa norovirusi se dalje klasificiraju u genotipove na osnovu sekvence gena koji kodira VP1. Norovirusi pokazuju izraženu stabilnost prema različitim okolišnim i fizičko-hemijskim faktorima, uključujući kiselu sredinu, niske temperature i djelovanje pojedinih dezinficijensa. Međutim, podatke o njihovoj otpornosti na temperaturu i druge postupke inaktivacije potrebno je tumačiti u odnosu na korištenu metodu, jer prisustvo virusne RNK ili očuvana struktura kapside ne predstavljaju nužno dokaz očuvane infektivnosti.

Glavni put prijenosa je fekalno-oralni put koji je iznimno učinkovit zbog niske doze. Prijenos se odvija direktnim kontaktom ili putem aerosola nastalih povraćanjem. Kontaminirana hrana i voda su također značajni vektori, osobito pri kvarovima u vodosnabdjevanju.

Izvori kontaminacije uključuju otpadne vode, led i rekreacijske vode. Osjetljive kategorije hrane su školjkaši, bobičasto voće i lisnato povrće. Ključnu ulogu imaju radnici koji često nastavljaju raditi unatoč simptomima što direktno kontaminira hranu.

Detekcija se oslanja na RT-qPCR metodu, standardizovanu kroz ISO 15216 i FDA protokole. Najveći izazov je što ove metode ne razlikuju infektivne od neinfektivnih virusnih čestica. Iako se razvijaju napredne metode poput digitalnog PCR-a i NGS-a, one su trenutno preskupe za rutinsku upotrebu. Prevencija zahtijeva strogu higijenu, kontrolu kvalitete vode i edukaciju osoblja. Efikasna kontrola je otežana nedostatkom zakonskih mikrobioloških kriterija za noroviruse u hrani.

Ključne riječi: Norovirus, prehrambeni lanac, gastroenteritis, RT-qPCR, prevencija

Summary

Noroviruses (NoV) are the leading causes of foodborne viral gastroenteritis. They were discovered after an epidemic in Norwalk (Ohio) in 1968 using electron microscope. Their epidemiological significance is enormous – they account for over 267 million infections per year and around 200.000 deaths among children in developing countries.

Noroviruses represent a genetically highly heterogeneous group of viruses. According to the current classification, they are divided into several genogroups based on the amino acid sequence of the major capsid protein VP1. Among these, GI, GII, GIV, GVIII, and GIX are associated with human infections, while the majority of human cases are caused by viruses belonging to genogroups GI and GII. Within each genogroup, noroviruses are further classified into genotypes based on the sequence of the gene encoding VP1. Noroviruses exhibit considerable stability under various environmental and physicochemical conditions, including acidic environments, low temperatures, and exposure to certain disinfectants. However, data on their resistance to heat and other inactivation treatments should be interpreted in relation to the method used, because the detection of viral RNA or preservation of capsid integrity does not necessarily indicate retained infectivity..

The main route of transmission is the fecal-oral route, which is extremely effective due to the low dose. Transmission occurs through direct contact or through aerosols created by vomiting. Contaminated food and water are also significant vectors, especially during water supply failures. Sources of contamination include sewage, ice, and recreational waters. Sensitive food categories are shellfish, berries, and leafy vegetables. A key role is played by workers who often continue to work despite symptoms, which directly contaminates food.

Detection relies on the RT-qPCR method, standardized through ISO 15216 and FDA protocols. The biggest challenge is that these methods do not distinguish infectious from non-infectious virus particles. Although advanced methods such as digital PCR and NGS are being developed, they are currently too expensive for routine use. Prevention requires strict hygiene, water quality control and staff education. Effective control is hampered by a lack of legal microbiological criteria for noroviruses in food.

Keywords: Norovirus, food chain, gastroenteritis, RT-qPCR, prevention