УДК 619:616.34

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THE ADHESIVE ACTIVITY OF STRAINS OF YERSINIA ENTEROCOLITICA ISOLATED FROM PRODUCTS OF SLAUGHTER CATTLE AND PIGS

Of the six Yersinia enterocolitica biotypes, the virulence of the pathogenic biotypes, namely, 1B and 2–5 is attributed to the presence of virulence plasmid, termed pYV/pCD and the production of heat-stable enterotoxin, which is controlled by chromosomal genes. In this paper adhesive activity were identified in strains of Y. enterocolitica which were isolated from samples of products of slaughter cattle, pigs and minced meat. According to the study of 20 strains of Y. enterocolitica which were isolated from various products of slaughter cattle had average adhesion (AA) varies considerably – from 0,2±0,05 to 4,9±0,24. 27 strains of Y. enterocolitica, isolated from the products of slaughter pigs, had average adhesion 0,3±0,06 – 4,6±0,04.

Yersinia enterocolitica was discovered more than 60 years ago but was not considered as a human or veterinary pathogen until the late 1960s when it became increasingly identified in foodborne gastrointestinal infections [2, 7]. *Y. enterocolitica* is a member of the genus *Yersinia* which encompasses a heterogeneous collection of facultatively anaerobic bacteria that belong to the family Enterobacteriaceae. Of the 11 species within this genus [13], only three, *Y. pestis, Y. pseudotuberculosis* and *Y. enterocolitica* are regarded as pathogenic for humans whereas *Y. ruckeri* is a fish pathogen, and *Y. enterocolitica*-like organisms *Y. krirtensenii, Y. intermedia, Y. mollaretii, Y. frederiksenii* and *Y. bercovieri* have yet an unidentified role in human disease [11]. *Y. enterocolitica* is associated with a wide range of clinical and immunological manifestations, responsible for intestinal diseases, including enterocolitis with an inflammatory diarrhea in affected infants and young children; acute terminal ileitis and mesenteric lymphadenitis mimicking appendicitis in older children and young adults, as well as rare extraintestinal manifestations including urinary tract and respiratory tract infection (empyema), osteoarticular infection (reactive arthritis), erythema nodosum, infected mycotic aneurysm, axillary abscesses, and endocarditis [8].

Yersinia enterocolitica has evolved into an apparently heterogeneous collection of organisms encompassing six biotypes differentiated by physiochemical and biochemical tests (1A, 1B, 2, 3, 4, and 5) and more than 50 serotypes differentiated by antigenic variation in cell wall lipopolysaccharide. Of the six biotypes, biotype 1A is the most heterogeneous, and encompasses a wide range of serotypes, of which serotypes O:5, O:6,30, O:6,31, O:7,8, O:10, as well as O-nontypable strains, are isolated most often [12]. The virulence of the pathogenic biotypes, namely, 1B and 2–5 is attributed to the presence of a highly conserved 70-kb virulence plasmid, termed pYV/pCD and certain chromosomal genes [4].

Yersinia enterocolitica penetrates into the human and animal organism predominantly by alimentary way. Thanks adhesin, virulent strains attach to epitheliocytes and colonize the intestine. Interaction of microbial adhesins (biomolecules, ligands) with complementary structures of cells (receptors) leads to disruption of the normal structure and function of body tissues and runs a specific infection. After this, pathogen using phagocytes can cross the intestinal barrier and diseminirovat through the body, forming lesions in various organs and tissues, causing infectious – allergic reactions and long-term persistence. Main damaging effect thus belongs to toxins. In general virulent strain characteristics associated with not one, but with a complex pathogenicity factors, described in many publications [5, 6, 9].

Most isolates of *Y. enterocolitica* from food or clinical materials have either of two pathogenic properties. First property is the ability to penetrate the intestinal wall, which is thought to be controlled by 70-kb virulence plasmid (pYV/pCD) genes; that is absent in avirulent strains; second one is the production of heat-stable enterotoxin which is controlled by chromosomal genes (*ystA, ystB,* and *ystC*) [10].

The **aim of the study** was to determine the adhesive activity in strains of *Y. enterocolitica* isolated from samples of products of slaughter cattle, pigs and beef mince.

MATERIAL AND METHODS

The work was carried out on the basis of the laboratory of veterinary microbiology, virology and immunobiotechnology Department of Microbiology, Virology and Biotechnology NULES of Ukraine.

The determination of adhesion activity was carried out by the Brillis V.I. et al. method [1]. As cell substrate guinea pig erythrocytes were used. The results were evaluated by determining the average adhesion (AA) – the average number of microorganisms adhering to one erythrocyte. Were assayed at least 25 red blood cells, taking into account no more than 5 red blood cells in one field of view. Adhesiveness was considered zero at AA from 0 to 1,0, low – from 1,01 to 2,0, medium – from 2,01 to 4,0, high – more than 4,0.

RESULTS AND DISCUSSION

In the process of determining the presence of pathogen factors of *Y. enterocolitica*, in particular, the adhesive activity of 20 strains which isolated from different products of slaughter cattle (pieces of liver,

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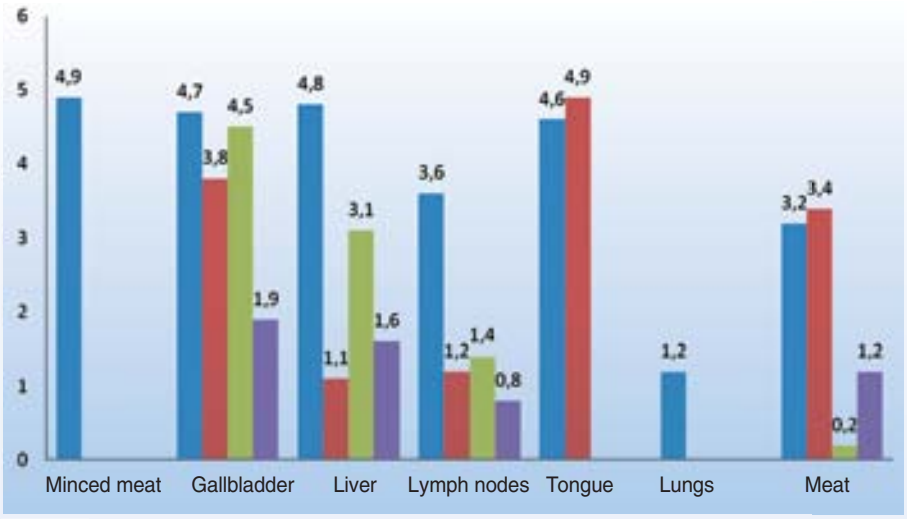

Fig. 1. The average adhesion (AA) *Yersinia enterocolitica* strains were isolated from products of slaughter cattle

lung, lymph nodes, tongue, gallbladder, meat, minced meat) was characterized. Besides, the average adhesion of 26 strains isolated from products of slaughter pigs (pieces of lung, heart, liver, spleen, mandible and retropharyngeal lymph nodes, tongue, meat, minced meat) was characterized too. According to the study of *Yersinia enterocolitica* strains isolated from various products of slaughter cattle the adhesive activity varied considerably – from 0,2±0,05 to 4,9±0,24. Highly adhesive were 6 (30%) tested strains (Fig. 1).

The average adhesion activity of strains was highly adhesive within 4,5±0,36 – 4,9±0,24. Five strains (25%) isolated from the liver, gallbladder, lymph node, and meat, were characterized by medium adhesiveness. Their AA was within 3,1±0,2 – 3,8±0,21. Low adhesive strains were determined in amount of 7 (35%), the average adhesion activity was within 1,14±0,07 – 1,9±0,19. Two strains (10%) had an adhesion rate of zero. Adhesive activity of *Y. enterocolitica* strains isolated from different products of slaughter pigs ranged from 0,3±0,06 to 4,6±0,04 (Fig. 2).

In 8 (29,6%) highly adhesive strains AA was within 4,1±0,16 – 4,6 ± 0,4. Eleven strains (40,7%) were characterized by medium adhesiveness and AA was within 2,2±0,2 – 3,8 ± 0,03. The average adhesion of five (18,5%) low adhesive strains was within 1,14±0,07 – 1,9±0,19. Three strains (11,2%) had the adhesion rate of zero and AA was within 0,3±0,01 – 0,7 ±0,06.

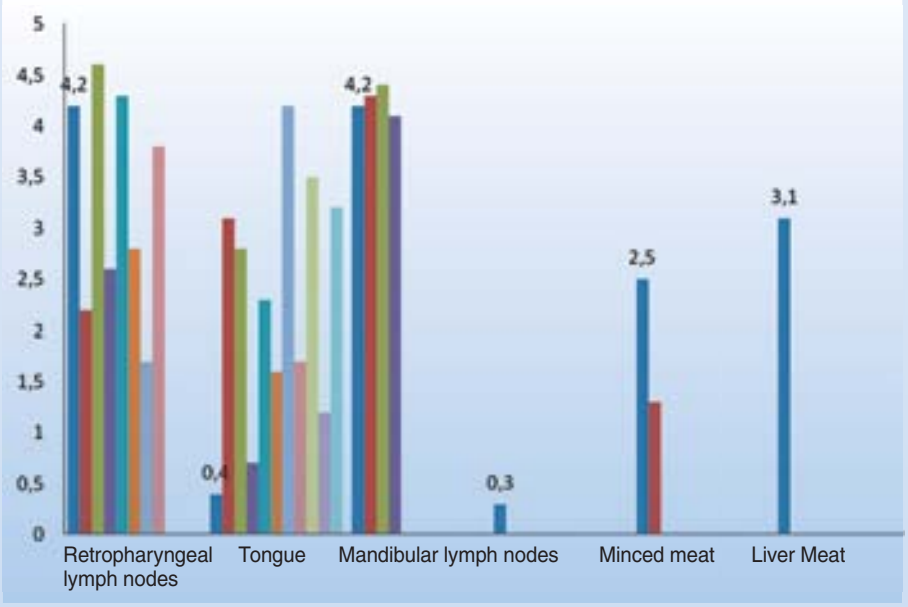

Fig. 2. The average adhesion (AA) of *Yersinia enterocolitica* strains were isolated from products of slaughter pigs

CONCLUSION

The strains of *Y. enterocolitica* isolated from products of slaughter cattle, pigs and minced meat are characterized by polymorphic adhesive properties. The isolation of strains with high adhesive properties indicates a danger of raw meat. This causes the further study of this organism, particularly in terms of developing technologies for producing, storing and consumption of animal products, which would make impossible the realization of its pathogenic potential.

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Одержано 24.01.2014

Адгезивна активність штамів *Y. enterocolitica*, ізольованих із продуктів забою великої рогатої худоби. *В.Г. Скибіцький, Г.В. Козловська*

Із шести біотипів *Y. enterocolitica* вірулентність патогенних біотипів 1В і 2–5 пояснюється наявністю плазміди вірулентності, яка називається pYV/pCD, адгезивністю і виробництвом термостабільного ентеротоксину, що кодується хромосомними генами. У статті визначено адгезивну активність штамів *Y. enterocolitica*, виділених зі зразків продуктів забою великої рогатої худоби, свиней і м'ясного фаршу. За результатами дослідження 20 штамів *Y. enterocolitica*, виділених із різних продуктів забою великої рогатої худоби, середній показник адгезії (СПА) коливався в значних межах – від 0,2±0,05 до 4,9±0,2; СПА 27 штамів *Y. enterocolitica*, виділених із продуктів забою свиней, – у межах 0,3±0,06 – 4,6±0,04.

Адгезивная активность штаммов *Y. enterocolitica*, изолированных из продуктов убоя крупного рогатого скота. *В.Г. Скибицкий, Г.В. Козловская*

Из шести биотипов *Y. enterocolitica* вирулентность патогенных биотипов 1В и 2–5 объясняется наличием плазмиды вирулентности, которая называется pYV/pCD, адгезивностью и производством термостабильного энтеротоксина, который кодируется хромосомными генами. В статье определена адгезивная активность штаммов *Y. enterocolitica*, выделенных из образцов продуктов убоя крупного рогатого скота, свиней и мясного фарша. По результатам исследования 20 штаммов *Y. Enterocolitica*, выделенных из различных продуктов убоя крупного рогатого скота, средний показатель адгезии (СПА) колебался в значительных пределах – от 0,2±0,05 до 4,9±0,2; СПА 27 штаммов *Y. enterocolitica*, выделенных из продуктов убоя свиней, составил 0,3±0,06 – 4,6±0,04. ○

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