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БИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ И МЕДИЦИНСКАЯ ЗНАЧИМОСТЬ БАКТЕРИЙ РОДА LISTERIA

Деревянченко И. А. [1, 2],
Краева Л. А. [1 ,3]

[1] Санкт-Петербургский НИИ эпидемиологии и микробиологии имени Пастера, Санкт-Петербург, Россия.
[2] Восточной филиал ФБУЗ «Центр гигиены и эпидемиологии в городе Санкт-Петербурге и Ленинградской области», Санкт-Петербург, Россия.
[3] Военно-медицинская академия им. С.М. Кирова МО РФ, Санкт-Петербург, Россия.

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BIOLOGICAL FEATURES AND MEDICAL SIGNIFICANCE OF THE LISTERIA BACTERIA

Derevyanchenko I. A. [a, b],
Kraeva L. A. [a, c]

[a] St. Petersburg Pasteur Research Institute of Epidemiology and Microbiology, St. Petersburg, Russia.
[b] Eastern Branch of the Center of Hygiene and Epidemiology in the city of St. Petersburg and the Leningrad Region", St. Petersburg, Russia.
[c] S.M. Kirov Military Medical Academy, St. Petersburg, Russia.

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Резюме

Бактерии рода *Listeria* широко распространены в окружающей среде, выделяются из почвенных и водных экосистем, продуктов питания, объектов внешней среды, циркулируют в организме. Некоторые их виды, прежде всего, *L. monocytogenes,* являются патогенными для человека и животных. Экологическая пластичность, стрессоустойчивость и толерантность листерий обусловливает их способность переходить от сапрофитного к паразитическому образу жизни и снова реверсировать к сапрофитизму при попадании в окружающую среду и выживать при различных ее условиях. При этом выявлено, что после размораживания и последующего культивирования листерий на свежих питательных средах отмечается выраженный гетероморфизм популяции, в том числе образование клеток протопластного типа, L-форм и извитых клеток-ревертантов, что усложняет их обнаружение и типирование в размороженных пищевых продуктах и требует применения таких методов обнаружения бактерий, как ПЦР и ИФА.

Известно, что непатогенные листерии, а также патогенные микроорганизмы, образующие биоценоз с *L. monocytogenes,* могут служить резервуаром детерминант патогенности и резистентности и быть переданы патогенным листериям путем горизонтального переноса, что обусловливает появление новых более вирулентных и патогенных, а также резистентных к антибиотикам штаммов. Кроме того, важнейшим механизмом адаптации *L. monocytogenes* к неблагоприятным факторам окружающей среды является их способность к образованию биопленок, существенно повышающих выживаемость и устойчивость к дезинфикантам. Сравнительно высокое геномное сходство между *L. monocytogenes* и некоторыми непатогенными видами листерий, в том числе *L. innocua*, и зачастую их сосуществование в сходных экологических нишах, может предоставить возможность для переноса генов устойчивости или вирулентности и обусловливает возможность создания у *L. innocua* резервуаров генов устойчивости, которые могут передаваться бактериям *L. monocytogenes.* В то же время, возможна

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передача генов патогенности от *L. monocytogenes* к *L. innocua*, что предопределяет появление атипичных гемолитических патогенных штаммов, которые, учитывая более широкое распространеннее *L. innocua* в окружающей среде, могут представлять большую опасность для человека и животных.

Увеличение роли листерий в структуре инфекционных патологий человека и животных, изменчивость их морфологических, культуральных и биохимических свойств, а также постоянная модификация поверхностных антигенов листерий предопределяет необходимость совершенствования диагностики листериоза и требует создания новых иммунобиологических препаратов и современных схем для выделения и идентификации различных видов листерий.

В настоящем обзоре рассматриваются современные представления относительно распространенности и биологических свойств *Listeria* spp., факторов вирулентности и патогенности *L. monocytogenes*, а также методов идентификации листерий разных видов.

Ключевые слова: бактерии, листерии, листериоз, *L. monocytogenes*, *L. Innocua, патогенность.*

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Abstract

Bacteria of the genus *Listeria* are widely distributed in the environment; they are isolated from soil and water ecosystems, food products, environmental objects, and circulate *in vivo*. *L. monocytogenes* are pathogenic for animals and humans. The ecological plasticity, stress resistance and tolerance of *Listeria* determines their ability to switch from a saprophytic to a parasitic life cycle and survive under various environmental conditions. After thawing and subsequent cultivation of *Listeria* on fresh nutrient medium, a pronounced populational heteromorphism is noted: formation of protoplast-type cells, L-forms and convoluted revertant cells, which requires the use PCR and ELISA for bacteria detection.

It is known that non-pathogenic *Listeria*, as well as pathogenic microorganisms forming a biocenosis with *L. monocytogenes*, can serve as a reservoir of pathogenicity and resistance determinants and be transferred to pathogenic *Listeria* by horizontal transfer, which leads to the emergence of new, more virulent and antibiotic-resistant strains. In addition, the most important adaptation mechanism of *L. monocytogenes* to adverse environmental factors is their ability to form biofilms markedly enhancing survival and disinfectant resistance. The relatively high genomic similarity between *L. monocytogenes* and some non-pathogenic *Listeria* species and often their coexistence in similar ecological niches, may provide an opportunity for the transfer of resistance or virulence genes. At the same time, the transmission of pathogenicity genes from *L. monocytogenes* to *L. innocua* is also possible, which predetermines the appearance of atypical hemolytic pathogenic strains, which, given the greater environmental prevalence of the latter can pose a great danger to humans and animals.

The increasing role of *Listeria* in the pattern of human and animal infectious pathologies, the variability of their morphological, cultivable and biochemical properties, as well as the constant modification of the surface *Listeria* antigens underlies a need to improve listeriosis diagnostics and requires creation of new immunobiological preparations and modern regimens for isolation and identification of various *Listeria* types.

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This review discusses current views on *Listeria spp.* prevalence and biological qualities, virulence and pathogenicity factors of *L. monocytogenes*, as well as methods for identifying different *Listeria* species.

Keywords: bacteria, Listeria, listeriosis, *L. monocytogenes*, *L. innocua*, *pathogenicity.*

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1 Inroducion

It is known that bacteria of the genus *Listeria* can cause listeriosis, a severe infectious disease of humans and animals characterised by polymorphic clinical manifestations, high mortality (up to 20-40% among adults and more than 50% in newborns) [28] and often complicated by meningoencephalitis [97]. At the same time, while previously only *L. monocytogenes* was considered pathogenic for humans, the literature has recently begun to describe cases of listeriosis infection caused by other *Listeria* species, including *L. ivanovii* [66], *L. seeligeri* [140], *L. innocua* [103], *L. welshimeri* [43], and *L. grayi* [150].

In general, it is currently accepted that *L. monocytogenes* is the etiological agent of listeriosis in humans and many vertebrate species, including birds, whereas *L. ivanovii* causes infections mainly in ruminants [106].

The epidemic situation of listeriosis worldwide continues to worsen due to a number of reasons, including the unique plasticity of listeria and its ability not only to persist but also to multiply in infected products even at low temperatures (+4 - +7 °C, typical of a refrigerator) [120], acidic environments [124], high salt concentrations [88], and under oxygen-deficient conditions (in vacuum-packed finished products) [45].

At the same time, one unfavourable external factor can increase the resistance of *Listeria* to others. For example, incubation of *L. monocytogenes* at low temperatures was found to increase its resistance to osmotic stress [115]. Similarly, high salt concentrations in the incubation medium can lead to cross-protection of *L. monocytogenes* against other causes of cell death including high temperature, acidity and oxidative stress [128]. It has been revealed that cultivation of *L. monocytogenes* under conditions of vacuum packing and low temperature (+6˚C), regardless of the nutrient substrate, causes the formation of a capsule in the pathogen and the emergence of resistance to some antibiotics from the penicillin group [41]. In addition, under unfavourable conditions, *Listeria* are capable of forming biofilms that attach to abiotic or biological surfaces and serve as a survival strategy for the bacteria, allowing them to persist in unfavourable conditions, being protected from

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the human immune system and various environmental factors (ultraviolet light, acids, drying, salinity, antimicrobial agents, disinfectants) [46].

The extremely high tolerance of *L. monocytogenes* to stress conditions causes a serious problem of listeriosis in the food industry, and the increasing role of listeria in the structure of infectious pathologies of humans and animals predetermines the need to improve the diagnosis, prevention and sanitary and epidemiological surveillance of listeriosis, which requires the creation of new immunobiological preparations and modern schemes for the isolation and identification of various *Listeria* species.

The present review discusses the current understanding of the prevalence and biological properties of *Listeria* spp. and the virulence and pathogenicity factors of *L. monocytogenes*, as well as methods of identification of *Listeria* species.

The prevalence and biological properties of species of the *Listeria* genus

Listeria spp. are gram-positive flagellated bacilliform bacteria, facultative anaerobes that do not form spores and are motile at low temperatures [68], are widely distributed in the environment, isolated from soil and aquatic ecosystems, food, and environmental objects, circulate in the body, and some of their species are pathogenic for humans and animals [137].

Initially (until 2009), 7 species were identified in the genus *Listeria* (Pirie, 1940): *L. monocytogenes, L. ivanovii, L. grayi, L. murrayi, L. innocua, L. seeligeri*, and *L. welshimeri*, of which *L. monocytogenes*, the main causative agent of listeriosis, poses the greatest threat to humans. In the last decade, due to the rapid development of sequencing technologies, 13 new species with diverse phenotypic and genotypic characteristics have been identified within the genus *Listeria: L. marthii* [83], *L. rocourtiae* [100], *L. fleischmannii* [47], *L. weihenstephanensis* [99], *L. riparia* [64], *L. grandensis* [64], *L. floridensis* [64], *L. cornellensis* [64], *L. aquatic*a [64], *L. newyorkensis* [141], *L. booriae* [141], *L. costaricensis* [123] and *L. goaensis* [68]. In addition, two subspecies, subsp. fleischmannii and subsp. colouradonensis, have been established within the species *L. fleischmannii* [65].

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Phylogenetic studies based on the 16S and 23S rRNA sequences revealed that the genus *Listeria* includes two evolutionarily formed lineages: *Listeria* sensu strictu, which includes *L. monocytogenes*, *L. innocua*, *L. welshimeri*, *L. seeligeri*, *L. ivanovii*, and *L. marthii*, and *Listeria* sensu lato, which unites *L. grayi*, previously considered nonpathogenic, and 12 new *Listeria* species discovered since 2009 [58, 126]. All 6 species of *Listeria* sensu strictu share common phenotypic characteristics, such as the ability to grow at low temperatures and flagellar motility, whereas the 11 species of *Listeria* sensu lato represent three distinct monophyletic groups that can be recognised as separate genera [126]. These three putative genera of *Listeria* are immobile (except *L. grayi*), capable of nitrate reduction (except *L. floridensis*) and give a negative result in the Voges-Proskauer test (except *L. grayi*) [126]. Unlike all other *Listeria* species, species of the proposed new genus *Mesolisteria* cannot grow at temperatures below 7°C [126].

The prevalence of *Listeria* in the environment

The main source and reservoir of *Listeria* are environmental objects, primarily soil. *Listeria* is also excreted from plants, silage, dust, water bodies and sewage [26]. There are 92 known animal species that serve as reservoirs or participate in the circulation of *Listeria*. The spread of the pathogen is particularly intensive during the period of rodent migration to places of their concentration (haystacks, hayfields). Rodents play a leading role in the transmission of *Listeria* to farm animals by contaminating feed and water [22]. Transmission of the pathogen between rodents in natural foci is supported by arthropods, including mites.

In addition, *Listeria* can be present in water in the environment, and therefore infection of animals through water is possible [33], including live fish, on whose body surface *Listeria* can multiply using the esculin of the mucus covering the scales as a food source [25]; cold smoking of fish creates specific conditions (salt, smoking solution) that favour *Listeria* multiplication [85]. *Listeria* can multiply in water and in soil microecosystems at low temperature with preservation of virulence of populations [37], which determines the spread and long-term persistence of *Listeria* in the external environment and economic objects.

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Ecological plasticity and tolerance of *Listeria* stipulates their ability to switch from saprophytic to parasitic lifestyle and to reverse to saprophyticism again when introduced into the environment and survive under its various conditions. *Listeria* concentration has been found to increase in the external environment in autumn and spring, stabilise in winter and decrease in summer [7]. In addition, the ability of *Listeria* to actively multiply in melt water (at a temperature of 6°C) has been revealed, providing a 2-fold increase in bacterial mass [7]. At the same time, no significant changes in cell morphology in the population were observed when *Listeria* survived at low temperatures, including sub-zero temperatures, but after thawing and subsequent cultivation on fresh nutrient media, a pronounced heteromorphism of the *Listeria* population was observed, including the formation of protoplast-type cells, L-forms, and twisted revertant cells [5]. In this regard, the detection of *Listeria* in unfrozen food products requires, firstly, a long time for reversion in enrichment medium, and, secondly, there is a need to apply bacterial detection methods such as DNA diagnosis, PCR and ELISA.

The ability of *Listeria* to remain viable on food-contact surfaces in packinghouses has been revealed, which predetermines the likelihood of contamination of food products, including fruit, with a subsequent increase in the abundance of these bacteria as the products are stored [141]. In addition, there has recently been a steady increase in the proportion of multiple antibiotic-resistant *L. monocytogenes* strains worldwide [44], with additional pathogenicity factors [18].

In addition to abiotic factors, *Listeria* biology is also influenced by biotic environmental factors, including saprophytic microorganisms that contaminate food products, form common biocenoses with *Listeria*, and influence *Listeria* through exogenous metabolites or competition for nutrient substrates [36]. Nonpathogenic *Listeria*, as well as pathogenic microorganisms that form a biocenosis with *L. monocytogenes*, can serve as a reservoir of pathogenicity and resistance determinants and can be transmitted to pathogenic *Listeria* by horizontal transfer [9].

L. monocytogenes and *L. innocua* are the most common species of the genus *Listeria*, related in a strict sense [94] and often co-exist in environmental sites. It

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was initially hypothesised that the two species evolved from a common ancestor but differ due to the loss of virulence genes in *L. innocua* [55]. It was later hypothesised that *L. innocua* evolved from the ancestors of four strains of the *L. monocytogenes* serogroup and may have retained some characteristics of its ancestor [116]. Atypical *L. innocua* was found to induce a protective immune response against *L. monocytogenes*, which is also in favour of a close genetic relationship between *L. innocua* and *L. monocytogenes* [111].

Genetically close to these two species is *L. welshimeri*, which is characterised by a smaller genome size compared to *L. monocytogenes*, suggesting similar evolutionary pathways of their genomes from a common ancestor [86]. However, the genome of the ancestor of *L. welshimeri* was more compact than that of *L. monocytogenes*, which led to the emergence of non-pathogenic species of *Listeria* spp. [86]. At the same time, the prfA virulence gene cluster present in the common ancestor of *Listeria* species was eventually lost in *L. innocua* and *L. welshimeri* [94, 116].

The bacteria of *L. welshimeri* species are found in meat products and *L. seeligeri* in fish [17]. *L. innocua* is the predominant species in seawater, especially in coastal waters, compared to other *Listeria* species, which may cause contamination of fish, squid, crustaceans and other animals (seafood) and pose a risk to humans [74]. Bacteria of this species are often found in meat (frozen minced meat and semi-finished products, as well as smoked products ready for consumption), fish (salted, raw smoked fish, chilled and frozen semi-finished products), vegetables (onions, cabbage, potatoes, beetroot) stored in vegetable warehouses [17, 73], and are capable of adaptation in changing environmental conditions (survival in a wide range of temperature, humidity, pH of the environment), which significantly increases their chances of survival in different environmental conditions, causes their widespread active distribution and promotes the emergence of strains with atypical properties [59]. Thus, in addition to food products, *L. innocua* species are often present in silage and organs of rodents [17]. *L. innocua* have dual nature and are capable of both saprophytic and parasitic lifestyle depending on the habitat [15].

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Bacteria of *L. monocytogenes* species were first isolated and described in 1911 by the Swedish scientist G. Hulphers from purulent pus. Hulphers from a purulent nodule of the liver of a fallen rabbit [93], and a precise and detailed description of listeriosis was made in 1923 by E. Murray et al. [119]. The first documented culture of the pathogen in humans was isolated in France in 1921 by Dumont and Cotoni from a patient with meningitis, and its modern name was given in 1940 in honour of the English surgeon J. Lister, the founder of antiseptic methods. Despite the fact that *L. monocytogenes* is the main causative agent of listeriosis in humans, it is typical of the normal microflora of the middle and lower intestinal tracts of many animal and human species [54]; therefore, it may be excreted with faeces into the environment and subsequently contaminate soil, water, grass, etc.

The relatively high genomic similarity between *L. innocua* and *L. monocytogenes*, and sometimes their coexistence in similar ecological niches, may provide an opportunity for horizontal transfer of resistance or virulence genes [102]. And, in particular, although antimicrobial resistance is less common in *L. monocytogenes* than in *L. innocua*, but *L. innocua* may form a reservoir of resistance genes that can be transferred between bacterial species, including transferring them to pathogenic *L. monocytogenes* [81]. In addition, the possibility of transferring antibiotic resistance genes to *Listeria* spp. from enterococci via transposons is also accepted [92].

Biological properties of *L. monocytogenes*, *L. innocua* and *L. ivanovii*

Morphologically, *L. monocytogenes*, *L. innocua* and *L. ivanovii* are short, gram-positive, non-spore-forming bacilli of regular shape and are facultative anaerobes [26]. However, *L. monocytogenes* and *L. ivanovii* can transform into L-forms and parasitise intracellularly [26], showing the ability to survive in macrophages and infiltrate a number of normally non-phagocytic cells such as epithelial cells, hepatocytes and endothelial cells [139].

L. monocytogenes exhibits the ability to grow in a wide range of temperatures (1-45 °C, with the optimum temperature for their growth being 30-37 °C) and pH

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(from 4.0-4.8 to 9.5-10.0) in the presence of NaCl (20%) and 15% CO_2 [11]. At 70 °C, *Listeria* die within half an hour and at 100 °C within 3-5 minutes [34].

L. monocytogenes is able to remain viable when stored in semi-liquid nutrient medium and lyophilised under refrigerator conditions [4]. In this regard, dairy products with a long shelf life, including soft cheeses, ice cream and butter, are the most dangerous source of listeriosis, as they multiply at low temperatures and accumulate dangerous doses of *Listeria* in milk [18]. In addition, *L. monocytogenes* is detected not only in raw products, but also in cooked, uncooked and raw smoked meat products, frozen, pickled and preserved seafood, as well as various semi-finished products [144].

The high thermostability of *Listeria* is due to the presence of a complex of genetic and biochemical mechanisms that allow them to adapt to changing temperature conditions and survive in many environmental objects. One of the mechanisms of thermoadaptation is the induction and repression of genes acting at the isoenzyme level, regulating the launch of synthesis of "cold" and "heat" isoenzymes. Moreover, the number of "cold" isoenzymes in *Listeria* significantly exceeds the number of "thermal" isoenzymes, which makes *Listeria* facultative psychrophiles. The most important mechanism of adaptation of *Listeria* to unfavourable environmental factors is their ability to form biofilms, which significantly increase survival and resistance to disinfectants [134].

The wide range of host organisms in which *L. monocytogenes* can reproduce has caused antigenic heterogeneity of its outer envelope [23]. Thus, using molecular typing methods, it is possible to distinguish within the species of *L. monocytogenes*, three evolutionary lineages can be distinguished within the *L. monocytogenes* species, characterised by different pathogenic potentials: Lineage I are strains associated with epidemic outbreaks of listeriosis (serotypes 1/2b, 3b, 4b, 4d and 4e); Lineage II are strains isolated during sporadic cases of listeriosis (serotypes 1/2a, 1/2c, 3a and 3c); Lineage III are strains rarely associated with cases of listeriosis (serotypes 4a and 4c) and Lineage IV (4a, 4b, 4c) [107, 126, 131]. The most common serotypes of *L. monocytogenes* in listeriosis patients are 4b, 1/2a, 1/2b [14]. At the

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same time, about half of all cases of listeriosis in the world are caused by strains of serovar 4b, whereas serovariants 1/2a, 1/2b, 1/2c, and 3a are most often detected in infected products and natural environment [58, 104, 105].

At the same time, no regularities between the biological type of the host and the serovars of the isolated strains or the severity of the disease have been found. At the same time, it has been established that the course of the pathological process and host specificity are determined by listeriolysin and internalins A and B, which act as pathogenicity factors of *Listeria* [38, 126]. It has been found that DNA regions encoding *Listeria* pathogenicity factors are more frequently found in strains of serovar 4b [118].

Intraspecific cross-reactions are characteristic of *Listeria*: in particular, a culture containing DNA fragments characteristic of other serovariants was isolated within serovariant 4b [101]. In addition to intraspecies cross-reactions, *Listeria* also cross-reacts serologically with typhoid-paratyphoid bacteria and staphylococci [10].

The most genetically similar species to *L. monocytogenes* is *L. innocua*, which serves as an indicator of the possible presence of *L. monocytogenes* in products and can be pathogenic not only to animals [139], but also to humans [117].

The bacteria of *L. innocua* species are characterised by stability of phenotypic manifestations: morphology (short, randomly arranged bacilli, coccoid forms and ovoid bacteria that stain positively according to Gram stain), blue or bluish-green luminescence in oblique light, typical growth of colonies on nutrient media with a characteristic fermented milk odour, presence of catalase and absence of oxidase activity, motility at temperatures of 22ºC and 37ºC. Bacteria of this species are catalase-positive, most cultures show DNAase activity, and some strains are characterised by haemolytic activity [15]. In addition, bacteria of the *L. innocua* species are characterised by the presence of a gene encoding lecithinase, typical of *L. monocytogenes* [82], but not typical of *L. monocytogenes*, which retains lecithinase activity when cultured on nutrient medium containing lecithin, both in the presence and absence of activated carbon [21]. *L. innocua* is sensitive to

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penicillins, aminoglycosides, carbapenems, fluoroquinolones, but resistant to nalidixic acid [15].

A peculiarity of *L. innocua* is the variability of biochemical activity. Thus, some experts [15] have established the ability of *L. innocua* to degrade glucose, salicin, rhamnose, mannose, maltose, esculin and fructose, along with the absence of degradation of urea, dulcite, inulin, adonite, raffinose, melibiose, starch and arabinose. The study of pathogenicity factors in some cultures of *L. innocua*, especially those isolated from fish, revealed haemolytic activity uncharacteristic for bacteria of this species [15], indicating the appearance of atypical strains and possibly due to the appearance of gene clusters similar to *L. monocytogenes* in the genome of *L. innocua* [59].

Although *L. monocytogenes* and *L. innocua* differ markedly in virulence, they are virtually indistinguishable by classical taxonomic criteria. Both species are actively motile and produce flagellin abundantly at 22°C. However, these species differ in motility and flagellin production at 37°C. At this temperature, *L. monocytogenes* strains are virtually immobile and produce little or no flagellin, whereas *L. innocua* strains are often motile and produce significant amounts of flagellin [95]. These data point in favour of differential regulation of flagellin production in *L. monocytogenes* and *L. innocua* at 37°C.

L. monocytogenes strains are characterised by the presence of both somatic O and flagellar H-antigens, whereas *L. ivanovii* (serotype 5) and *L. innocua* (serotype 6) have only one somatic O-antigen each [42].

Biological properties of other *Listeria* species

Phenotypic properties of other species of the genus *Listeria*: *L. ivanovii, L. grayi, L. murrayi, L. seeligeri, L. welshimeri* are not sufficiently defined, and in some respects are similar to *L. monocytogenes* bacteria, which may lead to inaccurate identification. Thus, it is known that the new *Listeria* species do not differ from *L. monocytogenes* and are short bacilli of regular shape with rounded ends, sometimes almost cocci, gram-positive, capsules and spores do not form, they are not resistant to acid, aerobes, facultative anaerobes, chemoorganoautotrophs, but in the external

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environment are chemolithoautotrophs, catalase-positive, oxidase-negative, exhibit motility at 20-25 °C [8].

Bacteria of *L. marthii* species grow well on conventional nutrient media in the temperature range of 1-45°C, the optimal temperature is 30-37°C. They are motile, form an umbrella of 3-5 mm in semi-liquid agar at 20-30°C and do not form it at 37°C. Nonhemolytic, hydrolyse esculin, produce hydrogen sulfide, tolerant to sodium chloride, positive for methyl red, ferment D-glucose, lactose and maltose; do not ferment D-xylose, D-mannite, sucrose and L-rhamnose, reduce nitrates, active against urease, form indole and hydrolyse gelatin. On dense media, after incubation for 24 hours at 37°C, colonies 0.2-0.8 mm in diameter, smooth, bluish-green, translucent, slightly raised with a fine surface texture and a smooth edge grow. The type strain is FSL S4-120T [83].

Colonies of *L. rocourtiae* species after 48 h of cultivation at 30°C grow on trypticase-soya agar 0.5-1.0 mm in diameter, round, translucent, convex with a fine surface texture and a smooth edge. They reduce nitrate and manite, do not exhibit haemolytic activity, are able to degrade to acid ribose, D-xylose, galactose, glycerol, erythritol, adonite, D-glucose, D-fructose, D-mannose, L-sorbose, rhamnose, dulcite, inositol, mannitol, sorbitol, methyl-D-glucoside, N-acetylglucosamine, amygdalin, arbutin, salicin, cellobiose, maltose, lactose, melibiose, starch, trehalose, glycogen and D-raffinose. It does not ferment L-xylose, D-arabinose, L-arabinose, methyl-D-mannoside, sucrose, inulin, melecitose, L-fructose, xylitol, D-turanose, D-fructose, D-tagatose, D-arabitol, 5-ketogluconate or 2-ketogluconate. The type strain is CIP 109804 (DSM 22097) [100].

The bacteria of *L. fleischmannii* species are typical short bacilli arranged singly or in short chains (0.4-0.6 mm diameter and 0.7-1.2 mm length). On nutrient agar at 37°C after 24 hours, colonies grow 0.4-1.0 mm in diameter, translucent, round, with a low convex surface and smooth edges. Immobile, although they contain the flagellin flaA gene. Reduce nitrate, hydrolyse hippurate and esculin, and produce hydrogen sulphide. The main differentiating character that distinguishes this species from others is the unique ability to ferment D-mannite and D-xylose.

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The species L. fleischmannii is non-haemolytic, does not invade Caco-2 cells and does not contain *Listeria* virulence genes on pathogenic islet 1. The type strain is LU2006-1T (DSM 24998) [47]. Based on molecular genetic studies, the species *L. fleischmanni* was divided into subspecies according to genomic characteristics: *L. fleischmannii* subsp. *fleischmannii* and *L. fleischmannii* subsp. *colouradonensis* [65].

Bacteria of the subspecies *L. fleischmannii* subsp. *fleischmannii* are characterised by an optimal growth temperature of 30-37 °C, are immobile at 25 °C, are non-haemolytic, reduce nitrate, and degrade D-xylose to acid, D-arabitol, L-rhamnose, α-methyl-D-glucoside, D-ribose, turanose, sucrose and melecitose, and do not ferment glucose-1-phosphate, inositol, arylamidase, α-mannosidase and D-tagatose. The typical strain is LU2006-1 [65].

Bacteria of the subspecies *L. fleischmannii* subsp. *soloradonensis* are characterised by similar phenotypic features to the subspecies *L. fleischmannii* subsp. *fleischmannii*, but differ from it in their inability to ferment sucrose, melecitose, and turanose, but ferment inositol. The type strain is TTU M1-001 [47, 65]. The genomes of both subspecies of *Listeria fleischmannii* contain putative enhancin genes; a mosquitocidal toxin has been identified in the genome of *Listeria fleischmannii* subsp. colouradonensis, suggesting possible adaptation to insect habitation [47, 65].

Bacteria of *L. weihenstephanensis* species are non-haemolytic bacilli 0.4-0.5 mm in diameter and 2.0-4.5 mm in length with rounded ends; colonies 1.0-2.5 mm in diameter, translucent, whitish, round, smooth, slightly convex with slightly irregular edges grow on trypticase-soya agar. The optimum temperature for their growth is 28-34°C, they do not grow at 38°C, their mobility is weak at 15-30°C, the optimum pH is 7-8. Isolates can grow in broth at 3°C for 10 days in anaerobic conditions. They grow well in nutrient broth containing 6.5 % NaCl. Test positive with methyl red, negative with Voges-Proskauer and CAMP test, do not hydrolyse urea and do not form indole and hydrogen sulphide, reduce nitrate to nitrite. Do not ferment α-mannosidase, arylamidase, D-ribose, 1-phosphate-glucose

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and D-tagatose. Esculin, D-arabitol, D-xylose, L-rhamnose and methyl-D-glucopyranoside are fermented [99]. After 14 days of anaerobic incubation, acid formation is noted from glycerol, D-ribose, D-xylose, D-glucose, D-fructose, D-mannose, L-rhamnose, inositol, D-mannite, and methyl-D-glucopyranoside, N-acetylglucosamine, amygdalin, arbutin, aequulin, salicin, cellobiose, maltose, lactose, trehalose, starch, glycogen, xylitol, gentiobiose, D-arabitol and potassium 5-ketogluconate. Not able to degrade erythritol, D-arabinose, L-arabinose, D-galactose, L-xylose, D-adonite, L-sorbose, methyl-b-D-xylopyranoside, dulcite, D-sorbitol, methyl-D-mannopyranoside to acid, melibiose, sucrose, inulin, melecytose, raffinose, turanose, D-lyxose, D-tagatose, D-fucose, L-fucose, L-arabitol, potassium 2-ketogluconate and potassium gluconate [99].

Bacteria of *L. floridensis* species are morphologically bacilli with rounded ends, 0.6×1.3-1.9 mm in size, unable to grow at temperatures below 7 °C. The optimum temperature for their growth is 37-41 °C; they do not show motility at temperatures of 4, 22, 30 and 37 °C. The species *L. floridensis* is the only species of the genus *Listeria* lacking motility and unable to reduce nitrate, characterised by negative Voges-Proskauer reaction and CAMP test. The typical strain is FSL S10-1187 [64].

The bacteria of *L. aquatica* species are 0.6-0.7 × 1.5-2.4 mm in size, like *L. floridensis* are unable to grow at temperatures below 7 °C, and the optimal temperature for them is 37-41 °C, are not motile at 4, 22, 30 and 37 °C, and show negative Voges-Proskauer reaction and CAMP test. Unlike *L. floridensis*, they reduce nitrate but do not reduce nitrite, do not ferment maltose but are able to ferment D-tagatose. The typical strain is FSL S10-1188 [64].

Bacteria of *L. riparia* species are straight bacilli with rounded ends, measuring 0.5-0.7×2.3-3.7 mm. Like *L. floridensis* and *L. aquatica*, they do not grow at 7 °C and below, their optimum temperature is 37-41 °C, are not motile at 4, 22, 30 and 37 °C, and show negative Voges-Proskauer reaction and CAMP test. Similar to *L. aquatica* and unlike *L. floridensis*, they reduce nitrate and do not reduce nitrite. The main differential characteristic from other species of the genus *Listeria* is the ability

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to ferment L-rhamnose, mannose, D-galactose and L-arabinose. The typical strain is FSL S10-1204 [64].

The species *L. cornellensis* is represented by straight sticks with rounded ends, measuring 0.4-0.7×2.4-3.8 mm. The optimum temperature for their growth is 30-37 °C, they are not motile at 4, 22, 30 and 37 °C, exhibit negative Voges-Proskauer reaction and CAMP test. They reduce nitrate and do not reduce nitrite. Phenotypic traits resemble the species *L. grandensis*. The typical strain is TTU A1-0210 [64].

Phenotypically similar to *L. cornellensis* are bacteria of *L. grandensis* species, which morphologically are straight bacilli with rounded ends, 0.6-0.7×2.0-3.1 mm in size. Their optimum growth temperature is 30-37 °C, and they are immobile at temperatures of 4, 22, 30 and 37 °C. Voges-Proskauer reaction and CAMP test are negative. Reduces nitrate and does not reduce nitrite. The type strain is TTU A1-0212 [64]. In addition, *L. cornellensis* and *L. grandensis* are the only species of *Lisretia* unable to cleave L-rhamnose. At the same time, *L. cornellensis* differs from *L. grandensis* species in its weak lactose cleavage [64].

Bacteria of *L. newyorkensis* species are immobile at all temperatures, able to grow in the temperature range of 4-41 °C, the optimal temperature for their growth is 30-37 °C. Able to reduce nitrate but do not ferment nitrite. Show positive reaction with methyl red, Voges-Proskauer test negative, unable to ferment xylitol, D-fructose, α-mannosidase, D-arabitol, but do ferment D-galactose, D-ribose and L-arabinose. The typical strain is FSL M6-0635 [152].

Bacteria of the species *L. booriae* are non-haemolytic bacilli, non-motile at all temperatures and capable of growth between 4-41 °C, the optimum temperature for growth is 30-41 °C. They differ from other species in their ability to ferment D-arabitol, melibiose and L-arabinose. The typical strain is FSL A5-0281 [152].

The species *L. costaricensis* shows the greatest similarity in the structure of 16S rRNA genes with the type strain *L. floridensis* (98.7 %), which allowed us to assign it to the same branch as *L. fleishmannii*, *L. floridensis* and *Listeria* sensu lato. The typical strain is CLIP 2016/00682 [123].

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L. goaensis are short non-spore-forming gram-positive immobile bacilli, oxidase-negative, catalase-positive and exhibit the ability to α-haemolysis on dishes with 5% agar with sheep and horse blood [68].

Thus, bacteria of the genus *Listeria* are ubiquitous and have a wide adaptive capacity that allows them to adapt to existence in different environments and, at the same time, to acquire various uncharacteristic properties. In this regard, knowledge of phenotypic features of biological properties of different *Listeria* species may be useful in determining approaches to the detection of epidemically dangerous *Listeria* from a variety of environmental objects.

Pathogenicity factors of *L. monocytogenes*

Currently, *L. monocytogenes* serves as a model system for studying the main aspects of intracellular pathogenesis, as its ability to parasitise in the cytosol of mammalian cells, to use the actin-based motility system and to spread from cell to cell, avoiding contact with the humoral immune system [150], to overcome three principal protective barriers on the way of spreading in the body has been established: to penetrate through intestinal enterocytes, entering the blood and lymph, and to overcome the blood-brain barrier and placental barrier [63]. At the same time, *L. monocytogenes* is able to penetrate into target cells by phagocytosis, including it in those cells for which it is not characteristic, and, as a result, to affect various cell types, suppressing at the initial stages of infection the Th1-type immune response, which is the main one for the elimination of intracellular parasites, which significantly complicates the organism's fight against this pathogen [1].

The most typical features of *L. monocytogenes* are an exceptionally large number of surface proteins, an abundance of transport proteins, in particular proteins designed for carbohydrate transport, and a variety of regulatory proteins [50].

Surface proteins play an important role in the interactions of the microorganism with the environment, including target cells during infection of the host organism. In this case, the main virulence factors of *L. monocytogenes* are such surface proteins as internalins A and B, necessary for penetration into eukaryotic cells, and actA, which plays a key role in actin-based motility [50].

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Pathogenicity islands identified in the *L. monocytogenes* genome are LIPI-1 (prfA, hly, plcA, plcB, mpl and actA) regulated by the PrfA protein [78], LIPI-2 (inlABCJ) [151], LIPI-3 (llsAXAXGHHBYDP) [57] and LIPI-4 (licABC, lm900558-70013 and glvA) [154]. It has been found that the presence of the pathogenicity island LIPI-3 in the genome of the bacterium causes a high level of its virulence and is often accompanied by the development of the meningoencephalic form of the disease [3].

The pathogenesis of *L. monocytogenes* requires the coordinated expression of six genes, namely prfA, plcA, hly, mpl, actA and plcB, which are mainly localised to the pathogenicity island LIPI-1 [150] regulated by the transcription regulator PrfA [56]. The processes activated by PrfA are crucial for the infection cycle of *L. monocytogenes*. They include phagosome lysis with release of bacteria into the cytoplasm and actin-dependent intercellular mobility of bacteria [77]. For example, the prfA gene encodes the transcription activator prfA, which directly or indirectly induces the transcription of more than 140 genes, including the other five genes found in LIPI-1 [129]. The plcA and plcB genes encode phospholipases C, which in combination with listeriolysin O (LLO) protect bacteria from cytoplasmic phagosomes [143]. The mpl gene encodes a zinc-metalloprotease required for pro-plcB maturation [134], and the actA gene product is a multifunctional virulence factor [149].

Auxiliary, or minor, virulence factors of *L. monocytogenes* are the products of 13 genes, 5 of which are associated with bacterial adhesion to and/or invasion into mammalian cells. The iap (invasion-a-associated p protein) gene encodes the extracellular protein p60, which has murein hydrolase activity and is required for bacterial division and invasion into target cells [150]. The lpeA gene encodes a protein that belongs to the lipoprotein receptor associated antigen I (LraI) superfamily. LraI proteins, in turn, are associated with the bacterial surface and include several adhesion proteins of many gram-positive pathogenic bacteria, such as the adhesins PsaA, also typical of *Streptococcus pneumoniae*, FimA, typical of *Streptococcus parasanguinis*, and EfmA, also characteristic of *Enterococcus*

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faecium [110]. The lpeA gene also encodes the extracellular domain of SBP ("Streptococcal solute binding proteins"), which in *L. monocytogenes* binds Zn^{2+} and Mn^{2+} and mediates entry into eukaryotic cells, including hepatocytes and macrophages [135].

The lpsA gene encodes a protein of the same name, which is a type II signal peptidase required for lpeA maturation [136], with genetic defects in lpsA causing improper maturation of lpeA, subsequent loss of its proper surface localisation and ultimately a significant weakening of *L. monocytogenes* virulence.

The lap gene encoding a protein of the same name (Listeria adhesion protein p) promotes adhesion to intestinal epithelial cells and facilitates extraintestinal dissemination of bacteria [51]. Specifically, the lap gene product interacts with its cognate host cell receptor, heat shock protein 60 (Hsp60) on the apical side and causes dysfunction of the epithelial barrier, which favours translocation of L. monocytogenes across it [71]. Lap is an alcohol acetaldehyde dehydrogenase (lmo1634) present in both pathogenic and non-pathogenic *Listeria* species [91]. However, lap exhibits virulent properties only in pathogenic *Listeria* due to the lack of secretion and surface reassociation of lap in non-pathogenic species [52, 91]. The interaction of lap with the host cell receptor Hsp60 leads to activation and nuclear translocation of nuclear factor-kB (NF-kB), which causes activation of myosin light chain kinase (MLCK) [71]. Activated MLCK phosphorylates myosin light chain (MLC), which predisposes cellular redistribution of tight junction proteins (claudin-1 and occludin) and adhesive junction protein (E-cadherin) and opening of the intercellular junction [71]. Consequently, *L. monocytogenes* performs efficient translocation across the intestinal barrier by activating the Lap-Hsp60-NF-kB-MLCK axis [70].

The fbpA gene encodes an adhesin containing fibronectin-binding domains; this protein provides adhesion to target cells, especially hepatocytes [127].

The genome of *L. monocytogenes* also contains genes encoding enzymes that protect bacteria from the host immune system or increase their survival in the cytosol of infected cells. For example, the pdgA and oatA genes (peptidoglycan-N-

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deacetylase and O-acetylase, respectively) may be required for resistance to host lysozyme. Mutations in these two genes result in increased sensitivity of peptidoglycan to lysozyme inducing attenuation of *L. monocytogenes* virulence [133].

The lplA1 gene encodes a lipoatligase that promotes cytosolic replication of Listeria in target cells [96].

The gtcA gene encodes an enzyme that catalyses glycosylation of teichoic acid in the envelope of *L. monocytogenes*, which mediates key features of pathogenicity: proper anchoring of the main surface virulence factors (Ami and InlB); resistance to antimicrobial peptides and reduced susceptibility to antibiotics [114].

The prsA2 gene encodes a peptidylprolyl-cis-trans isomerase that promotes proper protein folding, which is essential for the maturation and secretion of some proprotein virulence factors (such as phospholipase C PC-PLC) of *L. monocytogenes*, and the lplA1 gene is required for intracellular survival of *Listeria* [76].

The clpC, clpE and clpP genes encode proteases that presumably act as mediators of the stress response and promote intracellular replication [150].

Hypervirulent isolates of *L. monocytogenes*, in addition to the pathogenicity islet LIPI-1, also contain islets LIPI-3 and LIPI-4 [112]. Moreover, the LIPI-3 islet contains genes encoding listeriolysin S, a second haemolysin that enhances *L. monocytogenes* survival in polymorphonuclear neutrophils, whereas LIPI-4 encodes a cellobiose phosphotransferase system [61] that enhances invasion into the central nervous system, along with maternal-neonatal infection. In addition, the pathogenicity islet LIPI-3 contains genes encoding important virulence factors, namely internalins. These include the operon InLab, which promotes invasion of epithelial and other cells, and inlC, which is involved in intercellular spread [60]. Hypervirulent strains of *L. monocytogenes* containing LIPI-3, having a bactericidal function, have been found to promote intestinal colonisation and can modulate the host microbiota [132].

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Along with genes encoding pathogenicity and virulence factors, the genome of *L. monocytogenes* is characterised by the presence of SSI-1 (lmo0444, lmo0445, pva, gadD1 and gadT1) [130] and SSI-2 (lin0464 and lin0465) stress tolerance islands [87]. It was found that SSI-1 predetermines bacterial resistance to acids, salts, and growth in food [130], whereas SSI-2 predetermines survival under alkaline conditions and oxidative stress [57, 87].

It has also been shown that the presence in the *L. monocytogenes* genome of the lin gene correlates with resistance to the macrolide clarithromycin, the sul gene – to the sulfonamide biseptol, the fosX gene – to fosfomycin, the aad, ant, and aph genes – to amikacin, and alleles 1, 8, 15, 18, and 28 of the pbp-like gene – to beta-lactams [3].

An important specific feature of the genomes of the genus *Listeria*, probably also related to the ability of these bacteria to colonise a wide range of ecosystems, is the presence of a large number of genes encoding various transport proteins [50]. As in most bacterial genomes, the predominant class of transport proteins in *Listeria* is ABC-transporters. Moreover, 26% of the genes encoding *Listeria* transport proteins are responsible for carbohydrate transport mediated by the phosphoenolpyruvate-dependent phosphotransferase (PTS) system, which allows bacteria to utilise different carbon sources. Furthermore, in many bacteria studied so far, PTS is a key link between metabolism and regulation of catabolic operons [146].

Thus, the genome of *L. monocytogenes* is characterised by the presence of a large variety of genes responsible for invasion into target cells of the host organism, survival in them, resistance to antibiotics and disinfectants, which determines the high pathogenicity and virulence of bacteria of this species.

Methods of identification of different *Listeria* species

The increasing role of *Listeria* in the structure of human infectious pathologies makes it necessary to improve the diagnosis, prevention, and sanitary and epidemiological surveillance of listeriosis, which predetermines the creation of new immunobiological preparations and modern schemes for the isolation and identification of *L. monocytogenes* in accordance with international standards [30].

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In addition, it has been established that *L. monocytogenes* is characterised by variability in morphological, cultural and biochemical properties, which causes difficulties in the laboratory diagnosis of listeriosis. In particular, it has been revealed that storage of food products at +22ºC and seafood and dairy products at +6ºC may change the pathogenic properties of *Listeria* and, in particular, the loss of haemolytic activity and decreased production of lecithinase, which is important for the differentiation of *L. monocytogenes* from other nonpathogenic *Listeria* species [41].

Currently, morphological, bacteriological, biochemical, serological and molecular biological methods are used to diagnose listeriosis.

Morphological diagnosis of listeriosis is based on the detection during autopsy of granulomas (listeriomas) in internal organs in the form of whitish, greyish or yellowish nodules ranging in size from a poppy seed to a millet grain, which are most often found in the liver, colon, pharynx, oesophagus, lungs, spleen and brain [26]. In the initial stages, listeriomas represent a small focus of inflammation, in the centre of which a large number of partially phagocytised *Listeria* are found among decaying leukocytes. Further the number of leucocytes in the focus increases, and in its peripheral parts an admixture of fibrin is found. At later stages of the process on the periphery of the focus there are small overgrowths of granulation tissue, consisting mainly of macrophages, which can gradually completely replace the area of necrosis. *Listeria* is practically undetectable in the granulation tissue [153].

The biochemical methods of *L. monocytogenes* differentiation are based on catalase positivity, motility at 18-25ºC and immobility at 37ºC, the ability to hydrolyse esculin and not to exhibit lecithinase activity, typical of *Listeria* parasitising inside the cell, when cultured on nutrient media containing lecithin [21].

The presence of the gene encoding lecithinase is typical not only for *L. monocytogenes*, but also for *L. seeligeri* and *L. ivanovii*, but not for *L. innocua* [82]. At the same time, *L. monocytogenes* is characterised by induction of lecithinase activity when activated charcoal is added to the nutrient medium, whereas *L. ivanovii* is characterised by lecithinase activity irrespective of the presence of activated

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charcoal in the incubation medium, and *L. seeligeri* is characterised by the absence of lecithinase activity irrespective of the presence of activated charcoal in the incubation medium [21], which is most likely due to interspecific differences in the regulation of the expression of pathogenicity factors. One of the reasons for the increased production of lecithinase and other pathogenicity factors in *L. monocytogenes* is the activation of the positive regulator of pathogenicity factor expression PrfA [137], which is highly homologous in *L. monocytogenes, L. ivanovii*, and *L. seeligeri*, but differs by 3 amino acid residues in these species, possibly affecting its functionality.

The increase in the production of pathogenicity factors (particularly lecithinase) by *L. monocytogenes* in the presence of activated charcoal is associated with its adsorption and, consequently, the elimination of the autorepressor product produced by *Listeria* itself from the incubation medium [75]. In this connection, the restoration of *Listeria's* ability to produce lecithinase upon addition of the sorbent to the incubation medium should not depend on the composition of the cultivation medium. At the same time, in the studies of some specialists a significant difference in the induction of lecithinase activity on different media, including media of the same name, produced by different manufacturers, was found, which may be due to the following reasons. Firstly, the components of the medium can influence the adsorption capacity of carbon, in particular, even trace amounts of detergents can reduce the adsorption properties of carbon. Secondly, the increase in lecithinase activity when a sorbent is added to *Listeria* incubation medium may be due not only to an increase in the amount of lecithinase produced, but also to an increase in its lecithinase activity depending on the influence of external factors, the concentration of which in the medium may vary.

Differentiation of species of the genus *Listeria* based on motility at certain temperatures is complicated by the fact that some strains of *L. innocua* showed motility at both 37ºC and 20ºC, while some strains of *L. welshimeri* remained immobile at room temperature [21].

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Another biochemical feature of bacteria of the genus *Listeria* is the ability to hydrolyse 4 carbohydrates (manitol, rhamnose, raffinose and D-xylose), but this ability cannot be used to differentiate *L. monocytogenes* from *L. innocua* [21].

Other methods of bacteriological identification of *Listeria*, which allow differentiating pathogenic and non-pathogenic species, often give contradictory results. In particular, the b-haemolysis characteristic of *L. monocytogenes* on blood agar is weakly expressed in some strains, and some strains show no haemolytic activity at all [21].

To date, bacteriological confirmation of listeriosis is the only reliable way to make a final diagnosis [42], which necessitates the development of new approaches for isolating, typing, and identifying virulent strains of *Listeria* in order to identify the most significant of them in human infectious pathology.

At the same time, the duration of investigations by bacteriological methods varies from 3-4 days for negative results to 10-11 days to confirm a positive result. In addition, the detection of *L. monocytogenes* in animal products by microbiological methods is often difficult due to the high concentration of competitive microflora, the presence of Listeria-inhibiting food components and the generally low level of *L. monocytogenes* in samples [122]. Finally, the bacteriological characterisation of *Listeria* in clinical samples is sometimes difficult due to the variability of *Listeria* and its tendency to form coccoid forms [21], predisposing cases of false identification of *Philococcus*, *Corynebacterium* and *Enterococcus* as *L. monocytogenes* and vice versa. At the same time, the parallel use of biochemical methods, and, in particular, the typical for *L. monocytogenes* induction of lecithinase activity in the incubation medium in the presence of sorbents makes it possible to reliably identify *L. monocytogenes* from lecithinase-producing *Enterococcus* spp. and *Escherichia coli*, whereas the absence of lecithinase activity in the medium without sorbents distinguishes *L. monocytogenes* from staphylococci.

Although serological methods are adjunctive in the diagnosis of listeriosis, they are often effective and provide relatively rapid results, ease of reaction, and the ability to test a variety of biomaterial.

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Serological reactions used for the diagnosis of listeriosis include enzyme-linked immunosorbent assay (ELISA), agglutination reaction (RA), complement binding reaction (CBR), indirect haemagglutination reaction (IHGR), and indirect immunofluorescence reaction (NIRF). Blood and cerebrospinal fluid can be used as test material, and the result is considered positive when the antibody titre is from 1:250 to 1:5000 [32].

In the laboratory diagnosis of listeriosis, two serological methods are most often used: complement binding reaction with inactivated cytoplasmic antigen and indirect haemagglutination reaction with erythrocyte antigenic diagnosticum [2], which are not highly specific. In general, serological diagnosis of listeriosis is not sufficiently effective due to false-positive results, the diverse antigenic structure of the bacterium, the antigenic affinity of *Listeria* with other microorganism species, and the technical conditions of the reactions [34].

Most serological methods for the detection of *Listeria* are based on the use of monoclonal antibodies, which was the first method for typing *L. monocytogenes* serotypes [72]. However, this method is time-consuming and has a low differential capacity [98]. Therefore, molecular typing methods have become increasingly popular for *Listeria* typing [72], including ribotyping, multi-target enzyme electrophoresis (MLEE), pulsed-field gel electrophoresis (PFGE), and multi-target sequencing (MLST) [90]. Meanwhile, PFGE is considered the gold standard method for determining Listeria subtypes because of its differential ability, reproducibility and repeatability [109].

The first monoclonal antibodies for the detection of *Listeria* showed specificity to a common flagellar H-antigen typical for *L. monocytogenes*, *L. ivanovi*, *L. innocua*, *L. weishimeri* and *L. seeligeri*, but not for 30 cultures of other species, including staphylococci and streptococci [80]. Subsequently, a genus-specific panel of monoclonal antibodies developed by B.T. Butman et al. Butman et al. [53], including 15 specific antibodies showing affinity to thermostable rhodospecific protein with molecular mass from 30,000 to 38,000 Da and not cross-reacting with 21 species of other microorganisms, including streptococci. Two monoclonals from

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this panel were subsequently used to create a commercial immunoenzyme test system (Listeria – EEK) for the detection of *Listeria* spp. [62], which has found widespread use as an additional, but not alternative, method for the detection of *Listeria* spp. in food [138].

At the same time, polyclonal antibodies used in the immunofluorescence method and monoclonal antibodies are currently not practically used for the diagnosis of listeriosis and retain practical significance only in livestock facilities for the prevention of listeriosis in animals and service personnel [39].

Currently, serological methods used in clinical laboratory diagnostics and aimed at detecting specific antibodies to listeria have been developed. One of the relatively specific serological methods is the detection of antibodies to listeriolysin O, the terminal polypeptide fragment of the recombinant molecule of which is the most specific when screening sera of listeriosis patients compared to other protein antigens [84]. At the same time, experts recommend using this serological method only to detect non-invasive asymptomatic forms of the disease in epidemic outbreaks of listeriosis [53]. When analysing the sera of donors and patients with listeriosis, it is advisable to detect antibodies to the protein antigens of *Listeria* (irpA, InlB and actA) associated with pathogenicity [24, 84]. Specific antibodies to *Listeria* antigens are detected in the blood from the second week of the disease and persist for several years after recovery.

At the same time, it is known that *Listeria* serovars and serotypes are not speciospecific and may be common to different *Listeria* species regardless of their pathogenicity for humans. In particular, *L. monocytogenes* is characterised by one or more common antigenic determinants with *Listeria* species other than *L. welshimeri*. In this regard, serovar identification alone, without the use of other methods, does not accurately identify listeriosis [50].

Thus, serological methods for diagnosing listeriosis have a number of disadvantages, including low specificity (listeria antigens are very similar in structure to antigens of other microorganisms, so false-positive or false-negative results are often obtained), the possibility of detecting not the pathogen itself, but

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only antibodies to it, low reliability of the results, false-negative reactions in severe immunodeficiency states even in very severe course of listeriosis, and the possibility of performing the analysis of listeria antigens. In general, the results of serological tests provide certain information about a patient's possible contact with the pathogen, but do not allow diagnosing listeriosis with a high degree of accuracy even when several serological methods are used, including due to the antigenic affinity of Listeria with staphylococci, enterococci and erysipeloid [20].

The diagnosis of listeriosis can be suspected or made if there is a reliable difference in antibody titres in paired sera of patients with a characteristic clinical picture (RA with coloured diagnostics, RBC, NIRF, RNAS), cerebrospinal fluid (NIRF, PCR, ELISA, microscopy) and bacteriological examination by enrichment with charcoal immunoglobulin sorbent [13, 39, 42].

At the same time, serological methods of laboratory diagnostics of listeriosis remain the main methods in the practice of Russian bacteriologists and allow establishing the presumed diagnosis with further confirmation by bacteriological methods [40]. At the same time, the slide agglutination method is relatively simple and reliable, requiring the availability of agglutinating listeriosis sera, the improvement of methods for obtaining which is very important at present.

One of the relatively fast, highly effective methods for the detection of *L. monocytogenes* is the molecular biological method of PCR and enzyme immunoassay [27] using the highly specific chromogenic medium ALOA-agar [48].

The specificity and high sensitivity of PCR have been confirmed on various strains of pathogenic *Listeria*, but poor lysis of some *Listeria* strains, apparently related to the structure of the cell wall, may give false-negative results [21]. In this regard, some specialists recommend PCR using listeria cells added to the reaction mixture without pretreatment with lytic enzymes [67]. In addition, the multi-targeted variable number of tandem repeats assay (MLVA), a PCR-based typing method that characterises bacteria by detecting tandem repeats at several specific loci in the bacterial genome, is quite informative [79, 108].

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Matrix Assisted Laser Desorption/Ionisation Time of Flight (MALDI-TOF) is a relatively effective method for the identification of *L. monocytogenes* [12]. At the same time, there are reports in the literature that species identification of *Listeria* species by MALDI-TOF is not always correct, which may be due to the influence of various factors, such as cultivation conditions, the composition of nutrient media, and the level of polymorphism of strains taken for research [89, 125].

Real-time polymerase chain reaction is a comparatively fast and practical alternative to the microbiological method for the detection of *Listeria* [35]. Therefore, the development of species-specific PCR methods for the detection of the *L. monocytogenes* genome is an urgent task. For PCR identification of *L. monocytogenes*, various genes are used as targets: 16S and 23S rRNA, prs, gyrB, rpoB, hly, inlA and inlB, plcA, iap, etc. [17, 21, 69, 113, 121, 147]. At the same time, the real-time PCR method does not allow distinguishing viable bacterial cells from non-viable ones; therefore, positive results obtained using this method must necessarily be confirmed by a traditional microbiological method [35].

To determine the serological affiliation of *Listeria* cultures, according to the world classification, it is recommended to use the multiplex PCR method based on the correlation between the serogroup affiliation of an isolate and the presence of specific open reading frames in its genome [9, 16], which makes it possible to identify the diversity of *L. monocytogenes* cultures and differentiate the strains of epidemic significance and danger to humans [39].

To obtain *Listeria* isolation media, it is necessary to study the optimal conditions for their growth and reproduction and to determine the optimal concentrations of nutrient elements. *Listeria* have been found to grow on simple nutrient media, capable of reproduction in a wide range of temperatures (4-45 °C), pH (5.0-9.0), and humidity, in the presence of 20% NaCl and 15% CO_2 [29, 49]. The high metabolic plasticity of *Listeria* determines the possibility of their transition from the saprophytic phase to the parasitic phase and vice versa; optimal cultivation conditions are necessary to preserve the virulent properties of *Listeria*, which is important for the accumulation of full biomass [29]. At the same time, the cultivation

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conditions (composition of nutrient media, temperature and incubation time) influence the polymorphism of *Listeria*, which complicates the estimation of the results of bacteriological analysis and may lead to errors in diagnosis [5]. In particular, the prolonged stay of *Listeria* in cold storage predetermines the presence of most of the microorganisms at the L-transformation stage, which requires a long time of their reversion in enrichment media for the detection of pathogens [5]. In this regard, accurate diagnosis of *Listeria* requires the use of methods such as DNA diagnosis, PCR and ELISA [5].

At the same time, accelerated methods such as ELISA, PCR, DNA-DNA and DNA-RNA hybridisation, radioimmunological methods, and the use of chromogenic nutrient media are the most suitable for the detection of *L. monocytogenes* in perishable products, which are characterised by high speed of analysis, sensitivity and specificity, and low consumption of nutrient media. High sensitivity and specificity in detecting *L. monocytogenes* has been shown for the test system LOCATE® Listeria, in which highly specific monoclonal antibodies to thermostable O-antigens or somatic antigens of the *Listeria* cell wall are used as antibodies [6]. Proteomics methods involving mass spectrometric analysis of proteins are also used to diagnose listeriosis [31].

2 **Conclusion**

Throughout their long evolution, pathogenic *Listeria* have developed a set of unique mechanisms that allow them, along with a saprophytic lifestyle, to switch to intracellular parasitisation, avoiding contact with the humoral immune system and suppressing at the initial stages of infection the Th1-type immune response, which is essential for the elimination of intracellular parasites. In addition, *L. monocytogenes* is able to switch on phagocytosis in those cells for which it is not usually characteristic, which predetermines the possibility of its invasion of a wide range of target cells and significantly complicates the course of listeriosis.

Ecological plasticity and tolerance of listeria determine their ability to change from saprophytic to parasitic way of life and to reverse back to saprophyticism when they enter the environment and survive under different environmental conditions. At

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the same time, non-pathogenic *Listeria*, as well as pathogenic microorganisms forming a biocenosis with *L. monocytogenes*, can serve as a reservoir of pathogenicity and resistance determinants and be transmitted to pathogenic *Listeria* by horizontal transfer. Thus, the high degree of genetic relatedness of *L. monocytogenes* with L. innocua makes it possible for *L. innocua* to create reservoirs of resistance genes that can be transferred to *L. monocytogenes*, including virulence genes. In addition, pathogenicity genes can be transferred from *L. monocytogenes* to *L. innocua*, which predetermines the emergence of atypical haemolytic pathogenic strains, which, given the greater prevalence of *L. innocua* in the environment, may pose a greater threat to humans and animals.

The constant evolution of pathogenic *Listeria* and their acquisition of new surface antigens, in turn, complicate the laboratory diagnosis of listeriosis and differential typing of *Listeria* in the food industry and require the development of new immunobiological preparations, culture media and modern schemes for the isolation and identification of *L. monocytogenes*.

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ТИТУЛЬНЫЙ ЛИСТ_МЕТАДАННЫЕ

Блок 1. Информация об авторе ответственном за переписку

Краева Людмила Александровна, доктор медицинских наук, доцент, заведующая лабораторией медицинской бактериологии ФБУН НИИ эпидемиологии и микробиологии имени Пастера; профессор кафедры микробиологии ФГБВОУ ВО Военно-медицинская академия имени С.М. Кирова МО РФ, Санкт-Петербург, Российская Федерация;

адрес: 197101, Россия, Санкт-Петербург, ул. Мира, д.14;

телефон: 8(812)232-94-85;

факс: 8(812)498-09-39;

e-mail: lykraeva@yandex.ru

Kraeva Lydmila Aleksandrovna, Doc.Med.Sci., Associate Professor, Head of the Laboratory of Medical Bacteriology, St. Petersburg Pasteur Institute; Professor, Department of Microbiology, Military Medical Academy named after S.M. Kirov, St. Petersburg, Russian Federation;

address: 197101, Russian Federation, St.Petersburg, Mira str. 14;

telephone: 8(812)232-94-85;

fax: 8(812)498-09-39;

e-mail: lykraeva@yandex.ru

Блок 2. Информация об авторах

Деревянченко И. А., биолог бактериологической лаборатории Восточного филиала ФБУЗ «Центр гигиены и эпидемиологии в городе Санкт-Петербурге и Ленинградской области»; младший научный сотрудник лаборатории медицинской бактериологии ФБУН НИИ эпидемиологии и микробиологии имени Пастера, Санкт-Петербург, Российская Федерация;

адрес: 192012, Россия, Санкт-Петербург, улица Ново-Александровская, 12 литера А;

телефон: 8(921)882-98-46;

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 10.15789/2220-7619-BFA-17639
e-mail: tamiirina110804@mail.ru

Derevyanchenko I. A., Biologist at the Bacteriological Laboratory of the Eastern Branch of the Center for Hygiene and Epidemiology in the city of St. Petersburg and the Leningrad Region; Junior Researcher at the Laboratory of Medical Bacteriology, St. Petersburg Pasteur Institute, St. Petersburg, Russian Federation;
address: 192012, Russia, St. Petersburg, Novo-Alexandrovskaya street, 12 letter A;
telephone: 8(921)882-98-46;
e-mail: tamiirina110804@mail.ru

Блок 3. Метаданные статьи

БИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ И МЕДИЦИНСКАЯ ЗНАЧИМОСТЬ БАКТЕРИЙ РОДА LISTERIA

BIOLOGICAL FEATURES AND MEDICAL SIGNIFICANCE OF THE LISTERIA BACTERIA

Сокращенное название статьи для верхнего колонтитула:
БАКТЕРИИ РОДА *LISTERIA*
LISTERIA SPP BACTERIA

Ключевые слова: бактерии, листерии, листериоз, *L. monocytogenes*, *L. Innocua, патогенность.*

Keywords: bacteria, Listeria, listeriosis, *L. monocytogenes*, *L. innocua*, *pathogenicity.*

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1.	Антошина И.Ф., Мезенцева М.В. Listeria monocytogenes: распространение и механизмы иммунного ответа // Инфекция и иммунитет. 2012. Т. 2, № 3. С. 627–634.	Antoshina I.F., Mezentseva M.V. Listeria monocytogenes: spreading and mechanisms of immune response. Infektsiya i immunitet = Infection and immunity, 2012, v. 2, no. 3, pp. 627–634. (In Russ.)	[https://elibrary.ru/download/elibrary_17918335_30408151.pdf]
2.	Арзымбетова Ж.Х., Ахметова А.Т., Нургалиева К.Ж. Лабораторная диагностика листериоза //	Arzymbetova Zh.H., Ahmetova A.T., Nurgaliyeva K.Zh. Laboratory diagnostic of listeriosis. Meditsinskiy zhurnal Zapadnogo Kazakhstana = Medical journal of Western	[https://elibrary.ru/download/elibrary_24154875_64008462.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Медицинский журнал Западного Казахстана. 2011. Т. 30, № 2. С. 12–15.	Kazakhstan, 2011, v. 30, no. 2, pp. 12–15. (In Russ.)	
3.	Асташкин Е.И., Алексеева Е.А., Борзенков В.Н., Кисличкина А.А., Мухина Т.Н., Платонов М.Е., Светоч Э.А., Шепелин А.П., Фурсова Н.К. Молекулярно-генетическая характеристика полирезистентных штаммов Listeria monocytogenes и идентификация новых сиквенс-типов //	Astashkin E.I., Alekseeva E.A., Borzenkov V.N., Kislichkina A.A., Mukhina T.N., Platonov M.E., Svetoch E.A., Shepelin A.P., Fursova N.K. Molecular genetic characteristics of polyresistant Listeria monocytogenes strains and identification of new sequence types. Molekulyarnaya Genetika, Mikrobiologiya i Virusologiya = Molecular Genetics, Microbiology and Virology, 2021, v. 39, no. 4, pp. 3–13. (In Russ.)	[DOI: 10.17116/molgen2021390413]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Молекулярная генетика, микробиология и вирусология. 2021. Т. 39, № 4. С. 3–13.		
4.	Балясова Н.А., Алимов А.М. Стабильность штаммов листерий // Ученые записки Казанской государственной академии ветеринарной медицины им. Н.Э. Баумана. 2017. Т. 230, №2. С. 24–26.	Balyasova N.A., Alimov A.M. Stability of listeria strains. Uchenyye zapiski Kazanskoy gosudarstvennoy akademii veterinarnoy meditsiny im. N.E. Baumana = Scientific notes of the Kazan State Academy of Veterinary Medicine. N.E. Bauman, 2017, v. 230, no. 2, pp. 24–26. (In Russ.)	[https://elibrary.ru/download/elibrary_29461491_70476663.pdf]
5.	Банникова Д.А., Павлова И.Б., Кононенко А.Б., Болотский М.Н., Британова С.В. Морфология	Bannikova D.A., Pavlova I.B., Kononenko A.B., Bolotsky M.N., Britova S.V. Morphology of listeria popylation under thr different conditions of cultivation (scanning electron microscooy).	[https://www.elibrary.ru/download/elibrary_16453522_26609628.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	популяций листерий при различных условиях культивирования (сканирующая электронная микроскопия). I сообщение // Российский журнал Проблемы ветеринарной санитарии, гигиены и экологии. 2009. Т. 2, №2. С. 1–7.	Rossiyskiy zhurnal Problemy veterinarnoy sanitarii, gigiyeny i ekologii = Russian Journal Problems of Veterinary Sanitation, Hygiene and Ecology, 2009, v. 2, no. 2, pp. 1–7. (In Russ.)	
6.	Болотский М.Н. Индикация Listeria monocytogenes в продовольственном сырье и продуктах животного происхождения методом ИФА // Ветеринарная	Bolotsky M.N. Indication of Listeria monocytogenes in food raw materials and products of animal origin by EIA. Veterinarnaya patologiya = Veterinary pathology, 2007, no. 2, pp. 46–49. (In Russ.)	[https://www.elibrary.ru/download/elibrary_16861278_76249978.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	патология. 2007. № 2. С. 46–49.		
7.	Бузолева Л.С., Терехова В.Е. Выживаемость и адаптивная изменчивость штаммов Listeria monocytogenes в морской и речной воде // Ветеринарная патология. 2004. № 4 (11). С. 31–35.	Buzoleva L.S., Terekhova V.E. Survival and adaptive variability of Listeria monocytogenes strains in sea and river water. Veterinarnaya patologiya = Veterinary pathology, 2004, no. 4 (11), pp. 31–35. (In Russ.)	[https://www.elibrary.ru/download/elibrary_9167811_28316628.pdf]
8.	Васильев Д.А., Мастиленко А.В., Ковалева Е.Н. Разработка системы молекулярно-генетической детекции бактерий видов *Listeria*	Vasilyev D.Ar., Mastilenko A.V., Kovaleva E.N. Development of a system of molecular genetic detection of bacteria types of Listeria monocytogenes and Listeria ivanovii. Vestnik Ural'skoy gosudarstvennoy sel'skokhozyaystvennoy akademii = Bulletin of	[https://www.elibrary.ru/download/elibrary_21585687_46593758.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	monocytogenes и *Listeria ivanovii* // Вестник Уральской государственной сельскохозяйственной академии. 2014. № 1 (25). С. 43–46.	the Ural State Agricultural Academy, 2014, no. 1 (25), pp. 43–46. (In Russ.)	
9.	Васильев Д.А., Ковалева Е.Н., Мастиленко А.В. Идентификация бактерий видов *Listeria monocytogenes* и *Listeria ivanovii* методом мультиплексной ПЦР в режиме «реального времени» // Биотика. 2014. Т. 1, № 1. С. 3–6.	Vasiliev D.A., Kovaleva E.N., Mastilenko A.V. Identification of bacteria species Listeria monocytogenes and Listeria ivanovii by multiplex real-time PCR. Bïotïka = Biotika, 2014, v. 1, no. 1, pp. 3–6. (In Russ.)	[https://www.elibrary.ru/download/elibrary_23045120_38446023.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

10.	Гальцева Г.В., Федоренко Л.М., Инжеватова В.Б., Буланова Е.Е. Лабораторная диагностика листериоза // Успехи современного естествознания. 2006. № 1. С 52–53.	Galtseva G.V., Fedorenko L.M., Ingevatova V.B., Bulanova E.E. Laboratory diagnostics of listeriosis. Uspekhi sovremennogo yestestvoznaniya = Success in modern natural science, 2006, no. 1, pp. 52–53. (In Russ.)	[https://natural-sciences.ru/ru/article/view?id=14133]
11.	Громыко Н.Л., Захаренкова Т.Н., Желобкова Т.И., Недосейкина М.С., Кустова М.А. Акушерские аспекты листериоза // Проблемы здоровья и экологии. 2013. № 3 (37). С. 132–136.	Gromyko N.L., Zakharenkova T.N., Zhelobkova T.I., Nedoseikina M.S., Kustova M.A. Obstetrical aspects of listeriosis. Problemy zdorov'ya i ekologii = Problems of health and ecology, 2013, no. 3 (37), pp. 132–136. (In Russ.)	[https://www.elibrary.ru/download/elibrary_24314710_34261605.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

12.	Детушев К.В., Богун А.Г., Мухина Т.Н., Соломенцев В.И. Сравнение методов прямого нанесения биомассы и белковых экстрактов при идентификации микроорганизмов рода *Listeria* методом MALDI-TOF-типирования // Бактериология. 2018. Т. 3, № 3. С. 28–33.	Detushev K.V., Bogun A.G., Mukhina T.N., Solomentsev V.I. Comparing methods of direct application of biomass and protein extracts in identification of microorganisms of the genus of listeria by MALDI-TOF typing method. Bakteriologiya = Bacteriology, 2018, v. 3, no. 3, pp. 28–33. (In Russ.)	[https://obolensk.org/images/journal/2018/3-3/2018-3-3%20p28-33%20Detushev.pdf]
13.	Егорова И.Ю., Цыбанова В.А. Дикие животные как источник пищевых токсикоинфекций человека // Ветеринарная	Egorova I.Yu., Tsybanova V.A. Wild animals as a source of human food poisoning. Veterinarnaya patologiya = Veterinary pathology, 2014, no. 4, pp. 45–49. (In Russ.)	[https://www.elibrary.ru/download/elibrary_17650463_41935555.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	патология. 2014. № 4. С. 45–49.		
14.	Ермолаева С.А., Тартаковский И.С. Регуляция экспрессии факторов вирулентности у Listeria monocytogenes // Журнал микробиологии. 2001. № 3. С. 106–110.	Ermolaeva S.A., Tartakovskiĭ I.S. Virulence factor expression regulation in Listeria monocytogenes. Zhurnal mikrobiologii = Journal of Microbiology, 2001, no. 3, pp. 106–110. (In Russ.)	[https://pubmed.ncbi.nlm.nih.gov/11550545/]
15.	Зайцева Е.А. Особенности биологических свойств бактерии вида *Listeria innocua*, выделенных на территории Приморского края // Альманах клинической медицины.	Zaitseva E.A. Specific biological properties of Listeria innocua spp. isolated in Primorye Territory. Al'manakh klinicheskoy meditsiny = Almanac of Clinical Medicine, 2017, v. 45, no. 2, pp. 147–153. (In Russ.)	[https://almclinmed.ru/jour/article/viewFile/527/524]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	2017. Т. 45, № 2. С. 147–153.		
16.	Зайцева Е.А., Ермолаева С.А. Дифференциация штаммов *Listeria monocytogenes* методом мультиплексной полимеразной цепной реакции // Тихоокеанский медицинский журнал. 2014. № 3. С. 40–42.	Zaytseva E.A.,, Yermolaeva S.A. Differentiation of listeria monocytogenes strains by the method of multiplex polymerase chain reaction. Tikhookeanskiy meditsinskiy zhurnal = Pacific Medical Journal, 2014, no. 3, pp. 40–42. (In Russ.)	[https://www.tmj-vgmu.ru/jour/article/view/656]
17.	Зайцева Е.А., Ермолаева С.А., Пуховская Н.М., Мусатов Ю.С., Иванов Л.И., Сомов Г.П. Распространение Listeria	Zaitseva E.A., Ermolaeva S.A., Pukhovskaya N.M., Musatov Yu.S., Ivanov L.I., Somov G.P. Spreading Listeria monocytogenes and its role in infectious pathology in the russian far east. Tikhookeanskiy meditsinskiy zhurnal = Pacific	[https://www.elibrary.ru/download/elibrary_16753678_94858071.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	monocytogenes и ее роль в инфекционной патологии на Дальнем Востоке России // Тихоокеанский медицинский журнал. 2010. № 4. С. 19–23.	Medical Journal, 2010, no. 4, pp. 19–23. (In Russ.)	
18.	Зайцева Е.А., Федянина Л.Н. О неспецифической профилактике листериоза // Тихоокеанский медицинский журнал. 2010. № 4. С. 5–7.	Zaitseva E.A., Fedyanina L.N. On non-specific prevention of listeriosis. Tikhookeanskiy meditsinskiy zhurnal = Pacific Medical Journal, 2010, no. 4. pp. 5–7. (In Russ.)	[https://www.elibrary.ru/download/elibrary_16753668_28415505.pdf]
19.	Зайцева Е.А., Сомов Г.П. Микробиологическая характеристика Listeria monocytogenes, изолированных из различных источников в	Zaitseva E.A., Somov G.P. Microbiological characterization of Listeria monocytogenes isolated from different sources in the primorsky territory. Zhurnal mikrobiologii = Journal of Microbiology, 2006, no. 2, pp. 3–6. (In Russ.)	[https://pubmed.ncbi.nlm.nih.gov/16758889/]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Приморском крае // Журнал микробиологии. 2006. №2. С. 3–6.		
20.	Идиатулин Р.И. Диагностический мониторинг листериоза // Вопросы нормативно-правового регулирования в ветеринарии. 2010. № 4. С. 23–26.	Idiatulin R.I. Diagnostic monitoring of listeriosis. Voprosy normativno-pravovogo regulirovaniya v veterinarii = Issues of legal regulation in veterinary medicine, 2010, no. 4, pp. 23–26. (In Russ.)	[https://www.elibrary.ru/item.asp?id=15541377&ysclid=lqzl0h35cp306818297]
21.	Карпова Т.И., Ермолаева С.А., Лопырев И.В. Новые методы идентификации *Listeria monocytogenes* // Клиническая микробиология и	Karpova T.I., Ermolaeva S.A., Lopirev I.V., Brodinova N.S., Tartakovski I.S., Vazquez-Boland J.A. New Methods for Identification of Listeria monocytogenes. Klinicheskaya mikrobiologiya i antimikrobnaya khimioterapiya = Clinical microbiology and antimicrobial	[https://cmac-journal.ru/publication/2001/3/cmac-2001-t03-n3-p266/cmac-2001-t03-n3-p266.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	антимикробная химиотерапия. 2001. Т. 3, № 3. С. 266–227.	chemotherapy, 2001, v. 3, no. 3, pp. 266–227. (In Russ.)	
22.	Куликовский А.В., Хапцев З.Ю., Макаров Д.А., Комаров А.А. Пищевая микробиология: эмерджентные зоонозы. Москва: Издательство Юрайт, 2019. 233 с.	Kulikovsky A.V., Khaptsev Z.Yu., Makarov D.A., Komarov A.A. Food microbiology: emerging zoonoses / Pishchevaya mikrobiologiya: emerdzhentnyye zoonozy. Moscow: Yurayt Publishing House, 2019. 233 p. *(In Russ.)*	[https://azon.market/image/catalog/v_1/product/pdf/371/3707918.pdf]
23.	Лабинская А.С., Костюкова Н.Н., Иванова С.М. Руководство по медицинской микробиологии. Частная медицинская микробиология и	Labinskaya A.S., Kostyukova N.N., Ivanova S.M. Guide to medical microbiology. Private medical microbiology and etiological diagnosis of infections / Rukovodstvo po meditsinskoy mikrobiologii. Chastnaya meditsinskaya mikrobiologiya i etiologicheskaya diagnostika infektsiy. M.: BINOM, 2012. 1152 p. *(In Russ.)*	[https://rus.logobook.ru/af/2285297/2643/Лабинская%20т%203%20часть%201.pdf?ysclid=lqzlmd1ymj164694601]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	этиологическая диагностика инфекций. М.: БИНОМ, 2012. 1152 с.		
24.	Мукантаев К.Н., Бегалиева А., Інірбай Б., Райымбек Г., Казыкен Д., Сегизбаева Г.Ж. Получение рекомбинантного антигена p60 Listeria monocytogenes // Биотехнология. Теория и практика. 2015. № 1. С. 17–25.	Mukantayev K.N., Shustov A.B., Sydyknabi I., Bigalyeva A., Raiymbek G., Mukanov K.K. Obtaining of recombinant protein fragment of the GP51 antigen virus of bovine leukemia expressed in E.coli without insert thioredoxin. Biotekhnologiya. Teoriya i praktika = Biotechnology. Theory and practice, 2015, no. 1, pp. 17–25. (In Russ.)	[DOI: 10.11134/btp.1.2015.2]
25.	Мухина Л.Б., Дмитриева Е.Ю. Организация контроля за	Mukhina L.B., Dmitrieva E.Yu. Organization of control over the spread of the causative agent of listeriosis Listeria monocytogenes at fish	[https://files.stroyinf.ru/Data2/1/4293731/4293731394.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	распространением возбудителя листериоза Listeria monocytogenes на рыбоперерабатывающих предприятиях. СПб.: Моринтех, 2003. 32 с.	processing plants / Organizatsiya kontrolya za rasprostraneniyem vozbuditelya listerioza Listeria monocytogenes na ryboperabatyvayushchikh predpriyatiyakh. St. Petersburg: Morintech, 2003. 32 p. (In Russ.)	
26.	Нафеев А.А., Сидорова Н.Н., Лебедько А.М., Никонов О.А., Минаев М.Ю., Сайфутдинова Ф.Ф., Попов В.В., Модникова В.И. Случай септико-тифозной формы листериоза // Клиническая медицина. 2013. № 2. С. 58–59.	Nafeev A.A., Sidorova N.N., Lebed'ko A.M., Nikonov O.A., Minaev M.Yu., Saifutdinova F.F., Popov V.V., Mednikova V.I. Clinical manifestations of listeriosis sepsis. Klinicheskaya meditsina = Clinical medicine, 2013, no. 2, pp. 58–59. (In Russ.)	[https://www.elibrary.ru/download/elibrary_18801187_84495217.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

27.	Нечаев А.Ю. Сравнительный анализ результатов выявления *Listeria monocytogenes* в мясе и мясопродуктах // Международный вестник ветеринарии. 2009. № 3. С. 13–17.	Nechaev A.Y. Comparative analysis of results for the determination of *Listeria monocytogenes* in meat and meat products. Mezhdunarodnyy vestnik veterinarii = International Bulletin of Veterinary Medicine, 2009, no. 3, pp. 13–17. (In Russ.)	[https://www.elibrary.ru/download/elibrary_13616592_52309396.pdf]
28.	Олещенко Е.П., Алферова Е.В. Листерии как возбудители пищевых инфекций // Здоровье. Медицинская экология. Наука. 2012. № 3-4. С. 211–212.	Oleshchenko E.P., Alferova E.V. Lister as causative agents of food borne infections. Zdorov'ye. Meditsinskaya ekologiya. Nauka = Health. Medical ecology. The science, 2012, no. 3-4, pp. 211–212. (In Russ.)	[https://www.elibrary.ru/download/elibrary_20397525_17882363.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

29.	Омарова С.М., Исаева Р.И. Биологические свойства штаммов Listeria monocytogenes, выделенных на новых отечественных селективных питательных средах из клинического материала при диагностике листериоза беременных и новорожденных // Астраханский медицинский журнал. 2011. Т. 6, № 1. С. 147–151.	Omarova S.M., Isaeva R.I. The biological properties of Listeria monocytogenes strains received on the base of new home-produced selective nutritive media from the clinical material in listeria diagnostics of pregnant women and new-borns. Astrakhanskiy meditsinskiy zhurnal = Astrakhan medical journal, 2011, v. 6, no. 1. pp. 147–151. (In Russ.)	[https://cyberleninka.ru/article/n/biologicheskie-svoystvashtammov-listeria-monocytogenes-vydelennyh-na-novyh-otechestvennyh-selektivnyh-pitatelnyh-sredah-iz/viewer]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

30.	Омарова С.М., Ахмедова Э.М., Муртазалиева П.М. Питательные среды для изучения биологических свойств листерий // Журнал микробиологии. 2007. № 3. С. 95–97.	Akhmedova E.M., Omarova S.M., Murtuiaheva P.M., Nurmagomedova Z.M. Nutnent media for study of biologic characteristics of listeria. Zhurnal mikrobiologii = Journal of Microbiology, 2007, no. 3, pp. 95–97. (In Russ.)	[https://www.elibrary.ru/item.asp?id=9521253]
31.	Пискунов А.В., Прунтова О.В., Шадрова Н.Б., Ручнова О.И. Использование MALDI-TOF МАСС-спектрометрии для идентификации бактерий рода *Listeria* // Труды федерального центра охраны здоровья	Piskunov A.V., Pruntova O.V., Shadrova N.B., Ruchnova O.I. Application of MALDI-TOF MASS-spectrometry for identification of Listeria species. Trudy federal'nogo tsentra okhrany zdorov'ya zhivotnykh = Works of the Federal Center for Animal Health, 2011, v. 9, no. 1, pp. 242–249. (In Russ.)	[https://www.elibrary.ru/download/elibrary_16986205_82550637.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	животных. 2011. Т. 9, № 1. С. 242–249.		
32.	Покровский В.И., Пак С.Г., Брико Н.И., Данилкин Б.К. Инфекционные болезни и эпидемиология: учебник. М.: ГЭОТАР-Медиа, 2009. 816 с.	Pokrovsky V.I., Pak S.G., Briko N.I., Danilkin B.K. Infectious diseases and epidemiology: a textbook / Infektsionnyye bolezni i epidemiologiya. M.: GEOTAR-Media, 2009. 816 p. (In Russ.)	[https://bronhus.com/wp-content/uploads/2019/02/Инфекционные-болезни-и-эпидемиология-В.И.-Покровский-Г.С.-Пак-В.И.-Брико-2007.pdf]
33.	Поманская Л.А. О размножении листерий в почве // Микробиология, эпидемиология, иммунобиология. 1963. № 6. С. 99–101.	Pomanskaya L.A. On the reproduction of listeria in the soil. Mikrobiologiya, epidemiologiya, immunobiologiya = Microbiology, epidemiology, immunobiology, 1963, no. 6, pp. 99–101. (In Russ.)	[https://pubmed.ncbi.nlm.nih.gov/14073947/]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

34.	Садова Н.В., Заплатников А.Л. Врожденный листериоз // Русский медицинский журнал. 2008. № 18. С. 162–165.	Sadova N.V., Zaplatnikov A.L. Congenital listeriosis. Russkiy meditsinskiy zhurnal = Russian medical journal, 2008, no. 18. pp. 162–165. (In Russ.)	[https://www.rmj.ru/articles/pediatriya/Vroghdennyy_listerioz/]
35.	Скитович Г.С., Шадрова Н.Б., Прунтова О.В., Серова К.В. Оптимизация ПЦР в реальном времени для выявления генома *Listeria monocytogenes* // Ветеринария сегодня. 2018. Т. 26, № 3. С. 63–68.	Skitovich G.S., Shadrova N.B., Pruntova O.V., Serova K.V. Real-time PCR optimization for Listeria monocytogenes genome detection. Veterinariya segodnya = Veterinary today, 2018, v. 26, no. 3, pp. 63–68. (In Russ.)	[https://www.elibrary.ru/download/elibrary_36784597_43263528.pdf]
36.	Сидоренко М.Л. Влияние летучих метаболитов бактерий рода Pseudomonas на размножение патогенных	Sidorenko M.L., Buzoleva L.S. Influence of volatile metabolites of bacteria of the genus Pseudomonas on the reproduction of pathogenic bacteria. Tikhookeanskiy meditsinskiy zhurnal =	[https://www.elibrary.ru/download/elibrary_17727125_73879678.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	бактерий // Тихоокеанский медицинский журнал. 2001. № 7. С. 131.	Pacific Medical Journal, 2001, no. 7, p. 131. (In Russ.)	
37.	Сомов Г.П. Особенности экологии внеорганизменных популяций патогенных бактерий и их отражение в эпидемиологии инфекции // Микробиология, эпидемиология, иммунобиология. 1997. № 5. С. 12–15.	Somov G.P. Features of the ecology of extraorganismal populations of pathogenic bacteria and their reflection in the epidemiology of infection. Mikrobiologiya, epidemiologiya, immunobiologiya = Microbiology, epidemiology, immunobiology, 1997, no. 5, pp. 12–15. (In Russ.)	[https://pubmed.ncbi.nlm.nih.gov/9432853/]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

38.	Стародумова С.М., Зайцева Е.А. Способ быстрой идентификации бактерий рода Listeria и патогенного вида *Listeria monocytogenes* с помощью мультиплексной ПЦР. Тихоокеанский медицинский журнал. 2014. № 1. С. 95–97.	Starodumova S.M., Zaitseva E.A. The way of a quick identification of bacteria genus Listeria and pathogenic species of Listeria monocytogenes by means of the multiplex polymerase chain reaction. Tikhookeanskiy meditsinskiy zhurnal = Pacific Medical Journal, 2014, no. 1, pp. 95–97. (In Russ.)	[https://www.tmj-vgmu.ru/jour/article/view/732/688]
39.	Тартаковский И.С. Листерии: роль в инфекционной патологии человека и лабораторная диагностика // Клиническая микробиология антимикробная	Tartakovski I.S. Listeriae: the role in infection diseases and laboratory diagnostics, Klinicheskaya mikrobiologiya antimikrobnaya khimioterapiya = Clinical Microbiology Antimicrobial Chemotherapy, 2000, v. 2, no. 2, pp. 20–30. (In Russ.)	[http://old.antibiotic.ru/cmac/pdf/2_2_020.pdf]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	химиотерапия. 2000. Т. 2, № 2. С. 20–30.		
40.	Хаптанова Н.М., Андреевская Н.М., Лукьянова С.В., Коновалова Ж.А., Гефан Н.Г., Остяк А.С., Токмакова Е.Г. Особенности серологической диагностики листериоза (обзор литературы). Acta biomedica scientifica. 2019. Т. 4, № 1. С. 43–49.	Khaptanova N.M., Andreevskaya N.M., Lukyanova S.V., Konovalova Zh.A., Gefan N.G., Ostyak A.S., Tokmakova E.G. Aspects of serological diagnostics of listeriosis (literature review). Acta biomedica scientific, 2019, v. 4, no 1, pp. 43–49. *(In Russ.)*	[DOI: 10.29413/ABS.2019-4.1.7]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

41.	Цветкова Н.Б. Изменчивость биологических свойств Listeria monocytogenes под влиянием абиотических факторов // Здоровье. Медицинская экология. Наука. 2012. Т. 1-2, № 47-48. С. 253–257.	Tsvetkova N.B. The variability of the biological properties of Listeria monocytogenes under the influence of abiotic factors. Zdorov'ye. Meditsinskaya ekologiya. Nauka = Health. Medical ecology. The science, 2012, v. 1-2, no. 47-48, pp. 253–257. (In Russ.)	[https://www.elibrary.ru/download/elibrary_17964399_35547006.pdf]
42.	Ющук Н.Д., Венгеров Ю.Я. Инфекционные болезни: национальное руководство. М.: ГЭОТАР-Медиа, 2015. 1061 p.	Yushchuk N.D., Vengerov Yu.Ya. *Infectious diseases: national guidelines / Infektsionnyye bolezni: natsional'noye rukovodstvo*. M.: GEOTAR-Media, 2015. 1061 p. *(In Russ.)*	[DOI: 10.33029/9704- 6122-8-INB-2021-1-1104]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

43.	Andre P., Genicot A. First isolation of Listeria welshimeri in a human. Zentralbl. Bakteriol. Mikrobiol. Hyg A, 1987, v. 263, no 4, pp. 605–606	Andre P., Genicot A. First isolation of Listeria welshimeri in a human. Zentralbl. Bakteriol. Mikrobiol. Hyg A, 1987, v. 263, no 4, pp. 605–606	[https://pubmed.ncbi.nlm.nih.gov/3604501/]
44.	Baquero F., Lanza V., Duval M., Coque T.M. Ecogenetics of antibiotic resistance in *Listeria monocytogenes*. Molecular Microbiology, 2020, v. 113, no 3, pp. 570–579.	Baquero F., Lanza V., Duval M., Coque T.M. Ecogenetics of antibiotic resistance in *Listeria monocytogenes*. Molecular Microbiology, 2020, v. 113, no 3, pp. 570–579.	[DOI: 10.1111/mmi.14454]
45.	Becker B., Schuler S. Schnellnachweis von Listeria monocytogenes in Fleischerzeugnissen.	Becker B., Schuler S. Schnellnachweis von Listeria monocytogenes in Fleischerzeugnissen. Fleischwirtschaft, 2007, v. 87, no 7, pp.103–106	[https://www.scinapse.io/papers/2469824266]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Fleischwirtschaft, 2007, v. 87, no 7, pp.103–106		
46.	Berlec A, Janež N, Sterniša M, Klančnik A, Sabotič J. Listeria innocua Biofilm Assay Using NanoLuc Luciferase. Bio Protoc., 2022, v. 12, no 3, e4308.	Berlec A, Janež N, Sterniša M, Klančnik A, Sabotič J. Listeria innocua Biofilm Assay Using NanoLuc Luciferase. Bio Protoc., 2022, v. 12, no 3, e4308.	[DOI: 10.21769/BioProtoc.4308]
47.	Bertsch D., Rau J., Eugster M.R., Haug M.C., Lawson P.A., Lacroix C., Meile L. Listeria fleischmannii sp. nov., isolated from cheese. Int. J. Syst. Evol. Microbiol., 2013, v. 63, pp. 526-532.	Bertsch D., Rau J., Eugster M.R., Haug M.C., Lawson P.A., Lacroix C., Meile L. Listeria fleischmannii sp. nov., isolated from cheese. Int. J. Syst. Evol. Microbiol., 2013, v. 63, pp. 526-532.	[DOI: 10.1099/ijs.0.036947-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

48.	Beumer R., Hazeleger W.C. Listeria monocytogenes: diagnostic problems. FEMS Immunology and Medical Microbiology, 2003, v. 35, pp. 191–197.	Beumer R., Hazeleger W.C. Listeria monocytogenes: diagnostic problems. FEMS Immunology and Medical Microbiology, 2003, v. 35, pp. 191–197.	[DOI: 10.1016/s0928-8244(02)00444-3]
49.	Bhunia A.K. Antibodies to Listeria monocytogenes. Crit. Rev. Microbiol., 2008, v. 23, pp. 77–107.	Bhunia A.K. Antibodies to Listeria monocytogenes. Crit. Rev. Microbiol., 2008, v. 23, pp. 77–107.	[DOI: 10.3109/10408419709115131]
50.	Buchrieser C., Rusniok C., Kunst F., Cossart P., Glaser P. Comparison of the genome sequences of Listeria monocytogenes and Listeria innocua: clues for evolution and pathogenicity. FEMS	Buchrieser C., Rusniok C., Kunst F., Cossart P., Glaser P. Comparison of the genome sequences of Listeria monocytogenes and Listeria innocua: clues for evolution and pathogenicity. FEMS Immunol. Med. Microbiol., 2003, v. 35, no 3, pp. 207–213.	[DOI: 10.1016/S0928-8244(02)00448-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Immunol. Med. Microbiol., 2003, v. 35, no 3, pp. 207–213.		
51.	Burkholder K.M., Bhunia, A.K. Listeria monocytogenes uses Listeria Adhesion Protein (LAP) to promote bacterial transepithelial translocation and induces expression of LAP Receptor Hsp60. Infection and Immunity, 2010, v. 78, pp. 5062–5073.	Burkholder K.M., Bhunia, A.K. Listeria monocytogenes uses Listeria Adhesion Protein (LAP) to promote bacterial transepithelial translocation and induces expression of LAP Receptor Hsp60. Infection and Immunity, 2010, v. 78, pp. 5062–5073.	[DOI: 10.1128/IAI.00516-10]
52.	Burkholder K. M., Kim K.-P., Mishra K.K., Medina S., Hahm B.-K., Kim H., Bhunia A.K. Expression of LAP, a SecA2-dependent	Burkholder K. M., Kim K.-P., Mishra K.K., Medina S., Hahm B.-K., Kim H., Bhunia A.K. Expression of LAP, a SecA2-dependent secretory protein, is induced under anaerobic	[DOI: 10.1016/j.micinf.2009.05.006]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	secretory protein, is induced under anaerobic environment. Microbes Infect., 2009, v. 11, pp. 859–867.	environment. Microbes Infect., 2009, v. 11, pp. 859–867.	
53.	Butman B.T., Plank M.C., Durham R.J., Mattingly J.A. Monoclonal antibodies which identify a genus-specific Listeria antigen. Appl. Environ. Microbiol., 1988, v. 54, no 6, pp. 1564–1569.	Butman B.T., Plank M.C., Durham R.J., Mattingly J.A. Monoclonal antibodies which identify a genus-specific Listeria antigen. Appl. Environ. Microbiol., 1988, v. 54, no 6, pp. 1564–1569.	[DOI: 10.1128/aem.54.6.1564-1569.1988]
54.	Carrero J.A., Calderon B., Unanue E.R. Lymphocytes are detrimental during the early innate immune response against Listeria	Carrero J.A., Calderon B., Unanue E.R. Lymphocytes are detrimental during the early innate immune response against Listeria monocytogenes. J. Exp. Med., 2006, v. 203, pp. 933–940.	[DOI: 10.1084/jem.20060045]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	monocytogenes. J. Exp. Med., 2006, v. 203, pp. 933–940.		
55.	Chen J., Chen Q., Jiang L., Cheng C., Bai F., Wang J., Mo F., Fang W. Internalin profiling and multilocus sequence typing suggest four *Listeria innocua* subgroups with different evolutionary distances from Listeria monocytogenes. BMC Microbiol., 2010, v. 10, no 1, p. 97–123.	Chen J., Chen Q., Jiang L., Cheng C., Bai F., Wang J., Mo F., Fang W. Internalin profiling and multilocus sequence typing suggest four *Listeria innocua* subgroups with different evolutionary distances from Listeria monocytogenes. BMC Microbiol., 2010, v. 10, no 1, p. 97–123.	[DOI: 10.1186/1471-2180-10-97]
56.	Chen M., Cheng J., Wu Q., Zhang J., Chen Y., Zeng H., Ding Y. Prevalence,	Chen M., Cheng J., Wu Q., Zhang J., Chen Y., Zeng H., Ding Y. Prevalence, potential virulence, and genetic diversity of Listeria	[DOI: 10.3389/fmicb.2018.01711]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	potential virulence, and genetic diversity of Listeria monocytogenes isolates from edible mushrooms in Chinese markets. Frontiers in Microbiology, 2018, v. 9, pp. 1711–1722.	monocytogenes isolates from edible mushrooms in Chinese markets. Frontiers in Microbiology, 2018, v. 9, pp. 1711–1722.	
57.	Chen Y., Chen Y., Pouillot R., Dennis S., Xian Z., Luchansky J.B., Porto-Fett A.C.S., Lindsay J.A., Hammack T.S., Allard M., Van Doren J.M., Brown E.W. Genetic diversity and profiles of genes associated with virulence and stress resistance among isolates from the 2010—2013	Chen Y., Chen Y., Pouillot R., Dennis S., Xian Z., Luchansky J.B., Porto-Fett A.C.S., Lindsay J.A., Hammack T.S., Allard M., Van Doren J.M., Brown E.W. Genetic diversity and profiles of genes associated with virulence and stress resistance among isolates from the 2010—2013 interagency Listeria monocytogenes market basket survey. PLoS One, 2020, v. 15, no 4, e0231393.	[DOI: 10.1371/journal.pone.0231393]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	interagency Listeria monocytogenes market basket survey. PLoS One, 2020, v. 15, no 4, e0231393.		
58.	Chiara M., Caruso M., D'Erchia A.M., Manzari C., Fraccalvieri R., Goffredo E., Latorre L., Miccolupo A., Padalino I., Santagada G., Chiocco D., Pesole G., Horner D.S., Parisi A. Comparative genomics of Listeria sensu lato: genus-wide differences in evolutionary dynamics and the progressive gain of complex, potentially	Chiara M., Caruso M., D'Erchia A.M., Manzari C., Fraccalvieri R., Goffredo E., Latorre L., Miccolupo A., Padalino I., Santagada G., Chiocco D., Pesole G., Horner D.S., Parisi A. Comparative genomics of Listeria sensu lato: genus-wide differences in evolutionary dynamics and the progressive gain of complex, potentially athogenicity related traits through lateral gene transfer. Genome Biol. Evol., 2015, v. 7, no 8, pp. 2154-2172.	[DOI: 10.1093/gbe/evv131]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	athogenicity related traits through lateral gene transfer. Genome Biol. Evol., 2015, v. 7, no 8, pp. 2154-2172.		
59.	Clayton E.M., Daly K.M., Guinane C.M., Hill C., Cotter P.D., Ross P.R. Atypical Listeria innocua strains possess an intact LIPI-3. BMC Microbiol., 2014, v. 14, no 1, p. 58-67.	Clayton E.M., Daly K.M., Guinane C.M., Hill C., Cotter P.D., Ross P.R. Atypical Listeria innocua strains possess an intact LIPI-3. BMC Microbiol., 2014, v. 14, no 1, p. 58-67.	[DOI: 10.1186/1471-2180-14-58]
60.	Cossart P. Illuminating the landscape of host-pathogen interactions with the bacterium Listeria monocytogenes. Proceedings of the National	Cossart P. Illuminating the landscape of host-pathogen interactions with the bacterium Listeria monocytogenes. Proceedings of the National Academy of Sciences of the United States of America, 2011, v. 108, no 49, pp. 19484-19491.	[DOI: 10.1073/pnas.1112371108]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Academy of Sciences of the United States of America, 2011, v. 108, no 49, pp. 19484-19491.		
61.	Cotter P.D., Draper L.A., Lawton E.M., Daly K.M., Groeger D.S., Casey P.G., Ross R.P., Hill C. Listeriolysin S, a novel peptide haemolysin associated with a subset of lineage I Listeria monocytogenes. PLoS Pathog., 2008, v. 4, e1000144.	Cotter P.D., Draper L.A., Lawton E.M., Daly K.M., Groeger D.S., Casey P.G., Ross R.P., Hill C. Listeriolysin S, a novel peptide haemolysin associated with a subset of lineage I Listeria monocytogenes. PLoS Pathog., 2008, v. 4, e1000144.	[DOI: 10.1371/journal.ppat.1000144]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

62.	Curiale M.S., Lepper W., Robison B. Enzyme-linked immunoassay for detection of Listeria monocytogenes in dairy products, seafoods, and meats: collaborative study. J. AOAC Int., 1994, v. 77, no 6, pp. 1472-1489.	Curiale M.S., Lepper W., Robison B. Enzyme-linked immunoassay for detection of Listeria monocytogenes in dairy products, seafoods, and meats: collaborative study. J. AOAC Int., 1994, v. 77, no 6, pp. 1472-1489.	[DOI: 10.1093/jaoac/77.6.1472]
63.	Czuprynski C.J., Brown J.F., Wagner R.D., Steinberg H. Administration of antigranulocyte monoclonal antibody RB6-8C5 prevents expression of acquired resistance to Listeria monocytogenes infection in previously immunized mice. Infect.	Czuprynski C.J., Brown J.F., Wagner R.D., Steinberg H. Administration of antigranulocyte monoclonal antibody RB6-8C5 prevents expression of acquired resistance to Listeria monocytogenes infection in previously immunized mice. Infect. Immun., 1994, v. 62, pp. 5161–5163.	[DOI: 10.1128/iai.62.11.5161-5163.1994]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Immun., 1994, v. 62, pp. 5161–5163.		
64.	den Bakker H.C., Warchocki S., Wright E.M., Allred A.F., Ahlstrom C., Manuel C.S., Stasiewicz M.J., Burrell A., Roof S., Strawn L.K., Fortes E., Nightingale K.K., Kephart D., Wiedmann M. Listeria floridensis sp. nov., Listeria aquatica sp. nov., Listeria cornellensis sp. nov., Listeria riparia sp. nov. and Listeria grandensis sp. nov., from agricultural and	den Bakker H.C., Warchocki S., Wright E.M., Allred A.F., Ahlstrom C., Manuel C.S., Stasiewicz M.J., Burrell A., Roof S., Strawn L.K., Fortes E., Nightingale K.K., Kephart D., Wiedmann M. Listeria floridensis sp. nov., Listeria aquatica sp. nov., Listeria cornellensis sp. nov., Listeria riparia sp. nov. and Listeria grandensis sp. nov., from agricultural and natural environments. Int. J. Syst. Evol. Microbiol., 2014, v. 64, no Pt_6, pp. 1882-1889.	[DOI: 10.1099/ijs.0.052720-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	natural environments. Int. J. Syst. Evol. Microbiol., 2014, v. 64, no Pt_6, pp. 1882-1889.		
65.	den Bakker H.C., Manuel C.S., Fortes E.D., Wiedmann M., Nightingale K.K. Genome sequencing identifies Listeria fleischmannii subsp. Coloradonensis subsp. nov., isolated from a ranch. Int. J. Syst. Evol. Microbiol., 2013, v. 63, no Pt_9, pp. 3257-3268.	den Bakker H.C., Manuel C.S., Fortes E.D., Wiedmann M., Nightingale K.K. Genome sequencing identifies Listeria fleischmannii subsp. Coloradonensis subsp. nov., isolated from a ranch. Int. J. Syst. Evol. Microbiol., 2013, v. 63, no Pt_9, pp. 3257-3268.	[DOI: 10.1099/ijs.0.048587-0]
66.	den Bakker H.C., Cummings C.A, Ferreira V., Vatta P., Orsi R.H.,	den Bakker H.C., Cummings C.A, Ferreira V., Vatta P., Orsi R.H., Degoricija L., Barker M., Petrauskene O., Furtado M.R., Wiedmann M.	[DOI: 10.1186/1471-2164-11-688]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Degoricija L., Barker M., Petrauskene O., Furtado M.R., Wiedmann M. Comparative genomics of the bacterial genus *Listeria*: Genome evolution is characterized by limited gene acquisition and limited gene loss. BMC Genomics, 2010, v. 11, no 1, pp. 688-708.	Comparative genomics of the bacterial genus *Listeria*: Genome evolution is characterized by limited gene acquisition and limited gene loss. BMC Genomics, 2010, v. 11, no 1, pp. 688-708.	
67.	Destro M.T., Leitao M.F., Farber J.M. Use of molecular typing methods to trace the dissemination of *Listeria monocytogenes* in a shrimp processing plant. Appl. Environm.	Destro M.T., Leitao M.F., Farber J.M. Use of molecular typing methods to trace the dissemination of *Listeria monocytogenes* in a shrimp processing plant. Appl. Environm. Microbiol., 1996, v. 62, no 2, pp. 705-711.	[DOI: 10.1128/aem.62.2.705-711.1996]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Microbiol., 1996, v. 62, no 2, pp. 705-711.		
68.	Doijad S.P., Poharkar K.V., Kale S.B., Kerkar S., Kalorey D.R., Kurkure N.V., Rawool D.B., Malik S.V.S., Ahmad R.Y., Hudel M., Chaudhari S.P., Abt B., Overmann J., Weigel M., Hain T., Barbuddhe S.B., Chakraborty T. Listeria goaensis sp. nov. Int. J. Syst. Evol. Microbiol., 2018, v. 68, no 10, pp. 3285-3291.	Doijad S.P., Poharkar K.V., Kale S.B., Kerkar S., Kalorey D.R., Kurkure N.V., Rawool D.B., Malik S.V.S., Ahmad R.Y., Hudel M., Chaudhari S.P., Abt B., Overmann J., Weigel M., Hain T., Barbuddhe S.B., Chakraborty T. Listeria goaensis sp. nov. Int. J. Syst. Evol. Microbiol., 2018, v. 68, no 10, pp. 3285-3291.	[DOI: 10.1099/ijsem.0.002980]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

69.	Doumith M., Buchrieser C., Glaser P. Differentiation of the major *Listeria monocytogenes* serovars by multiplex PCR. J. Clin. Microbiol., 2004, v. 42, no. 8, pp. 3819–3822.	Doumith M., Buchrieser C., Glaser P. Differentiation of the major *Listeria monocytogenes* serovars by multiplex PCR. J. Clin. Microbiol., 2004, v. 42, no. 8, pp. 3819–3822.	[DOI: 10.1128/JCM.42.8.3819-3822.2004]
70.	Drolia R., Bhunia A.K. Crossing the intestinal barrier via Listeria adhesion protein and internalin A. Trends Microbiol., 2019, v. 27, no. 5, pp. 408–425.	Drolia R., Bhunia A.K. Crossing the intestinal barrier via Listeria adhesion protein and internalin A. Trends Microbiol., 2019, v. 27, no. 5, pp. 408–425.	[DOI: 10.1016/j.tim.2018.12.007]
71.	Drolia R., Tenguria S., Durkes A.C., Turner J.R., Bhunia A.K. Listeria adhesion protein induces intestinal epithelial barrier	Drolia R., Tenguria S., Durkes A.C., Turner J.R., Bhunia A.K. Listeria adhesion protein induces intestinal epithelial barrier dysfunction for bacterial translocation. Cell Host Microbe, 2018, v. 23, no. 4, pp. 470–484.	[DOI: 10.1016/j.chom.2018.03.004]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	dysfunction for bacterial translocation. Cell Host Microbe, 2018, v. 23, no. 4, pp. 470–484.		
72.	Du X.-J., Zhang X., Wang X.-Y., Su Y.-L., Li P., Wang S. Isolation and characterization of Listeria monocytogenes in Chinese food obtained from the central area of China. Food Control, 2016, v. 74, pp. 9–16.	Du X.-J., Zhang X., Wang X.-Y., Su Y.-L., Li P., Wang S. Isolation and characterization of Listeria monocytogenes in Chinese food obtained from the central area of China. Food Control, 2016, v. 74, pp. 9–16.	[DOI: 10.1016/j.foodcont.2016.11.024]
73.	El-Shenawy M., Manes J., Soriano J.M. Listeria spp. in Street-Vended ReadytoEat Foods. Interdiscip. Perspect.	El-Shenawy M., Manes J., Soriano J.M. Listeria spp. in Street-Vended ReadytoEat Foods. Interdiscip. Perspect. Infect. Dis., 2011, v. 2011, pp. 1-6.	[DOI: 10.1155/2011/968031]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Infect. Dis., 2011, v. 2011, pp. 1-6.		
74.	El-Shenawy M.A. Listeria spp. in the coastal environment of the Aqaba Gulf, Suez Gulf and the Red Sea. Epidemiol. Infect., 2006, v. 134, no. 4, pp. 752–757.	El-Shenawy M.A. Listeria spp. in the coastal environment of the Aqaba Gulf, Suez Gulf and the Red Sea. Epidemiol. Infect., 2006, v. 134, no. 4, pp. 752–757.	[DOI: 10.1017/S0950268805005601]
75.	Ermolaeva S.A., Belyi Yu.F., Tartakovskii I.S. Characteristics of induction of virulence factor expression by activated charcoal in Listeria monocytogenes. FEMS	Ermolaeva S.A., Belyi Yu.F., Tartakovskii I.S. Characteristics of induction of virulence factor expression by activated charcoal in Listeria monocytogenes. FEMS Microbiol. Lett., 1999, v. 174, no. 1, pp. 137-141.	[DOI: 10.1111/j.1574-6968.1999.tb13560.x]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Microbiol. Lett., 1999, v. 174, no. 1, pp. 137-141.		
76.	Forster B.M., Zemansky J., Portnoy D.A., Marquis H. Posttranslocation chaperone PrsA2 regulates the maturation and secretion of Listeria monocytogenes proprotein virulence factors. Journal of Bacteriology, 2011, v. 193, pp. 5961–5970.	Forster B.M., Zemansky J., Portnoy D.A., Marquis H. Posttranslocation chaperone PrsA2 regulates the maturation and secretion of Listeria monocytogenes proprotein virulence factors. Journal of Bacteriology, 2011, v. 193, pp. 5961–5970.	[DOI: 10.1128/JB.05307-11]
77.	Freitag N.E., Port G.C., Miner M.D. Listeria monocytogenes - from saprophyte to intracellular	Freitag N.E., Port G.C., Miner M.D. Listeria monocytogenes - from saprophyte to intracellular pathogen. Nature Reviews Microbiology, 2009, v. 7, no. 9, pp. 623–628.	[DOI: 10.1038/nrmicro2171]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	pathogen. Nature Reviews Microbiology, 2009, v. 7, no. 9, pp. 623–628.		
78.	Gaballa A, Guariglia-Oropeza V, Wiedmann M, Boor KJ. Cross Talk between SigB and PrfA in *Listeria monocytogenes* Facilitates Transitions between Extra- and Intracellular Environments. Microbiology and Molecular Biology Reviews, 2019, v. 83, no. 4, pp. e00034-19.	Gaballa A, Guariglia-Oropeza V, Wiedmann M, Boor KJ. Cross Talk between SigB and PrfA in *Listeria monocytogenes* Facilitates Transitions between Extra- and Intracellular Environments. Microbiology and Molecular Biology Reviews, 2019, v. 83, no. 4, pp. e00034-19.	[DOI: 10.1128/MMBR.00034-19]
79.	Gana J., Gcebe N., Pierneef R., Moerane R., Adesiyun	Gana J., Gcebe N., Pierneef R., Moerane R., Adesiyun A.A. Multiple-Locus Variable-	[DOI: 10.4315/jfp-22-081]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	A.A. Multiple-Locus Variable-Number Tandem Repeat Analysis Genotypes of Listeria monocytogenes Isolated from Farms, Abattoirs, and Retail in Gauteng Province, South Africa. J. Food Prot., 2022, v. 85, no. 9, pp. 1249–1257.	Number Tandem Repeat Analysis Genotypes of Listeria monocytogenes Isolated from Farms, Abattoirs, and Retail in Gauteng Province, South Africa. J. Food Prot., 2022, v. 85, no. 9, pp. 1249–1257.	
80.	Gasanov U., Hughes D., Hansbro P.M. Methods for the isolation and identification of Listeria spp. and Listeria monocytogenes: a review. FEMS Microbiology Reviews, 2005, v. 29, no. 5, pp. 851-875.	Gasanov U., Hughes D., Hansbro P.M. Methods for the isolation and identification of Listeria spp. and Listeria monocytogenes: a review. FEMS Microbiology Reviews, 2005, v. 29, no. 5, pp. 851-875.	[DOI: 10.1016/j.femsre.2004.12.002]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

81.	Gómez D., Azón E., Marco N., Carramiñana J.J., Rota C., Ariño A., Yangüela J. Antimicrobial resistance of Listeria monocytogenes and Listeria innocua from meat products and meat-processing environment. Food Microbiol., 2014, v. 42, pp. 61-65.	Gómez D., Azón E., Marco N., Carramiñana J.J., Rota C., Ariño A., Yangüela J. Antimicrobial resistance of Listeria monocytogenes and Listeria innocua from meat products and meat-processing environment. Food Microbiol., 2014, v. 42, pp. 61-65.	[DOI: 10.1016/j.fm.2014.02.017]
82.	Gouin E., Mengaud J., Cossart P. The virulence gene cluster of *Listeria monocytogenes* is also *present in Listeria ivanovii*, an animal pathogen, and *Listeria seeligeri*, a nonpathogenic species.	Gouin E., Mengaud J., Cossart P. The virulence gene cluster of *Listeria monocytogenes* is also *present in Listeria ivanovii*, an animal pathogen, and *Listeria seeligeri*, a nonpathogenic species. Infect. Immun., 1994, v. 62, no. 8, pp. 3550-3553.	[DOI: 10.1128/iai.62.8.3550-3553.1994]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Infect. Immun., 1994, v. 62, no. 8, pp. 3550-3553.		
83.	Graves L.M., Helsel L.O., Steigerwalt A.G., Morey R.E., Daneshvar M.I., Roof S.E., Orsi R.H., Fortes E.D., Milillo S.R., Den Bakker H.C., Wiedmann M., Swaminathan B., Sauders B.D. Listeria marthii sp. nov., isolated from the natural environment, Finger Lakes National Forest. Int. J. Syst. Evol. Microbiol., 2010, v. 60, no. 6, pp. 1280-1288.	Graves L.M., Helsel L.O., Steigerwalt A.G., Morey R.E., Daneshvar M.I., Roof S.E., Orsi R.H., Fortes E.D., Milillo S.R., Den Bakker H.C., Wiedmann M., Swaminathan B., Sauders B.D. Listeria marthii sp. nov., isolated from the natural environment, Finger Lakes National Forest. Int. J. Syst. Evol. Microbiol., 2010, v. 60, no. 6, pp. 1280-1288.	[DOI: 10.1099/ijs.0.014118-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

84.	Grenningloh R., Darji A., Wehland J., Chakaraborty T., Weiss S. Listeriolysin and IrpA are major protein targets of the human humoral response against Listeria monocytogenes. Infect. Immun., 1997, v. 65, no. 9, pp. 3976-3980.	Grenningloh R., Darji A., Wehland J., Chakaraborty T., Weiss S. Listeriolysin and IrpA are major protein targets of the human humoral response against Listeria monocytogenes. Infect. Immun., 1997, v. 65, no. 9, pp. 3976-3980.	[DOI: 10.1128/iai.65.9.3976-3980.1997]
85.	Gudmundsdottir S., Gudbjornsdottir B., Lauzon H.L., Einarsson H., Kristinsson K.G. Listeria monocytogenes isolates from cold-smoked salmon and its processing environment in Iceland using pulsed-field gel	Gudmundsdottir S., Gudbjornsdottir B., Lauzon H.L., Einarsson H., Kristinsson K.G. Listeria monocytogenes isolates from cold-smoked salmon and its processing environment in Iceland using pulsed-field gel electrophoresis. Int. J. Food Microbiol., 2005, v. 101, no. 1, pp. 41–51.	[DOI: https://doi.org/10.1016/j.ijfoodmicro.2004.08.023]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	electrophoresis. Int. J. Food Microbiol., 2005, v. 101, no. 1, pp. 41–51.		
86.	Hain T., Steinweg C., Kuenne C.T., Billion A., Ghai R., Chatterjee S.S., Domann E., Kärst U., Goesmann A., Bekel T., Bartels D., Kaiser O., Meyer F., Pühler A., Weisshaar B., Wehland J., Liang C., Dandekar T., Lampidis R., Kreft J., Goebel W., Chakraborty T. Whole-genome sequence of Listeria welshimeri reveals common steps in genome reduction with Listeria	Hain T., Steinweg C., Kuenne C.T., Billion A., Ghai R., Chatterjee S.S., Domann E., Kärst U., Goesmann A., Bekel T., Bartels D., Kaiser O., Meyer F., Pühler A., Weisshaar B., Wehland J., Liang C., Dandekar T., Lampidis R., Kreft J., Goebel W., Chakraborty T. Whole-genome sequence of Listeria welshimeri reveals common steps in genome reduction with Listeria innocua as compared to Listeria monocytogenes. J. Bacteriol., 2006, v. 188, no. 21, pp. 7405-7415.	[DOI: 10.1128/JB.00758-06]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	innocua as compared to Listeria monocytogenes. J. Bacteriol., 2006, v. 188, no. 21, pp. 7405-7415.		
87.	Harter E., Wagner E.M., Zaiser A., Halecker S., Wagner M., Rychli K. Stress Survival Islet 2, Predominantly Present in *Listeria monocytogenes* Strains of Sequence Type 121, Is Involved in the Alkaline and Oxidative Stress Responses. Applied and Environmental Microbiology, 2017, v. 83, no. 16, e00827-17.	Harter E., Wagner E.M., Zaiser A., Halecker S., Wagner M., Rychli K. Stress Survival Islet 2, Predominantly Present in *Listeria monocytogenes* Strains of Sequence Type 121, Is Involved in the Alkaline and Oxidative Stress Responses. Applied and Environmental Microbiology, 2017, v. 83, no. 16, e00827-17.	[DOI: 10.1128/AEM.00827-17]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

88.	Hwang C.-A., Sheen S., Juneja V.K. Effect of salt, smoke compound, and temperature on the survival of Listeria monocytogenes in salmon during simulated smoking processes. J. Food Sci, 2009, v. 74, no. 9, pp. 522-529.	Hwang C.-A., Sheen S., Juneja V.K. Effect of salt, smoke compound, and temperature on the survival of Listeria monocytogenes in salmon during simulated smoking processes. J. Food Sci, 2009, v. 74, no. 9, pp. 522-529.	[DOI: 10.1111/j.1750-3841.2009.01377.x]
89.	Jadhav S., Gulati V., Fox E.M., Karpe A., Beale D.J., Sevior D., Bhave M., Palombo E.A. Rapid identification and source-tracking of *Listeria monocytogenes* using MALDITOF mass spectrometry. Int. J. Food	Jadhav S., Gulati V., Fox E.M., Karpe A., Beale D.J., Sevior D., Bhave M., Palombo E.A. Rapid identification and source-tracking of *Listeria monocytogenes* using MALDITOF mass spectrometry. Int. J. Food Microbiol., 2015, v. 202, pp. 1-9.	[DOI: 10.1016/j.ijfoodmicro.2015.01.023]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Microbiol., 2015, v. 202, pp. 1-9.		
90.	Jadhav S., Bhave M., Palombo E.A. Methods used for the detection and subtyping of Listeria monocytogenes. J. Microbiol. Methods, 2012, v. 88, no. 3, pp. 327–341.	Jadhav S., Bhave M., Palombo E.A. Methods used for the detection and subtyping of Listeria monocytogenes. J. Microbiol. Methods, 2012, v. 88, no. 3, pp. 327–341.	[DOI: 10.1016/j.mimet.2012.01.002]
91.	Jagadeesan B., Koo O.K., Kim K.-P., Burkholder K.M., Mishra K.K., Aroonnual A., Bhunia A.K. LAP, an alcohol acetaldehyde dehydrogenase enzyme in Listeria promotes bacterial adhesion to enterocyte-like	Jagadeesan B., Koo O.K., Kim K.-P., Burkholder K.M., Mishra K.K., Aroonnual A., Bhunia A.K. LAP, an alcohol acetaldehyde dehydrogenase enzyme in Listeria promotes bacterial adhesion to enterocyte-like Caco-2 cells only in pathogenic species. Microbiology, 2010, v. 156, no. 9, pp. 2782–2795.	[DOI: 10.1099/mic.0.036509-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Caco-2 cells only in pathogenic species. Microbiology, 2010, v. 156, no. 9, pp. 2782–2795.		
92.	Jahan M., Holley R.A. Transfer of antibiotic resistance from Enterococcus faecium of fermented meat origin to Listeria monocytogenes and Listeria innocua. Lett. Appl. Microbiol., 2016, v. 62, no. 4, pp. 304-310.	Jahan M., Holley R.A. Transfer of antibiotic resistance from Enterococcus faecium of fermented meat origin to Listeria monocytogenes and Listeria innocua. Lett. Appl. Microbiol., 2016, v. 62, no. 4, pp. 304-310.	[DOI: 10.1111/lam.12553]
93.	Junttila J.R., Niemela S.I., Hirn J. Minimum growth temperatures of Listeria monocytogenes and non-haemolytic listeria. J Appl.	Junttila J.R., Niemela S.I., Hirn J. Minimum growth temperatures of Listeria monocytogenes and non-haemolytic listeria. J Appl. Bacteriol., 1988, v. 65, no. 4, pp. 321-327.	[DOI: https://doi.org/10.1111/j.1365-2672.1988.tb01898.x]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Bacteriol., 1988, v. 65, no. 4, pp. 321-327.		
94.	Kaszoni-Rückerl I., Mustedanagic A., Muri-Klinger S., Brugger K., Wagner K.H., Wagner M., Stessl B. Predominance of Distinct Listeria Innocua and Listeria Monocytogenes in Recurrent Contamination Events at Dairy Processing Facilities. Microorganisms, 2020, v. 8, no. 2, pp. 234.	Kaszoni-Rückerl I., Mustedanagic A., Muri-Klinger S., Brugger K., Wagner K.H., Wagner M., Stessl B. Predominance of Distinct Listeria Innocua and Listeria Monocytogenes in Recurrent Contamination Events at Dairy Processing Facilities. Microorganisms, 2020, v. 8, no. 2, pp. 234.	[DOI: 10.3390/microorganisms8020234]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

95.	Kathariou S., Kanenaka R., Allen R.D., Fok A.K., Mizumoto C. Repression of motility and flagellin production at 37 degrees C is stronger in Listeria monocytogenes than in the nonpathogenic species Listeria innocua. Can. J. Microbiol., 1995, v. 41, no. 7, pp. 572-577.	Kathariou S., Kanenaka R., Allen R.D., Fok A.K., Mizumoto C. Repression of motility and flagellin production at 37 degrees C is stronger in Listeria monocytogenes than in the nonpathogenic species Listeria innocua. Can. J. Microbiol., 1995, v. 41, no. 7, pp. 572-577.	[DOI: 10.1139/m95-076]
96.	Keeney K.M., Stuckey J.A., O'Riordan M.X.D. LplA1-dependent utilization of host lipoyl peptides enables Listeria cytosolic growth and virulence. Molecular	Keeney K.M., Stuckey J.A., O'Riordan M.X.D. LplA1-dependent utilization of host lipoyl peptides enables Listeria cytosolic growth and virulence. Molecular Microbiology, 2007, v. 66, pp. 758–770.	[DOI: 10.1111/j.1365-2958.2007.05956.x]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Microbiology, 2007, v. 66, pp. 758–770.		
97.	Koopmans M.M., Bijlsma M.W., Brouwer M.C., van de Beek D., van der Ende A. *Listeria monocytogenes* meningitis in the Netherlands, 1985-2014: A nationwide surveillance study. The Journal of infection, 2017, v. 75, no. 1, pp. 12-19.	Koopmans M.M., Bijlsma M.W., Brouwer M.C., van de Beek D., van der Ende A. *Listeria monocytogenes* meningitis in the Netherlands, 1985-2014: A nationwide surveillance study. The Journal of infection, 2017, v. 75, no. 1, pp. 12-19.	[DOI: 10.1016/j.jinf.2017.04.004]
98.	Laksanalamai P., Huang B., Sabo, J., Burall L.S., Zhao S., Bates J., Datta A.R. Genomic Characterization of Novel Listeria monocytogenes Serotype 4b	Laksanalamai P., Huang B., Sabo, J., Burall L.S., Zhao S., Bates J., Datta A.R. Genomic Characterization of Novel Listeria monocytogenes Serotype 4b Variant Strains. PLoS ONE, 2014, v. 9, no. 2, e89024.	[DOI: 10.1371/journal.pone.0089024]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Variant Strains. PLoS ONE, 2014, v. 9, no. 2, e89024.		
99.	Lang Halter E., Neuhaus K., Scherer S. Listeria weihenstephanensis sp. nov., isolated from the water plant Lemna trisulca taken from a fresh water pond. Int. J. Syst. Evol. Microbiol., 2013, v. 63, no. Pt_2, pp. 641-647.	Lang Halter E., Neuhaus K., Scherer S. Listeria weihenstephanensis sp. nov., isolated from the water plant Lemna trisulca taken from a fresh water pond. Int. J. Syst. Evol. Microbiol., 2013, v. 63, no. Pt_2, pp. 641-647.	[DOI: 10.1099/ijs.0.036830-0]
100.	Leclercq A., Clermont D., Bizet C., Grimont P.A., Le Fleche-Mateos A., Roche S.M., Buchrieser C., Cadet-Daniel V., Le Monnier A.,	Leclercq A., Clermont D., Bizet C., Grimont P.A., Le Fleche-Mateos A., Roche S.M., Buchrieser C., Cadet-Daniel V., Le Monnier A., Lecuit M., Allerberger F. Listeria rocourtiae sp.	[DOI: 10.1099/ijs.0.017376-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Lecuit M., Allerberger F. Listeria rocourtiae sp. nov. Int. J. Syst. Evol. Microbiol., 2010, v. 60, no. 9, pp. 2210-2214.	nov. Int. J. Syst. Evol. Microbiol., 2010, v. 60, no. 9, pp. 2210-2214.	
101.	Lee S., Ward T.J., Graves L.M., Wolf L.A., Sperry K., Siletzky R.M., Kathariou S. Atypical Listeria monocytogenes serotype 4b strains harboring a lineage II-specific gene cassette. Appl. Environ. Microbiol., 2012, v. 78, no. 3, pp. 660-667.	Lee S., Ward T.J., Graves L.M., Wolf L.A., Sperry K., Siletzky R.M., Kathariou S. Atypical Listeria monocytogenes serotype 4b strains harboring a lineage II-specific gene cassette. Appl. Environ. Microbiol., 2012, v. 78, no. 3, pp. 660-667.	[DOI: 10.1128/AEM.06378-11]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

102.	Li M., Yan S., Fanning S., Li F., Xu J. Whole Genome Analysis of Three Multi-Drug Resistant Listeria innocua and Genomic Insights Into Their Relatedness With Resistant Listeria monocytogenes. Front. Microbiol., 2021, v. 12, pp. 694361-694369.	Li M., Yan S., Fanning S., Li F., Xu J. Whole Genome Analysis of Three Multi-Drug Resistant Listeria innocua and Genomic Insights Into Their Relatedness With Resistant Listeria monocytogenes. Front. Microbiol., 2021, v. 12, pp. 694361-694369.	[DOI: 10.3389/fmicb.2021.694361]
103.	Liao Y., Liu L., Zhou H., Fang F., Liu X. Case Report: Refractory Listeria innocua Meningoencephalitis in a Three-Year-Old Boy. Front. Pediatr., 2022, v. 10, pp. 857900-857905.	Liao Y., Liu L., Zhou H., Fang F., Liu X. Case Report: Refractory Listeria innocua Meningoencephalitis in a Three-Year-Old Boy. Front. Pediatr., 2022, v. 10, pp. 857900-857905.	[DOI: 10.3389/fped.2022.857900]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

104.	Locatelli A., Lewis M.A., Rothrock M.J.Jr. The Distribution of Listeria in Pasture-Raised Broiler Farm Soils Is Potentially Related to University of Vermont Medium Enrichment Bias toward Listeria innocua over Listeria monocytogenes. Front. Vet. Sci., 2017, v. 4, pp. 227-237.	Locatelli A., Lewis M.A., Rothrock M.J.Jr. The Distribution of Listeria in Pasture-Raised Broiler Farm Soils Is Potentially Related to University of Vermont Medium Enrichment Bias toward Listeria innocua over Listeria monocytogenes. Front. Vet. Sci., 2017, v. 4, pp. 227-237.	[DOI: 10.3389/fvets.2017.00227]
105.	Lomonaco S., Nucera D., Filipello V. The evolution and epidemiology of *Listeria monocytogenes* in Europe and the United	Lomonaco S., Nucera D., Filipello V. The evolution and epidemiology of *Listeria monocytogenes* in Europe and the United States. Infect. Genet. Evol,. 2015, v. 35, pp. 172-183.	[DOI: 10.1016/j.meegid.2015.08.008]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	States. Infect. Genet. Evol,. 2015, v. 35, pp. 172-183.		
106.	Luque-Sastre L., Arroyo C., Fox E.M., McMahon B.J., Bai L., Li F., Fanning S. Antimicrobial Resistance in Listeria Species. Microbiol. Spectr., 2018, v. 6, no. 4.	Luque-Sastre L., Arroyo C., Fox E.M., McMahon B.J., Bai L., Li F., Fanning S. Antimicrobial Resistance in Listeria Species. Microbiol. Spectr., 2018, v. 6, no. 4.	[DOI: 10.1128/microbiolspec.ARBA-0031-2017]
107.	Maćkiw E., Stasiak M., Kowalska J., Kucharek K., Korsak D., Postupolski J. Occurrence and characteristics of *Listeria monocytogenes* in ready-to-eat meat products in Poland. Journal of food protection.	Maćkiw E., Stasiak M., Kowalska J., Kucharek K., Korsak D., Postupolski J. Occurrence and characteristics of *Listeria monocytogenes* in ready-to-eat meat products in Poland. Journal of food protection. 2020, v. 83, no. 6, pp. 1002-1009.	[DOI: 10.4315/JFP-19-525]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	2020, v. 83, no. 6, pp. 1002-1009.		
108.	Manqele A., Gcebe N., Pierneef R.E., Moerane R., Adesiyun A.A. Identification of Listeria species and Multilocus Variable-Number Tandem Repeat Analysis (MLVA) Typing of Listeria innocua and Listeria monocytogenes Isolates from Cattle Farms and Beef and Beef-Based Products from Retail Outlets in Mpumalanga and North West Provinces,	Manqele A., Gcebe N., Pierneef R.E., Moerane R., Adesiyun A.A. Identification of Listeria species and Multilocus Variable-Number Tandem Repeat Analysis (MLVA) Typing of Listeria innocua and Listeria monocytogenes Isolates from Cattle Farms and Beef and Beef-Based Products from Retail Outlets in Mpumalanga and North West Provinces, South Africa. Pathogens, 2023, v. 12, no. 1, pp. 147.	[DOI: 10.3390/pathogens12010147]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	South Africa. Pathogens, 2023, v. 12, no. 1, pp. 147.		
109.	Martín B., Bover-Cid S., Aymerich T. MLVA subtyping of Listeria monocytogenes isolates from meat products and meat processing plants. Food Res. Int., 2018, v. 106, pp. 225–232.	Martín B., Bover-Cid S., Aymerich T. MLVA subtyping of Listeria monocytogenes isolates from meat products and meat processing plants. Food Res. Int., 2018, v. 106, pp. 225–232.	[DOI: 10.1016/j.foodres.2017.12.052]
110.	Matto C., D'Alessandro B., Mota M.I., Braga V., Buschiazzo A., Gianneechini E., Varela G., Rivero R. Listeria innocua isolated from diseased	Matto C., D'Alessandro B., Mota M.I., Braga V., Buschiazzo A., Gianneechini E., Varela G., Rivero R. Listeria innocua isolated from diseased ruminants harbour minor virulence genes of L. monocytogenes. Vet. Med. Sci., 2022, v. 8, no. 2, pp. 735-740.	[DOI: 10.1002/vms3.710]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	ruminants harbour minor virulence genes of L. monocytogenes. Vet. Med. Sci., 2022, v. 8, no. 2, pp. 735-740.		
111.	Maury M.M., Bracq-Dieye H., Huang L., Vales G., Lavina M., Thouvenot P., Disson O., Leclercq A., Brisse S., Lecuit M. Hypervirulent Listeria monocytogenes clones' adaption to mammalian gut accounts for their association with dairy products. Nature Communications, 2019, v. 10, no. 1, pp. 2488-2500.	Maury M.M., Bracq-Dieye H., Huang L., Vales G., Lavina M., Thouvenot P., Disson O., Leclercq A., Brisse S., Lecuit M. Hypervirulent Listeria monocytogenes clones' adaption to mammalian gut accounts for their association with dairy products. Nature Communications, 2019, v. 10, no. 1, pp. 2488-2500.	[DOI: 10.1038/s41467-019-10380-0]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

112.	Maury M.M., Tsai Y.-H.H., Charlier C., Touchon M., Chenal-Francisque V., Leclercq A., Criscuolo A., Gaultier C., Roussel S., Brisabois A., Disson O., Rocha E.P.C., Brisse S., Lecuit M. Uncovering Listeria monocytogenes hypervirulence by harnessing its biodiversity. Nat. Genet., 2016, v. 48, pp. 308–313.	Maury M.M., Tsai Y.-H.H., Charlier C., Touchon M., Chenal-Francisque V., Leclercq A., Criscuolo A., Gaultier C., Roussel S., Brisabois A., Disson O., Rocha E.P.C., Brisse S., Lecuit M. Uncovering Listeria monocytogenes hypervirulence by harnessing its biodiversity. Nat. Genet., 2016, v. 48, pp. 308–313.	[DOI: 10.1038/ng.3501]
113.	Meinersmann R., Phillips R.W., Wiedmann M., Berrang M.E. Multilocus sequence typing of *Listeria monocytogenes* by use of	Meinersmann R., Phillips R.W., Wiedmann M., Berrang M.E. Multilocus sequence typing of *Listeria monocytogenes* by use of hypervariable genes reveals clonal and recombination histories	[DOI: 10.1128/AEM.70.4.2193-2203.2004]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	hypervariable genes reveals clonal and recombination histories of three lineages. Appl. Environ. Microbiol., 2004, v. 70, no. 4, pp. 2193–2203.	of three lineages. Appl. Environ. Microbiol., 2004, v. 70, no. 4, pp. 2193–2203.	
114.	Meireles D., Pombinho R., Carvalho F., Sous, S., Cabane, D. Listeria monocytogenes wall teichoic acid glycosylation promotes surface anchoring of virulence factors, resistance to antimicrobial peptides, and decreased susceptibility to antibiotics. Pathogens, 2020, v. 9, no. 4, p. 290.	Meireles D., Pombinho R., Carvalho F., Sous, S., Cabane, D. Listeria monocytogenes wall teichoic acid glycosylation promotes surface anchoring of virulence factors, resistance to antimicrobial peptides, and decreased susceptibility to antibiotics. Pathogens, 2020, v. 9, no. 4, p. 290.	[DOI: 10.3390/pathogens9040290]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

115.	Melo J., Andrew P.W., Faleiro M.L. Listeria monocytogenes in cheese and the dairy environment remains a food safety challenge: the role of stress responses. Food Res. Int., 2015, v. 67, pp. 75-90.	Melo J., Andrew P.W., Faleiro M.L. Listeria monocytogenes in cheese and the dairy environment remains a food safety challenge: the role of stress responses. Food Res. Int., 2015, v. 67, pp. 75-90.	[DOI: 10.1016/j.foodres.2014.10.031]
116.	Milillo S.R., Friedly E.C., Saldivar J.C., Muthaiyan A., O'Bryan C., Crandall P.G., Johnson M.G., Ricke S.C. A review of the ecology, genomics, and stress response of Listeria innocua and Listeria monocytogenes. Crit. Rev.	Milillo S.R., Friedly E.C., Saldivar J.C., Muthaiyan A., O'Bryan C., Crandall P.G., Johnson M.G., Ricke S.C. A review of the ecology, genomics, and stress response of Listeria innocua and Listeria monocytogenes. Crit. Rev. Food Sci. Nutr., 2012, v. 52, no. 8, pp. 712-725.	[DOI: 10.1080/10408398.2010.507909]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Food Sci. Nutr., 2012, v. 52, no. 8, pp. 712-725.		
117.	Montazeri N., Himelbloom B.H., Oliveira A.C., Leigh M.B., Crapo C.A. Refined liquid smoke: a potential antiListerial additive to coldsmoked sockeye salmon (Oncorhynchus nerka). J. Food Prot., 2013, v. 76, no. 5, pp. 812–819.	Montazeri N., Himelbloom B.H., Oliveira A.C., Leigh M.B., Crapo C.A. Refined liquid smoke: a potential antiListerial additive to coldsmoked sockeye salmon (Oncorhynchus nerka). J. Food Prot., 2013, v. 76, no. 5, pp. 812–819.	[DOI: 10.4315/0362-028X.JFP-12-368]
118.	Montero D., Bodero M., Riveros G., Lapierre L., Gaggero A., Vidal R.M., et al. Molecular epidemiology and genetic diversity of	Montero D., Bodero M., Riveros G., Lapierre L., Gaggero A., Vidal R.M., et al. Molecular epidemiology and genetic diversity of Listeria monocytogenes isolates from a wide variety of ready-toeat foods and their relationship to	[DOI: 10.3389/fmicb.2015.00384]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Listeria monocytogenes isolates from a wide variety of ready-toeat foods and their relationship to clinical strains from listeriosis outbreaks in Chile. Front Microbiol., 2015, v. 6, pp. 384.	clinical strains from listeriosis outbreaks in Chile. Front Microbiol., 2015, v. 6, pp. 384.	
119.	Murray E.G.D, Webb R.A., Swann M.B.R. A disease of rabbits characterized by large mononuclear leucocytosis caused by a hitherto und escribed bacillus Bacterium monocytogenes (n.sp.). J. Pathol. Bacteriol., 1926, v. 29, no. 4, pp. 407-439.	Murray E.G.D, Webb R.A., Swann M.B.R. A disease of rabbits characterized by large mononuclear leucocytosis caused by a hitherto und escribed bacillus Bacterium monocytogenes (n.sp.). J. Pathol. Bacteriol., 1926, v. 29, no. 4, pp. 407-439.	[DOI: 10.1002/path.1700290409]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

120.	NicAogain K., O'Byrne C.P. The role of stress and stress adaptations in determining the fate of the bacterial pathogen Listeria monocytogenes in the food Chain. Frontiers Microbiology, 2016, v. 7, no. 1865, pp. 1-16.	NicAogain K., O'Byrne C.P. The role of stress and stress adaptations in determining the fate of the bacterial pathogen Listeria monocytogenes in the food Chain. Frontiers Microbiology, 2016, v. 7, no. 1865, pp. 1-16.	[DOI: 10.3389/fmicb.2016.01865]
121.	Nightingale K., Windham K., Wiedmann M. Evolution and molecular phylogeny of *Listeria monocytogenes* isolated from human and animal listeriosis cases and foods. J. Bacteriol., 2005, v. 187, no. 16, pp. 5537–5551.	Nightingale K., Windham K., Wiedmann M. Evolution and molecular phylogeny of *Listeria monocytogenes* isolated from human and animal listeriosis cases and foods. J. Bacteriol., 2005, v. 187, no. 16, pp. 5537–5551.	[DOI: 10.1128/JB.187.16.5537-5551.2005]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

122.	Norton D.M. Polimerase chain reaction-based methods for detection of *Listeria monocytogenes*: Toward real-time screening for food and environmental samples. J. AOAC Int., 2002, v. 85, no. 2, pp. 505–515.	Norton D.M. Polimerase chain reaction-based methods for detection of *Listeria monocytogenes*: Toward real-time screening for food and environmental samples. J. AOAC Int., 2002, v. 85, no. 2, pp. 505–515.	[DOI: 10.1093/jaoac/85.2.505]
123.	Nunez-Montero K., Leclercq A., Moura A., Vales G., Peraza J., Pizarro-Cerda J., Lecuit M. Listeria costaricensis sp. nov. Int. J. Syst. Evol. Microbiol., 2018, v. 68, pp. 844–850.	Nunez-Montero K., Leclercq A., Moura A., Vales G., Peraza J., Pizarro-Cerda J., Lecuit M. Listeria costaricensis sp. nov. Int. J. Syst. Evol. Microbiol., 2018, v. 68, pp. 844–850.	[DOI: 10.1099/ijsem.0.002596]

124.	O'Driscoll B., Gahan C.G.M., Hill C. Adaptive acid tolerance response in Listeria monocytogenes: isolation of an acid-tolerant mutant which demonstrates increased virulence. Appl. Environ. Microbiol., 1996, v. 62, no. 5, pp. 1693-1698.	O'Driscoll B., Gahan C.G.M., Hill C. Adaptive acid tolerance response in Listeria monocytogenes: isolation of an acid-tolerant mutant which demonstrates increased virulence. Appl. Environ. Microbiol., 1996, v. 62, no. 5, pp. 1693-1698.	[DOI: 10.1128/aem.62.5.1693-1698.1996]
125.	Ojima-Kato T., Yamamoto N., Takahashi H., Tamura H.. Matrix-assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry (MALDITOF MS) Can Precisely Discriminate the Lineages of *Listeria monocytogenes*	Ojima-Kato T., Yamamoto N., Takahashi H., Tamura H.. Matrix-assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry (MALDITOF MS) Can Precisely Discriminate the Lineages of *Listeria monocytogenes* and Species of *Listeria*. PLoS One, 2016, v. 11, no. 7, e0159730.	[DOI: 10.1371/journal.pone.0159730]

10.15789/2220-7619-BFA-17639

	and Species of *Listeria*. PLoS One, 2016, v. 11, no. 7, e0159730.		
126.	Orsi R.H., Wiedmann M. Characteristics and distribution of Listeria spp., including Listeria species newly described since 2009. Appl. Microbiol. Biotechnol., 2016, v. 100, no. 12, pp. 5273-5287.	Orsi R.H., Wiedmann M. Characteristics and distribution of Listeria spp., including Listeria species newly described since 2009. Appl. Microbiol. Biotechnol., 2016, v. 100, no. 12, pp. 5273-5287.	[DOI: 10.1007/s00253-016-7552-2]
127.	Osanai A., Li S.H., Asano K., Sashinami H., Hu D.L., Nakane A. Fibronectin-binding protein, FbpA, is the adhesin responsable for pathogenesis of Listeria monocytogenes infection.	Osanai A., Li S.H., Asano K., Sashinami H., Hu D.L., Nakane A. Fibronectin-binding protein, FbpA, is the adhesin responsable for pathogenesis of Listeria monocytogenes infection. Microbiology and Immunology, 2013, v. 57, pp. 253–262.	[DOI: 10.1111/1348-0421.12030]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Microbiology and Immunology, 2013, v. 57, pp. 253–262.		
128.	Papagianni M. Ribosomally synthesized peptides with antimicrobial properties: biosynthesis, structure, function and applications. Biotechnol. Adv., 2003, v. 21, no. 6, pp. 465-499.	Papagianni M. Ribosomally synthesized peptides with antimicrobial properties: biosynthesis, structure, function and applications. Biotechnol. Adv., 2003, v. 21, no. 6, pp. 465-499.	[DOI: 10.1016/s0734-9750(03)00077-6]
129.	Paramithiotis S., Hadjilouka A., Drosinos E.H. "Listeria Pathogenicity Island 1. Structure and function" in Listeria Monocytogenes: food sources, prevalence and management strategies.	Paramithiotis S., Hadjilouka A., Drosinos E.H. "Listeria Pathogenicity Island 1. Structure and function" in Listeria Monocytogenes: food sources, prevalence and management strategies. Ed. E.C. Hambrick, 2014, pp. 265–282	[https://www.researchgate.net/publication/272090200_Listeria_pathogenicity_island_1_Structure_and_function]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Ed. E.C. Hambrick, 2014, pp. 265–282		
130.	Patange A., O'Byrne C., Boehm D., Cullen P.J., Keener K., Bourke P. The Effect of Atmospheric Cold Plasma on Bacterial Stress Responses and Virulence Using *Listeria monocytogenes* Knockout Mutants. Frontiers in Microbiology, 2019, v. 10, pp. 2841.	Patange A., O'Byrne C., Boehm D., Cullen P.J., Keener K., Bourke P. The Effect of Atmospheric Cold Plasma on Bacterial Stress Responses and Virulence Using *Listeria monocytogenes* Knockout Mutants. Frontiers in Microbiology, 2019, v. 10, pp. 2841.	[DOI: 10.3389/fmicb.2019.02841]
131.	Poimenidou S.V., Dalmasso M., Papadimitriou K., Fox E.M., Skandamis P.N.,	Poimenidou S.V., Dalmasso M., Papadimitriou K., Fox E.M., Skandamis P.N., Jordan K. Virulence Gene Sequencing Highlights	[DOI: 10.3389/fmicb.2018.01103]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Jordan K. Virulence Gene Sequencing Highlights Similarities and Differences in Sequences in *Listeria monocytogenes* Serotype 1/2a and 4b Strains of Clinical and Food Origin From 3 Different Geographic Locations. Frontiers in Microbiology, 2018, v. 9, pp. 1103.	Similarities and Differences in Sequences in *Listeria monocytogenes* Serotype 1/2a and 4b Strains of Clinical and Food Origin From 3 Different Geographic Locations. Frontiers in Microbiology, 2018, v. 9, pp. 1103.	
132.	Quereda J.J., Nahori M.A., Meza-Torres J., Sachse M., Titos-Jiménez P., Gomez-Laguna J., Dussurget O., Cossart P., Pizarro-Cerdá J. Listeriolysin S is a streptolysin S-like virulence	Quereda J.J., Nahori M.A., Meza-Torres J., Sachse M., Titos-Jiménez P., Gomez-Laguna J., Dussurget O., Cossart P., Pizarro-Cerdá J. Listeriolysin S is a streptolysin S-like virulence factor that targets exclusively prokaryotic cells in vivo. mBio, 2017, v. 8, no. 2.	[DOI: 10.1128/mbio.00259-17]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	factor that targets exclusively prokaryotic cells in vivo. mBio, 2017, v. 8, no. 2.		
133.	Rae C.S., Geissler A., Adamson P.C., Portnoy D.A. Mutations of the Listeria monocytogenes peptidoglycan N-deacetylase and O-acetylase result in enhanced lysozyme sentivity, bacteriolysis, and hyper induction of innate immune pathways. Infection and Immunity, 2011, v. 79, no. 9, pp. 3596–3606.	Rae C.S., Geissler A., Adamson P.C., Portnoy D.A. Mutations of the Listeria monocytogenes peptidoglycan N-deacetylase and O-acetylase result in enhanced lysozyme sentivity, bacteriolysis, and hyper induction of innate immune pathways. Infection and Immunity, 2011, v. 79, no. 9, pp. 3596–3606.	[DOI: 10.1128/IAI.00077-11]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

134.	Raveneau J., Geoffroy C., Beretti J.L., Gaillard J.L., Alouf J.E., Berche P. Reduced virulence of a Listeria monocytogenes phospholipase-deficient mutant obtained by transposon insertion into the zinc metalloprotease gene. Infect. Immun., 1992, v. 60, pp. 916–921.	Raveneau J., Geoffroy C., Beretti J.L., Gaillard J.L., Alouf J.E., Berche P. Reduced virulence of a Listeria monocytogenes phospholipase-deficient mutant obtained by transposon insertion into the zinc metalloprotease gene. Infect. Immun., 1992, v. 60, pp. 916–921.	[DOI: 10.1128/iai.60.3.916-921.1992]
135.	Réglier-Poupet H., Pellegrini E., Charbit A., Berche P. Identification of LpeA, a PsaA-like membrane protein that promotes cell entry by Listeria monocytogenes.	Réglier-Poupet H., Pellegrini E., Charbit A., Berche P. Identification of LpeA, a PsaA-like membrane protein that promotes cell entry by Listeria monocytogenes. Infection and Immunity, 2003, v. 71, pp. 474–482.	[DOI: 10.1128/IAI.71.1.474-482.2003]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Infection and Immunity, 2003, v. 71, pp. 474–482.		
136.	Réglier-Poupet H., Frehel C., Dubail I., Beretti J.C., Berche P., Charbit A., Raynaud C. Maturation of lipoproteins by type II signal peptidase is required for phagosomal escape of *Listeria monocytogenes*. The Journal of Biological Chemistry, 2003, v. 278, no. 49, pp. 49469–49477.	Réglier-Poupet H., Frehel C., Dubail I., Beretti J.C., Berche P., Charbit A., Raynaud C. Maturation of lipoproteins by type II signal peptidase is required for phagosomal escape of *Listeria monocytogenes*. The Journal of Biological Chemistry, 2003, v. 278, no. 49, pp. 49469–49477.	[DOI: 10.1074/jbc.M307953200]
137.	Ripio M.T., Dominguez-Bernal G., Suarez M., Brehm K., Berche P.,	Ripio M.T., Dominguez-Bernal G., Suarez M., Brehm K., Berche P., Vázquez-Boland J.-A. Transcriptional activation of virulence genes in	[DOI: 10.1016/0923-2508(96)84712-7]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Vázquez-Boland J.-A. Transcriptional activation of virulence genes in wild-type strains of *Listeria monocytogenes* in response to a change in extracellular medium composition. Res. Microbiol., 1996, v. 147, no. 5, pp. 371-384.	wild-type strains of *Listeria monocytogenes* in response to a change in extracellular medium composition. Res. Microbiol., 1996, v. 147, no. 5, pp. 371-384.	
138.	Ryser E.T., Marth E.H. Listeria, listeriosis and food safety. 3rd ed. Ed. E.T. Ryser. New York: Marcel Dekker Inc, 2007, 896 p.	Ryser E.T., Marth E.H. Listeria, listeriosis and food safety. 3rd ed. Ed. E.T. Ryser. New York: Marcel Dekker Inc, 2007, 896 p.	[DOI: 10.1201/9781420015188]
139.	Rocha P.R., Dalmasso A., Grattarola C., Casalone C., Del Piero F., Bottero M.T., Capucchio M.T. Atypical	Rocha P.R., Dalmasso A., Grattarola C., Casalone C., Del Piero F., Bottero M.T., Capucchio M.T. Atypical cerebral listeriosis	[DOI: 10.1016/j.rvsc.2012.07.017]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	cerebral listeriosis associated with Listeria innocua in a beef bull. Res. Vet. Sci., 2013, v. 94, no. 1, pp. 111–114.	associated with Listeria innocua in a beef bull. Res. Vet. Sci., 2013, v. 94, no. 1, pp. 111–114.	
140.	Rocourt J., Hof H., Schrettenbrunner A., Malinverni R., Bille J. Acute purulent Listeria seeligeri meningitis in an immunocompetent adult. Schweiz. Med. Wochenschr., 1986, v. 116, no. 8, pp. 248–251	Rocourt J., Hof H., Schrettenbrunner A., Malinverni R., Bille J. Acute purulent Listeria seeligeri meningitis in an immunocompetent adult. Schweiz. Med. Wochenschr., 1986, v. 116, no. 8, pp. 248–251	[https://pubmed.ncbi.nlm.nih.gov/3082004/]
141.	Ruiz-Llacsahuanga B., Hamilton A., Zaches R., Hanrahan I., Critzer F. Prevalence of Listeria	Ruiz-Llacsahuanga B., Hamilton A., Zaches R., Hanrahan I., Critzer F. Prevalence of Listeria Species on Food Contact Surfaces in Washington State Apple Packinghouses. Appl.	[DOI: 10.1128/AEM.02932-20]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Species on Food Contact Surfaces in Washington State Apple Packinghouses. Appl. Environ. Microbiol., 2021, v. 87, no. 9, e02932-20.	Environ. Microbiol., 2021, v. 87, no. 9, e02932-20.	
142.	Salimnia H., Patel D., Lephart P.R., Fairfax M.R., Chandrasekar P.H. Listeria grayi: vancomycin-resistant, gram-positive rod causing bacteremia in a stem cell transplant recipient. Transpl. Infect. Dis., 2010, v. 12, no. 6, pp. 526–528.	Salimnia H., Patel D., Lephart P.R., Fairfax M.R., Chandrasekar P.H. Listeria grayi: vancomycin-resistant, gram-positive rod causing bacteremia in a stem cell transplant recipient. Transpl. Infect. Dis., 2010, v. 12, no. 6, pp. 526–528.	[DOI: 10.1111/j.1399-3062.2010.00539.x]
143.	Schlüter D., Domann E., Buck C., Hain T., Hof H.,	Schlüter D., Domann E., Buck C., Hain T., Hof H., Chakraborty T., Deckert-Schlüter M.	[DOI: 10.1128/iai.66.12.5930-5938.1998]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Chakraborty T., Deckert-Schlüter M. Phosphatidylcholine-specific phospholipase C from Listeria monocytogenes is an important virulence factor in murine cerebral listeriosis. Infect. Immun., 1998, v. 66, no. 12, pp. 5930–5938.	Phosphatidylcholine-specific phospholipase C from Listeria monocytogenes is an important virulence factor in murine cerebral listeriosis. Infect. Immun., 1998, v. 66, no. 12, pp. 5930–5938.	
144.	Shen Y., Liu Y., Zhang Y., Cripe J., Conway W., Meng J., Hall G., Bhagwat A.A. Isolation and characterization of Listeria monocytogenes isolates from ready-to-eat foods in	Shen Y., Liu Y., Zhang Y., Cripe J., Conway W., Meng J., Hall G., Bhagwat A.A. Isolation and characterization of Listeria monocytogenes isolates from ready-to-eat foods in Florida. Appl. Environ. Microbiol., 2006, v. 72, no. 7, pp. 5073–5076.	[DOI: 10.1128/aem.00435-06]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Florida. Appl. Environ. Microbiol., 2006, v. 72, no. 7, pp. 5073–5076.		
145.	Somers E.B., Wong A.C.L. Efficaly of two cleaning and sanitizing combinations on Listeria monocytogenes biofilms formed at low temperature on a variety of materials on the presence of ready-to-eat meat residue. J. Foot Prot., 2004, v. 76, no. 10, pp. 2218–2229.	Somers E.B., Wong A.C.L. Efficaly of two cleaning and sanitizing combinations on Listeria monocytogenes biofilms formed at low temperature on a variety of materials on the presence of ready-to-eat meat residue. J. Foot Prot., 2004, v. 76, no. 10, pp. 2218–2229.	[DOI: 10.4315/0362-028x-67.10.2218]
146.	Stülke J., Hillen W. Regulation of Carbon Catabolism in Bacillus Species. Annual Review of	Stülke J., Hillen W. Regulation of Carbon Catabolism in Bacillus Species. Annual Review of Microbiology, 2000, v. 54, no. 1, pp. 849-880.	[DOI: 10.1146/annurev.micro.54.1.849]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	Microbiology, 2000, v. 54, no. 1, pp. 849-880.		
147.	Sue D., Fink D., Wiedmann M., Boor K.J. σB-dependent gene induction and expression in *Listeria monocytogenes* during osmotic and acid stress conditions simulating the intestinal environment. Microbiology, 2004, v. 150, no. Pt_11, pp. 3843–3855.	Sue D., Fink D., Wiedmann M., Boor K.J. σB-dependent gene induction and expression in *Listeria monocytogenes* during osmotic and acid stress conditions simulating the intestinal environment. Microbiology, 2004, v. 150, no. Pt_11, pp. 3843–3855.	[DOI: 10.1099/mic.0.27257-0]
148.	Swaminathan B., Gerner-Smidt P. The epidemiology of human listeriosis. Microbes Infect., 2007, v. 9, no. 10, pp. 1236-1243.	Swaminathan B., Gerner-Smidt P. The epidemiology of human listeriosis. Microbes Infect., 2007, v. 9, no. 10, pp. 1236-1243.	[DOI: 10.1016/j.micinf.2007.05.011]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

149.	Travier L., Guadagnini S., Gouin E., Dufour A., Chenal-Francisque V., Cossart P., Olivo-Marin J.-Ch., Ghigo J.-M., Disson O., Lecuit M. ActA promotes Listeria monocytogenes aggregation, intestinal colonization and carriage. PLoS Pathog., 2013, v. 9, no. 1, e1003131.	Travier L., Guadagnini S., Gouin E., Dufour A., Chenal-Francisque V., Cossart P., Olivo-Marin J.-Ch., Ghigo J.-M., Disson O., Lecuit M. ActA promotes Listeria monocytogenes aggregation, intestinal colonization and carriage. PLoS Pathog., 2013, v. 9, no. 1, e1003131.	[DOI: 10.1371/journal.ppat.1003131]
150.	Vázquez-Boland J.A., Kuhn M., Berche P., Chakraborty T., Domínguez-Bernal G., Goebel W., González-Zorn B., Wehland J., Kreft J. Listeria pathogenesis and	Vázquez-Boland J.A., Kuhn M., Berche P., Chakraborty T., Domínguez-Bernal G., Goebel W., González-Zorn B., Wehland J., Kreft J. Listeria pathogenesis and molecular virulence determinants. J. Clinical Microbiol. Rev., 2001, v. 14, no. 3, pp. 584-640.	[DOI: 10.1128/CMR.14.3.584-640.2001]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	molecular virulence determinants. J. Clinical Microbiol. Rev., 2001, v. 14, no. 3, pp. 584-640.		
151.	Vilchis-Rangel R.E., Espinoza-Mellado M.D.R., Salinas-Jaramillo I.J., Martinez-Pena M.D., Rodas-Suarez O.R. Association of *Listeria monocytogenes* LIPI-1 and LIPI-3 marker llsX with invasiveness. Current Microbiology, 2019, v. 76, no. 5, pp. 637-643.	Vilchis-Rangel R.E., Espinoza-Mellado M.D.R., Salinas-Jaramillo I.J., Martinez-Pena M.D., Rodas-Suarez O.R. Association of *Listeria monocytogenes* LIPI-1 and LIPI-3 marker llsX with invasiveness. Current Microbiology, 2019, v. 76, no. 5, pp. 637-643.	[DOI: 10.1007/s00284-019-01671-2]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

152.	Weller D., Andrus A., Wiedmann M., Den Bakker H.C. Listeria booriae sp. nov. and Listeria newyorkensis sp. nov., from food processing environments in the USA. Int. J. Syst. Evol. Microbiol., 2015, v. 65, no. Pt_1, pp. 286-292.	Weller D., Andrus A., Wiedmann M., Den Bakker H.C. Listeria booriae sp. nov. and Listeria newyorkensis sp. nov., from food processing environments in the USA. Int. J. Syst. Evol. Microbiol., 2015, v. 65, no. Pt_1, pp. 286-292.	[DOI: 10.1099/ijs.0.070839-0]
153.	Williams D., Castleman J., Lee Ch., Mote B., Smith M.A. Risk of fetal mortality after exposure to Listeria monocytogenes based on dose-response data from pregnant guinea pigs and primates. Risk analysis,	Williams D., Castleman J., Lee Ch., Mote B., Smith M.A. Risk of fetal mortality after exposure to Listeria monocytogenes based on dose-response data from pregnant guinea pigs and primates. Risk analysis, 2009, v. 29, no. 11, pp. 1495–1505.	[DOI: 10.1111/j.1539-6924.2009.01308.x]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-BFA-17639

	2009, v. 29, no. 11, pp. 1495–1505.		
154.	Zhang Y., Dong S., Chen H., Chen J., Zhang J., Zhang Z., et al. Prevalence, Genotypic Characteristics and Antibiotic Resistance of Listeria monocytogenes From Retail Foods in Bulk in Zhejiang Province, China. Frontiers in Microbiology, 2019, v. 10, pp. 1710.	Zhang Y., Dong S., Chen H., Chen J., Zhang J., Zhang Z., et al. Prevalence, Genotypic Characteristics and Antibiotic Resistance of Listeria monocytogenes From Retail Foods in Bulk in Zhejiang Province, China. Frontiers in Microbiology, 2019, v. 10, pp. 1710.	[DOI: 10.3389/fmicb.2019.01710]

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)