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Evaluation of the effectiveness of control measures against American and European foulbrood in honey bees

Asalarilarda Amerika va Yevropa chirish kasalliklariga qarshi kurashish choralarining samaradorligini baholash

Оценка эффективности мер борьбы против американского и европейского гнильца пчёл

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Abstract. The study aimed to evaluate the clinical and epizootiological characteristics of American foulbrood and European foulbrood in honey bees and to assess the practical effectiveness of veterinary-sanitary and therapeutic control measures. Investigations were conducted at the Scientific-Research Institute of Veterinary and in different beekeeping farms. The epizootiological situation was assessed in affected and conditionally healthy colonies using clinical observation, laboratory diagnostics, and epizootiological monitoring. The findings indicated that the long-term persistence of Paenibacillus larvae spores in the environment complicates elimination of American foulbrood infection sources. European foulbrood was characterized mainly by damage to unsealed brood and by a more pronounced course under nutritional deficiency and unfavorable hive microclimate. Colonies infested with Varroa destructor showed a more severe clinical course of foulbrood. Veterinary measures, including transferring affected colonies to disinfected hives, removing contaminated combs, disinfection, and queen replacement, produced favorable practical outcomes. Antibiotic treatments reduced clinical signs, but uncontrolled use is inappropriate because of the risks of antimicrobial resistance and residues in bee products. Whey-based treatments showed promising supportive effects at the early stages of European foulbrood. Overall, combined biosecurity and veterinary-sanitary measures were identified as the central approach to disease control.

Keywords: beekeeping; American foulbrood; European foulbrood; Paenibacillus larvae; Melissococcus plutonius; Varroa destructor; biosecurity; shook swarm method

O‘ZBEKCHA

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Annotatsiya. Tadqiqotning maqsadi asalarilarda Amerika chirishi va Yevropa chirishining klinik-epizootologik xususiyatlarini baholash hamda ularga qarshi qo‘llaniladigan veterinariya-sanitariya va davolash tadbirlarining amaliy samaradorligini tahlil qilishdan iborat. Tadqiqotlar Veterinariya ilmiy-tadqiqot instituti sharoitida va turli asalarichilik xo‘jaliklarida olib borildi. Epizootik holat nosog‘lom va shartli sog‘lom asalari oilalarini klinik kuzatish, laboratoriya diagnostikasi va epizootologik monitoring asosida baholandi. Natijalar Amerika chirishida Paenibacillus larvae sporalarining tashqi muhitda uzoq saqlanishi infeksiya o‘chog‘ini bartaraf etishni murakkablashtirishini ko‘rsatdi. Yevropa chirishi, asosan, ochiq naslni zararlashi hamda oziqa tanqisligi va noqulay mikroiqlim sharoitlarida kuchayishi bilan tavsiflandi. Varroa destructor invaziyasi mavjud oilalarda kasalliklarning klinik kechishi og‘irlashgani kuzatildi. Kasallangan oilalarni dezinfeksiya qilingan uyalarga ko‘chirish, zararlangan mumkataklarni chiqarib tashlash, dezinfeksiya va ona arini almashtirish kabi zooveterinariya tadbirlari ijobiy natija berdi. Antibiotik vositalar klinik belgilarni kamaytirgan bo‘lsa-da, rezistentlik va asal mahsulotlarida qoldiq moddalar xavfi sababli ularni nazoratsiz qo‘llash maqsadga muvofiq emas. Sut zardobi asosidagi ishlovlar Yevropa chirishining

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dastlabki bosqichlarida istiqbolli yordamchi yondashuv sifatida qayd etildi. Kompleks bioxavfsizlik va veterinariya-sanitariya choralarini birgalikda qo‘llash kasalliklarni nazorat qilishning asosiy sharti sifatida baholandi.

Kalit so‘zlar: asalarichilik; Amerika chirishi; Yevropa chirishi; Paenibacillus larvae; Melissococcus plutonius; Varroa destructor; bioxavfsizlik; ko‘chirish (shook swarm) usuli

РУССКИЙ

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Аннотация. Цель исследования заключалась в оценке клинико-эпизоотологических особенностей американского и европейского гнильца пчёл, а также практической эффективности ветеринарно-санитарных и лечебных мероприятий, применяемых для их контроля. Исследования проводили в условиях Научно-исследовательского института ветеринарии и в различных пчеловодческих хозяйствах. Эпизоотическую ситуацию оценивали в неблагополучных и условно благополучных пчелиных семьях с использованием клинического наблюдения, лабораторной диагностики и эпизоотологического мониторинга. Полученные данные показали, что длительное сохранение спор Paenibacillus larvae во внешней среде осложняет ликвидацию источников инфекции при американском гнильце. Европейский гнилец характеризовался преимущественным поражением открытого расплода и более выраженным течением при дефиците корма и неблагоприятном микроклимате улья. В семьях, инвазированных Varroa destructor, отмечалось более тяжёлое течение гнильцовых болезней. Переселение поражённых семей в продезинфицированные ульи, удаление заражённых сотов, дезинфекция и замена маток дали положительный практический эффект. Антибиотикотерапия уменьшала выраженность клинических признаков, однако её бесконтрольное применение нецелесообразно из-за риска антимикробной резистентности и остаточных веществ в продуктах пчеловодства. Обработки на основе молочной сыворотки показали перспективный вспомогательный эффект на ранних стадиях европейского гнильца. В целом комплексное сочетание мер биобезопасности и ветеринарно-санитарных мероприятий определено как основа эффективного контроля заболеваний.

Ключевые слова: пчеловодство; американский гнилец; европейский гнилец; Paenibacillus larvae; Melissococcus plutonius; Varroa destructor; биобезопасность; метод переселения (shook swarm)

1. KIRISH
Introduction

Asalarichilik qishloq xo‘jaligining oziq-ovqat xavfsizligi va ekotizim barqarorligiga bevosita ta’sir ko‘rsatuvchi muhim tarmoqlaridan biridir. Asal va boshqa biologik mahsulotlar olish bilan bir qatorda, asalari oilalari entomofil o‘simliklarni changlatish orqali qishloq xo‘jaligi ekinlarining hosildorligini ta’minlashda katta ahamiyatga ega. O‘zbekistonda sohani rivojlantirishning tashkiliy-huquqiy asoslari O‘zbekiston Respublikasi Prezidentining 2017-yil 16-oktabrdagi PQ-3327-son “Respublikamizda asalarichilik tarmog‘ini yanada rivojlantirish chora-tadbirlari to‘g‘risida”gi qarorida belgilangan [1].

Asalari oilalarining bakterial kasalliklari orasida Amerika chirishi (American foulbrood) va Yevropa chirishi (European foulbrood) epizootologik va iqtisodiy jihatdan alohida ahamiyatga ega. Amerika chirishining etiologik agenti Paenibacillus larvae bo‘lib, uning sporali shakllari tashqi muhit omillariga yuqori chidamliligi bilan tavsiflanadi [2, 3, 5]. Yevropa chirishining asosiy qo‘zg‘atuvchisi Melissococcus plutonius bo‘lib, kasallik ko‘proq ochiq nasl bosqichida namoyon bo‘ladi [4, 9]. Ikkilamchi mikroflora tarkibida Paenibacillus alvei (avval Bacillus alvei) kabi bakteriyalar ham uchrashi mumkin.

Varroa destructor invaziyasi asalari oilalarining fiziologik holatini zaiflashtirishi va boshqa patogenlar bilan bog‘liq kasallik jarayonlarini murakkablashtirishi mumkin [6, 7]. Shu sabab chirish kasalliklarini nazorat qilish faqat bitta davolash vositasiga tayanmasdan, epizootologik monitoring, erta diagnostika, dezinfeksiya, zararlangan materiallarni chiqarib tashlash, oilalarni to‘g‘ri boshqarish va bioxavfsizlik choralarini bir tizimda qo‘llashni talab etadi.

Ilmiy adabiyotlarda Paenibacillus larvae sporalarining uzoq muddat saqlanishi, Amerika chirishining yuqori yuquvchanligi va kasallik o‘chog‘ini to‘liq bartaraf etishning murakkabligi ko‘p bora qayd etilgan [2, 3, 5]. Yevropa chirishi esa ko‘pincha bahorgi davr, oziqa yetishmovchiligi va uyadagi mikroiqlimning buzilishi bilan bog‘liq holda kuchayishi mumkin [4]. Antibiotiklarni uzoq muddat yoki nazoratsiz qo‘llash patogenlarda rezistentlik shakllanishi hamda asal va boshqa mahsulotlarda qoldiq moddalar paydo bo‘lishi xavfini oshiradi [10].

Mazkur tadqiqotning maqsadi Amerika va Yevropa chirishining klinik-epizootologik xususiyatlarini baholash, kasalliklarning Varroa destructor invaziyasi fonida kechishini tahlil qilish hamda ko‘chirish (shook swarm), dezinfeksiya, medikamentoz va biologik ishlovlarning amaliy samaradorligini mavjud kuzatuv materiallari asosida baholashdan iborat.

2. MATERIALLAR VA METODLAR
Materials and methods

Tadqiqotlar Veterinariya ilmiy-tadqiqot instituti sharoitida hamda turli asalarichilik xo‘jaliklarida olib borildi. Epizootik holatni baholash uchun Amerika va Yevropa chirishi bo‘yicha nosog‘lom hamda shartli sog‘lom asalari oilalari kuzatildi. Tadqiqot yondashuvi klinik kuzatuv, laboratoriya diagnostikasi va epizootologik monitoringni o‘z ichiga oldi.

Klinik kuzatuvlarda naslning umumiy holati, mum qopqoqlarining ko‘rinishi, zararlangan lichinkalarning rangi, konsistensiyasi, hidi va patologik massaning cho‘ziluvchanligi kabi belgilarga e’tibor qaratildi. Epizootologik baholashda kasallikning mavsumiy namoyon bo‘lishi, oziqa ta’minoti, oilaning umumiy kuchi, uyadagi mikroiqlim va Varroa destructor invaziyasi bilan bog‘liq holatlar hisobga olindi.

Qarshi kurash choralarini baholashda kasallangan oilalarni dezinfeksiya qilingan yangi uyalarga ko‘chirish, eski va zararlangan mumkataklarni chiqarib tashlash, dezinfeksiya tadbirlari, ona arini almashtirish, dastlabki materialda ko‘rsatilgan antibiotikli siroplar hamda sut zardobi asosidagi ishlovlardan keyingi klinik holat kuzatildi. Dastlabki qo‘lyozmada tajriba guruhlarining aniq soni, laboratoriya protokollarining batafsil tavsifi va statistik tahlil mezonlari berilmaganligi sababli samaradorlik ushbu maqolada sifat jihatdan tavsiflandi.

3. NATIJALAR
Results

3.1. Amerika chirishining klinik-epizootologik xususiyatlari

Kuzatuvlarda Amerika chirishi bilan zararlangan oilalarda kasallikning yozgi davrda, havo harorati yuqori bo‘lgan va tabiiy asal yig‘imi kamaygan sharoitlarda faolroq namoyon bo‘lishi qayd etildi. Bu holat oziqa tanqisligi va asalari oilalarining fiziologik zo‘riqishi bilan birga kechgan.

Klinik tekshiruvlarda zararlangan lichinkalarda jigarrang yopishqoq massa hosil bo‘lishi, mum qopqoqlarining ichkariga botishi va teshilishi, ayrim hollarda o‘ziga xos yelim hidi sezilishi kuzatildi. Chirigan massaning ipga o‘xshab cho‘zilishi Amerika chirishini boshqa nasl kasalliklaridan differensial ajratishda muhim klinik belgi sifatida baholandi. Ushbu kuzatuvlar Paenibacillus larvae bilan bog‘liq Amerika chirishining klassik tavsiflariga mos keladi [3, 9].

3.2. Yevropa chirishining klinik-epizootologik xususiyatlari

Yevropa chirishi, asosan, ochiq naslni zararlashi bilan tavsiflandi. Kasallik ko‘proq bahor mavsumida va oziqa yetishmovchiligi mavjud oilalarda kuzatildi. Zararlangan lichinkalarda sarg‘ayish, namlanish, segmentatsiyaning yo‘qolishi, nordon hid va patologik massaning Amerika chirishiga nisbatan kuchsizroq cho‘ziluvchanligi qayd etildi.

Patologik massa nisbatan tez uzilishi va katakchalardan osonroq ajralishi bilan farq qildi. Ayrim holatlarda Paenibacillus alvei kabi ikkilamchi bakterial mikroflora ishtiroki kasallikning klinik ko‘rinishini murakkablashtirishi mumkinligi hisobga olindi. Bu belgilar Melissococcus plutonius bilan bog‘liq Yevropa chirishining klinik tavsiflariga mos keladi [4, 9].

3.3. Varroatoz fonida kasalliklarning kechishi

Varroa destructor bilan invaziyalangan asalari oilalarida chirish kasalliklarining klinik kechishi og‘irroq bo‘lgani kuzatildi. Bunday oilalarda lichinkalar nobud bo‘lishining ko‘payishi, oilaning tez zaiflashishi va kasallik belgilari qisqa muddatda kengroq namoyon bo‘lishi qayd etildi. Ushbu holat Varroa destructor kanasining asalari salomatligiga ko‘p omilli salbiy ta’siri hamda ikkilamchi infeksiyalar bilan bog‘liq xavflar haqidagi ma’lumotlar bilan mos keladi [6, 7].

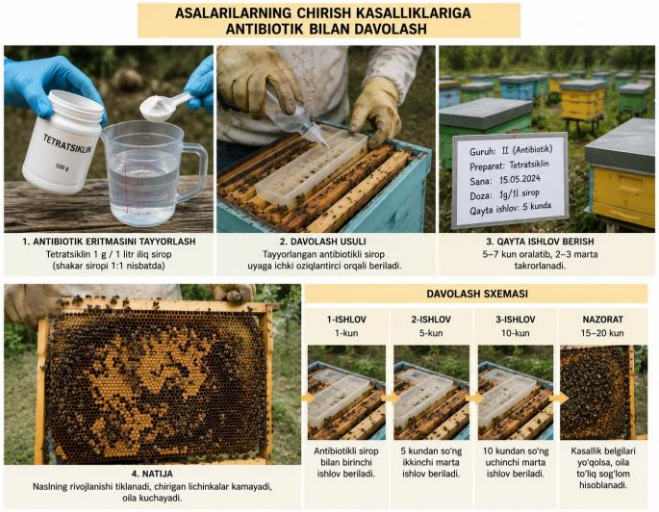
3.4. Qarshi kurash chora-tadbirlarining amaliy natijalari

Zooveterinariya tadbirlari orasida kasallangan oilalarni dezinfeksiya qilingan uyalarga ko‘chirish (shook swarm / peregon usuli) amaliy jihatdan ijobiy natija ko‘rsatdi. Eski va zararlangan mumkataklarni chiqarib tashlash, ona arini almashtirish va uyalarni o‘z vaqtida dezinfeksiya qilish infeksiya manbalarini kamaytirishga hamda sog‘lom nasl rivojlanishini tiklashga yordam berdi.

Dastlabki tadqiqot materialida tetratsiklin, eritromitsin va streptomitsin kabi antibiotik preparatlar qo‘llanilganda klinik belgilarning kamayishi va nasl tiklanishi kuzatilgani qayd etilgan. Biroq bunday preparatlarni uzoq muddat yoki nazoratsiz qo‘llash mikroorganizmlarda rezistentlik rivojlanishi, asalari ichak mikrobiotasining buzilishi va asal mahsulotlarida qoldiq moddalar paydo bo‘lishi bilan bog‘liq xavflarni kuchaytirishi mumkin [10]. Shu sabab antibiotiklardan foydalanish faqat amaldagi veterinariya talablari va mahsulot xavfsizligi me’yorlariga muvofiq amalga oshirilishi lozim.

Sut zardobi asosidagi biologik ishlovlar Yevropa chirishining dastlabki bosqichlarida ijobiy yordamchi natija ko‘rsatdi. Dastlabki materialga ko‘ra, bunday ishlovlarning afzalligi ekologik xavfsizlik va iqtisodiy qulaylik bilan bog‘langan. Biroq ushbu yondashuvning samaradorligini tasdiqlash uchun nazorat guruhlari, aniq dozalar, takrorlar va statistik tahlil keltirilgan qo‘shimcha tajribalar zarur.

3.5. Dastlabki qo‘lyozmada keltirilgan davolash sxemasi



1-rasm. Dastlabki materialda keltirilgan antibiotik bilan ishlov berish tartibi / **Fig. 1.** Antibiotic treatment procedure as presented in the primary study material

Izoh: antibiotik preparatlarini amaliy qo‘llashda amaldagi veterinariya talablari, antimikrob rezistentlik xavfi va asal mahsulotlaridagi qoldiq moddalar bo‘yicha cheklovlar hisobga olinishi lozim.

4. MUHOKAMA
Discussion

Olingan natijalar Amerika va Yevropa chirishini nazorat qilishda kasallik etiologiyasi va epizootologik xususiyatlarini hisobga olgan kompleks yondashuv zarurligini ko‘rsatadi. Amerika chirishida sporali qo‘zg‘atuvchining uzoq muddat saqlanishi oddiy simptomatik davolashning yetarli emasligini tushuntiradi. Shu bois zararlangan materiallarni chiqarib tashlash, dezinfeksiya va sanitariya rejimini qat’iy yuritish kasallik zanjirini uzishda asosiy choralar qatoriga kiradi [2, 3, 5].

Yevropa chirishida kasallikning ochiq naslda namoyon bo‘lishi, oziqa va mikroiqlim omillariga sezgirligi oilani umumiy mustahkamlash choralarini muhim qiladi [4]. Tadqiqotda Varroa destructor invaziyasi mavjud oilalarda chirish kasalliklari og‘irroq kechgani kuzatildi; bu asalari salomatligiga bir vaqtning o‘zida bir necha stress omili ta’sir qilishi mumkinligini ko‘rsatadi [6, 7].

Antibiotik preparatlari klinik belgilarni vaqtincha kamaytirishi mumkin, biroq ular sporali infeksiya manbaini to‘liq bartaraf etmaydi. Bundan tashqari, rezistentlik va qoldiq moddalar muammosi asalari kasalliklarida kimyoviy davolash imkoniyatlarini cheklaydi [10]. Shuning uchun medikamentoz yondashuvlar bioxavfsizlik, sanitariya, epizootologik nazorat va xo‘jalik boshqaruvi bilan birga ko‘rib chiqilishi kerak.

Mazkur tadqiqot klinik-amaliy va epizootologik kuzatuvlarga tayangan holda kasalliklarni nazorat qilish choralarining amaliy ahamiyatini ko‘rsatdi. Olingan natijalarni yanada chuqurlashtirish uchun keyingi tadqiqotlarda standart diagnostika protokollari, oldindan belgilangan natija mezonlari, nazorat guruhlari va statistik tahlil rejasidan foydalanish maqsadga muvofiq.

5. XULOSA

Conclusion

1. Amerika chirishi Paenibacillus larvae qo‘zg‘atuvchisining chidamli sporali shakllari bilan bog‘liq bo‘lib, infeksiya manbalarini uzoq muddat saqlab qolishi mumkin; Yevropa chirishi esa asosan ochiq naslni zararlashi va oziqa hamda mikroiqlim omillariga sezgirligi bilan tavsiflanadi. Varroa destructor invaziyasi mavjud oilalarda chirish kasalliklarining klinik kechishi og‘irlashishi kuzatildi.

2. Kasalliklarni nazorat qilishda oilalarni dezinfeksiya qilingan uyalarga ko‘chirish, zararlangan mumkataklarni chiqarib tashlash, dezinfeksiya, ona arini almashtirish va umumiy bioxavfsizlik choralarini birgalikda qo‘llash amaliy jihatdan maqsadga muvofiq.

3. Antibiotik preparatlar klinik belgilarni kamaytirishi mumkin, biroq rezistentlik va mahsulotlarda qoldiq moddalar xavfi ularning nazoratsiz qo‘llanilishini cheklaydi. Sut zardobi asosidagi ishlovlar yordamchi yondashuv sifatida istiqbolli bo‘lsa-da, ularning samaradorligini miqdoriy va statistik jihatdan tasdiqlovchi qo‘shimcha nazoratli tajribalar talab etiladi.

DECLARATIONS

Declarations

Author contributions *CRediT*

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Ethics approval

The study was conducted in accordance with the veterinary-sanitary and biosecurity requirements in force in the Republic of Uzbekistan, within the framework of routine diagnostic and practical observations carried out in beekeeping farms. The work involved no human participants and no experiments on regulated vertebrate animals.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

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Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Purpose and research problem

Beekeeping is an important branch of agriculture in Uzbekistan, contributing both to the production of honey and other bee products and to the pollination of entomophilous crops. The organisational and legal basis for developing the sector is defined by Presidential Resolution PQ-3327 of 16 October 2017. Among the bacterial diseases of honey bee colonies, American foulbrood and European foulbrood are of particular epizootiological and economic importance. American foulbrood is caused by Paenibacillus larvae, whose spore forms are highly resistant to environmental factors, while European foulbrood is caused primarily by Melissococcus plutonius and manifests mainly in the unsealed brood stage. Secondary microflora such as Paenibacillus alvei may complicate the clinical picture. Infestation with Varroa destructor weakens the physiological state of colonies and may aggravate disease processes associated with other pathogens. The aim of this study was to evaluate the clinical and epizootiological characteristics of American and European foulbrood, to analyse their course against a background of Varroa destructor infestation, and to assess the practical effectiveness of the shook swarm method, disinfection, medicinal treatment and biological treatment on the basis of the available observational material.

Materials and methods

The investigations were carried out at the Scientific-Research Institute of Veterinary and in various beekeeping farms. To assess the epizootiological situation, colonies affected by American and European foulbrood and conditionally healthy colonies were observed. The methodological approach combined clinical observation, laboratory diagnostics and epizootiological monitoring. Clinical examination focused on the general condition of the brood, the appearance of the wax cappings, and the colour, consistency, odour and ropiness of the pathological mass of affected larvae. Epizootiological assessment took into account the seasonal manifestation of the disease, feed supply, general colony strength, hive microclimate and the presence of Varroa destructor infestation. The evaluation of control measures was based on the clinical state observed after transferring affected colonies into disinfected hives, removing old and contaminated combs, carrying out disinfection, replacing queens, and applying the antibiotic syrups and whey-based treatments described in the primary material. Because the primary manuscript did not report the exact number of experimental groups, a detailed description of the laboratory protocols, or the criteria used for statistical analysis, effectiveness is described here in qualitative rather than quantitative terms.

Results and discussion

In colonies affected by American foulbrood the disease was more active during the summer period, at high air temperatures and when the natural honey flow had declined; this coincided with feed shortage and physiological stress in the colonies. Clinical examination revealed the formation of a brown viscous mass in affected larvae, sunken and perforated wax cappings and, in some cases, a characteristic glue-like odour. The thread-like ropiness of the decayed mass was assessed as an important clinical sign for differentiating American foulbrood from other brood diseases, in agreement with the classical descriptions of Paenibacillus larvae infection. European foulbrood was characterised mainly by damage to the unsealed brood, occurred more frequently in spring and in colonies with insufficient feed, and presented with yellowing, moistening and loss of segmentation of the larvae, a sour odour and weaker ropiness than in American foulbrood; the pathological mass broke more readily and separated more easily from the cells. In colonies infested with Varroa destructor the clinical course of foulbrood was more severe, with increased larval mortality, rapid weakening of the colony and a broader manifestation of clinical signs within a short period. Among the veterinary measures, transferring affected colonies into disinfected hives (the shook swarm or peregon method) gave a practically favourable outcome; removing old and contaminated combs, replacing the queen and disinfecting hives in good time helped to reduce the sources of infection and to restore healthy brood development. Antibiotic preparations such as tetracycline, erythromycin and streptomycin were reported to reduce clinical signs and restore the brood, but their long-term or uncontrolled use may increase the risk of resistance, disturbance of the bee gut microbiota and residues in bee products; their use must therefore comply with current veterinary requirements and product safety standards. Whey-based biological treatments gave a favourable supportive result at the early stages of European foulbrood, their advantages being ecological safety and economic convenience, although confirmation of their effectiveness requires additional experiments with control groups, defined doses, replicates and statistical analysis.

Conclusion and contribution

American foulbrood is associated with the resistant spore forms of Paenibacillus larvae and may retain sources of infection for a long time,

whereas European foulbrood mainly damages the unsealed brood and is sensitive to feed and microclimate factors; in colonies infested with Varroa destructor the clinical course of both diseases was more severe. For disease control, the combined application of transferring colonies into disinfected hives, removing contaminated combs, disinfection, queen replacement and general biosecurity measures is practically expedient. Antibiotic preparations may reduce clinical signs, but the risks of resistance and of residues in bee products limit their uncontrolled use; whey-based treatments are promising as a supportive approach, although additional controlled experiments confirming their effectiveness in quantitative and statistical terms are required. The contribution of this work lies in bringing together the clinical, epizootiological and management aspects of foulbrood control in the conditions of Uzbek beekeeping farms and in showing that biosecurity and veterinary-sanitary measures, rather than chemotherapy alone, form the core of effective disease control.

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