



Article

Expanded Diversity and Host Range of Bovine Hepacivirus—Genomic and Serological Evidence in Domestic and Wild Ruminant Species

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Abstract: The hepatitis C virus (HCV)-related bovine hepacivirus (BovHepV) can cause acute as well as persistent infections in cattle. The true clinical relevance of the virus is not yet known. As reliable antibody detection methods are lacking and prevalence studies have only been conducted in cattle and few countries to date, the true distribution, genetic diversity, and host range is probably greatly underestimated. In this study, we applied several RT-PCR methods and a nano-luciferase-based immunoprecipitation system (LIPS) assay to analyze bovine serum samples from Bulgaria as well as wild ruminant sera from Germany and the Czech Republic. Using these methods, BovHepV infections were confirmed in Bulgarian cattle, with viral genomes detected in 6.9% and serological reactions against the BovHepV NS3 helicase domain in 10% of bovine serum samples. Genetic analysis demonstrated co-circulation of highly diverse BovHepV strains in Bulgarian cattle, and three novel BovHepV subtypes within the genotype 1 could be defined. Furthermore, application of a nested RT-PCR led to the first description of a BovHepV variant (genotype 2) in a wild ruminant species. The results of this study significantly enhance our knowledge of BovHepV distribution, genetic diversity, and host range.

Keywords: bovine hepacivirus (BovHepV); cattle; wild ruminants; Bulgaria; Germany; Czech Republic; distribution; genetic diversity; host range

Article

First Insight into the Seroepidemiology of Hepatitis E Virus (HEV) in Dogs, Cats, Horses, Cattle, Sheep, and Goats from Bulgaria

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Abstract: In recent years, hepatitis E virus (HEV) infection has been found to be widespread among different animal species worldwide. In Bulgaria, high HEV seropositivity was found among pigs (60.3%), wild boars (40.8%), and East Balkan swine (82.5%). The aim of the present study was to establish the seroprevalence of HEV among dogs, cats, horses, cattle, sheep, and goats in Bulgaria. In total, 720 serum samples from six animal species were randomly collected: dogs—90 samples; cats—90; horses—180; cattle—180; sheep—90; and goats—90. The serum samples were collected from seven districts of the country: Burgas, Kardzhali, Pazardzhik, Plovdiv, Sliven, Smolyan, and Stara Zagora. The animal serum samples were tested for HEV antibodies using the commercial Wantai HEV-Ab ELISA kit (Beijing, China). The overall HEV seroprevalence among different animal species from Bulgaria was as follows: dogs—21.1%; cats—17.7%; horses—8.3%; cattle—7.7%; sheep—32.2%; and goats—24.4%. We found the lowest overall HEV seropositivity in Plovdiv district (6.2%; 4/64; $p = 0.203$) and Smolyan district (8.8%; 4/45; $p = 0.129$), vs. the highest in Pazardzhik district (21.6%; 29/134; $p = 0.024$) and Burgas district (28.8%; 26/90; $p = 0.062$). To the best of our knowledge, this is the first serological evidence of HEV infection in dogs, cats, horses, cattle, sheep, and goats from Bulgaria. We found high HEV seropositivity in small ruminants (sheep and goats), moderate seropositivity in pets (dogs and cats), and a low level of seropositivity in large animals (horses and cattle). Previous Bulgarian studies and the results of this research show that HEV infection is widespread among animals in our country. In this regard, the Bulgarian health authorities must carry out increased surveillance and control of HEV infection among animals in Bulgaria.

Keywords: Bulgaria; hepatitis E virus; one health; seroprevalence; zoonoses

Comparative Analysis on Clinical Characteristics Among Patients with Acute Hepatitis A Virus (HAV) and Patients with Acute Hepatitis E Virus (HEV): A Single-Center Retrospective Study from Bulgaria

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Introduction: The acute viral hepatitis was one of the most common conditions in daily clinical practice varying in different parts of the world. The aim of the present study was to perform a comparative analysis on clinical characteristics among patients with acute hepatitis A virus (HAV) infection and patients with acute hepatitis E virus (HEV) infection admitted to the Military Medical Academy (MMA), Sofia, Bulgaria.

Methods: A retrospective study was performed at MMA, between 1 January 2016 and 31 December 2021. The etiological diagnosis was confirmed by enzyme-linked immunosorbent assay (ELISA) HAV/HEV IgM serology assays.

Results: The current survey included 231 patients with mean age 45.11 ± 16.08 years (95% confidence interval: 43.04–47.19). According to the case definition, inclusion and exclusion criteria, persons were divided into two groups: patients with acute HAV infection (68.4%; 158/231) and patients with acute HEV infection (31.6%; 73/231). Males with HEV had 3.091 times the odds of comorbidity “hypertension” than males with HAV ($p = 0.032$). There were almost equal odds of increased ALT (odds ratio = 0.999; $p = 0.003$) in men with HEV and men with HAV. Females with HEV had 5.161 times the odds of comorbidity “hypertension” compared with females with HAV ($p = 0.049$). We found almost equal odds for elevated ALT in women with HEV and women with HAV (OR = 0.999; $p = 0.025$). In the non-elderly group (<60-year-old), HEV individuals had 4.544 and 10.560 times the odds of comorbidities “hypertension” and “cardiovascular diseases” compared with HAV patients ($p < 0.05$). We found almost equal odds for elevated ALT in HEV patients and HAV participants (OR = 0.998; $p = 0.002$).

Conclusion: The results from the current study may support the physicians daily care for patients with acute HAV and acute HEV.

Keywords: Bulgaria, clinical characteristics, hepatitis A virus, HAV, hepatitis E virus, HEV, single-center study

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Serological Evidence of *Borrelia burgdorferi*, *Anaplasma phagocytophilum* and *Ehrlichia* Spp. Infections in Horses from Southeastern Bulgaria

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Abstract

Lyme Borreliosis and granulocytic anaplasmosis are less extensively studied in horses than in dogs and humans. Equine ehrlichiosis is not known in Europe and is in the initial stage of investigation in South, Central, and North America. The aim of this study was to determine the seroprevalence of these infections in Bulgaria. A total of 155 horses were investigated from five regions in Southeastern Bulgaria. Horses were tested for *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, and *Ehrlichia* spp. antibodies by a commercial rapid ELISA test. *B. burgdorferi* and *A. phagocytophilum* antibodies were found in all five regions (Burgas, Sliven, Stara Zagora, Haskovo, and Kardzhali) at frequencies of 36/155 (23.2%; 95% CI: 16.8–30.7%; ranging by region from 6.4% to 50%) and 31/155 (20%; 95% CI: 14–27.2%; ranging by region from 10% to 30.8%), respectively. Antibodies against *Ehrlichia* spp. were found in horses from three regions (Burgas, Stara Zagora, and Haskovo) at a rate of 6/155 (3.9%; 95% CI: 1.4–8.2%; ranging by region from 5.7% to 6.4%). The combination of *B. burgdorferi*/*A. phagocytophilum* (11/155; 7.1%; 95% CI: 3.6–12.3%) was the most common coexposure observed, followed by *B. burgdorferi*/*Ehrlichia* spp. (2/155; 1.3%; 95% CI: 0.2–4.6%) and *A. phagocytophilum*/*Ehrlichia* spp. (1/155; 0.6%; 95% CI: 0–3.5%). The study shows that horses in Bulgaria are exposed or coexposed to three tick-transmitted zoonotic bacterial species. Furthermore, it reports *Ehrlichia* spp. seroreactivity in equines in Europe.

Seroprevalence of hepatitis E virus infection in pigs from Southern Bulgaria: a preliminary report

I. Tsachev¹ · R. Pepovich² · P. Marutsov¹ · M. Baymakova^{3,*} · M. Pishmisheva⁴ · L. Pekova⁵ · K. Gospodinova¹ Show less

Seroprevalence of hepatitis E virus infection in pigs from Southern Bulgaria: a preliminary report

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Purpose: Hepatitis E virus infection (HEV infection) is an emerging zoonosis. It becomes increasingly important in developed countries and occurs as current health and veterinary problem. In pigs, HEV infection is subclinical, but swine are main reservoir of HEV.

The aim of the study was to analyze the seroprevalence of HEV in industrial pig farms from Southern Bulgaria.

Methods & Materials: The study was conducted in two different Bulgarian districts (Yambol district and Sofia district). One hundred and eighty serum samples were tested, they belonged to three different age and technological swine groups: piglets (age: 1–3 months), fattening pigs (4–6 months) and sows (over 12 months). Serological test PrioCHECK HEV Ab porcine (MIKROGEN GmbH, Neuried, Germany) was used. The PrioCHECK HEV Ab porcine is a diagnostic test for detection of antibodies directed against hepatitis E virus in porcine serum based on ELISA technology.

Results: The serological test found positive results in both analyzed districts. The overall seroprevalence (in both farms) among piglets was 43.3% (95% CI: 8.9–95.6), in fattening group was 61.7 ± 54.2% and among sows was 93.3% (95% CI: 86.8–99.9). The highest prevalence was found in Sofia district (80/90; 88.9%), and the lowest was detected in Yambol district (39/90; 43.3%). Doubtful results were estimated in 6.1% of all investigated serum samples.

Conclusion: The present study established that HEV is widespread in pigs from Southern Bulgaria. The seroprevalence in Southwestern Bulgaria is twice higher than in Southeastern Bulgaria. Sows are most affected by HEV, while piglets are at least. The obtained results determine preventive measures and further investigations.

Current Surveys of the Seroprevalence of *Borrelia burgdorferi*, *Ehrlichia canis*, *Anaplasma phagocytophilum*, *Leishmania infantum*, *Babesia canis*, *Angiostrongylus vasorum* and *Dirofilaria immitis* in Dogs in Bulgaria

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Abstract

Canine vector-borne diseases (CVBDs) have increasingly become a focus of interest in recent years. Some of the CVBDs are zoonotic and may therefore also represent a risk for the human population. Different factors are in discussion to explain the expansion of vectors and pathogens into formerly unaffected areas. Knowledge of the prevalence and distribution of CVBDs in Bulgaria is scant overall and most data rely on single case descriptions. The aim of the present study was to determine the seroprevalence of important CVBDs in 167 dogs from central-southern Bulgaria (Stara Zagora), with special emphasis on hitherto

uninvestigated babesiosis and angiostrongylosis, on poorly investigated Lyme borreliosis and canine granulocytic anaplasmosis, and on the potentially zoonotic dirofilariosis and leishmaniasis. Relatively high prevalence rates were documented for anti-*Babesia canis* antibodies, *Dirofilaria immitis* antigen (16.2%; 27/167 each), anti-*Ehrlichia canis* (21%; 35/167) and anti-*Anaplasma phagocytophilum* antibodies (30.5–46.1%; 51–77/167), while *Borrelia burgdorferi* seroprevalence was low (2.4%; 4/167). All samples were negative for *Leishmania infantum* antibodies and *Angiostrongylus vasorum* antigen and antibodies. In total, 64.7% (108/167)

of the samples indicated infection or exposure to at least one agent and a high proportion of dual infections (39.8%; 43/108) was demonstrated. Multiple infections with up to four different organisms were also detected. Our data underline the importance of CVBDs and especially of co-infections which could influence the clinical outcome in dogs.

Communication

A Molecular Study on Hepatitis E Virus (HEV) in Pigs in Bulgaria

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Abstract: Information on hepatitis E virus (HEV) strains circulating in animal reservoirs in Bulgaria is currently lacking. Herein, by screening HEV seropositive sera obtained from Bulgarian swine and wild boars, viral RNA was detected at high prevalence rate (28.2%) in industrial pigs. Sequence analysis of the partial polymerase (RdRp) region revealed the highest genetic correlation with HEVs of genotype (Gt) 3 identified in French and Dutch patients. For three such strains, a 700-bp fragment of the open reading frame 2 gene was generated. On phylogenetic analysis, the Bulgarian strains clustered tightly (93.8–98.3% nt) with human and animal HEVs classified within the Gt3 subtype c.

Keywords: hepatitis E virus (HEV); RNA; genotype 3; pigs; Bulgaria



Serological Searching for Hepatitis E Virus Infection Among Pig Liver Transudate from Bulgaria: An Alternative Method for Seroepidemiological Survey

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Todor Kundurzhiev,⁶ Betina Valeva,¹ and Roman Pepovich⁷

Abstract

Background: The aim of this research was to perform a seroepidemiological survey of hepatitis E virus (HEV) by an alternative method—serological establishment of the virus from pig liver transudate. This is the first such research in Bulgaria. Moreover, no studies have been conducted on HEV in pig liver in our country.

Materials and Methods: A total of 90 liver samples from healthy pigs were collected from slaughterhouses in three parts of the country (Sofia, Lovech, and Stara Zagora districts). An equal number of samples ($n = 30$) were obtained from each district.

Results: The overall HEV seropositivity was 67.7% of all 90 tested pig liver transudate samples; in Sofia district 20.0%, in Lovech district 90.0%, and in Stara Zagora district 93.3%.

Conclusion: These data are similar to our previous serological studies for HEV in serum samples from industrial pigs, wild boars, and East Balkan swine. In this regard, testing the liver transudate could be a fine alternative method for seroepidemiological survey on HEV in swine.

Keywords: Bulgaria, pig liver transudate, seroepidemiological survey

Article

Seroprevalence of Hepatitis E Virus Infection among Blood Donors in Bulgaria

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Abstract: Hepatitis E virus (HEV) infection is widespread among domestic pigs, industrial swine, and wild boars in Bulgaria. The aim of the current research was to present the HEV seroprevalence among blood donors in Bulgaria. In the present study, 555 blood donors (479 males and 76 females) were enrolled from five districts in the country (Shumen, Pleven, Stara Zagora, Plovdiv, and Sofia districts). All blood samples were tested for anti-HEV IgG using the *recomWell* HEV IgG ELISA test (Mikrogen GmbH, Neuried, Germany). Each participating donor completed a short, structured, and specific questionnaire to document data on the current study. Anti-HEV IgG positive results were detected in 144 (25.9%) blood donors, including 129 (26.9%) males and 15 (19.7%) females. The established HEV seropositivity was 28.8% (23/80) in Shumen district, 23.2% (22/95) in Plevne district, 27.1% (38/140) in Stara Zagora district, 27.5% (44/160) in Plovdiv district, and 21.3% (17/80) in Sofia district. A high HEV seroprevalence was found for persons who declared that they were general hunters (48.7%; 19/39; $p = 0.001$) and hunters of wild boars (51.6%; 16/31; $p = 0.001$). We present the first seroprevalence rates of HEV infection in blood donors from Bulgaria. The results of our research showed high HEV seropositivity among blood donors.

Keywords: hepatitis E virus; blood donors; seroprevalence; Bulgaria

Article

High Seroprevalence of Hepatitis E Virus Infection among East Balkan Swine (*Sus scrofa*) in Bulgaria: Preliminary Results

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Abstract: The East Balkan swine (*Sus scrofa*) is the only aboriginal pig breed in Bulgaria, and it is indigenous to the eastern part of the country. The aim of the present study was to investigate East Balkan swine (EBS) in Bulgaria for serological evidence of hepatitis E virus (HEV). Sera from 171 swine from two parts of the country (northeastern and southeastern) were tested for anti-HEV IgG antibodies. The overall HEV seroprevalence was 82.5% (141/171), and for weaners it was 77.2% (44/57), for fattening pigs 79.0% (45/57), and for adults 91.2% (52/57). HEV positivity was higher in fattening pigs and adults compared to weaners: OR = 1.108 (95% CI: 0.456–2.692) and OR = 3.073 (95% CI: 1.016–9.294), respectively. This study provides the first evidence of exposure to HEV in EBS from Bulgaria.

Keywords: Bulgaria; East Balkan swine; hepatitis E virus; seroprevalence; *Sus scrofa*

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Seroprevalence Rates of Tick-Borne Pathogens in Cats from Southern Bulgaria

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Todor Kundurzhiev,⁴ and Laia Solano-Gallego⁵

Abstract

The aim of the present study was to investigate the prevalence rates of the feline tick-borne pathogens (FTBPs)—*Borrelia burgdorferi*, *Ehrlichia canis*, and *Anaplasma phagocytophilum* in stray cats from Southern Bulgaria. Serum antibodies were used to estimate the prevalence of exposure to FTBPs from blood swabs. Of the 100 cat samples tested with in-clinic assay SNAP 4Dx Plus, the overall FTBP seroprevalence was 3% (3/100); with *B. burgdorferi*—1% (1/100) and *E. canis*—2% (2/100). This study provides the first evidence of exposure to *B. burgdorferi* and *E. canis* in cats from Bulgaria.

Keywords: *Borrelia burgdorferi*, *Ehrlichia canis*, *Anaplasma phagocytophilum*, cats, tick-borne pathogens

Seroprevalence of hepatitis E virus infection in pigs from Southern Bulgaria: a preliminary report

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Seroprevalence of hepatitis E virus infection in pigs from Southern Bulgaria: a preliminary report



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Methods & Materials: The study was conducted in two different Bulgarian districts (Yambol district and Sofia district). One hundred and eighty serum samples were tested, they belonged to three different age and technological swine groups: piglets (age: 1–3 months), fattening pigs (4–6 months) and sows (over 12 months). Serological test PrioCHECK HEV Ab porcine (MIKROGEN GmbH, Neuried, Germany) was used. The PrioCHECK HEV Ab porcine is a diagnostic test for detection of antibodies directed against hepatitis E virus in porcine serum based on ELISA technology.

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piglets was 43.3% (95% CI: 8.9–95.6), in fattening group was 61.7 ± 54.2% and among sows was 93.3% (95% CI: 86.8–99.9). The highest prevalence was found in Sofia district (80/90; 88.9%), and the lowest was detected in Yambol district (39/90; 43.3%). Doubtful results were estimated in 6.1% of all investigated serum samples.

Conclusion: The present study established that HEV is widespread in pigs from Southern Bulgaria. The seroprevalence in Southwestern Bulgaria is twice higher than in Southeastern Bulgaria. Sows are most affected by HEV, while piglets are at least. The obtained results determine preventive measures and further investigations.

Coxiella burnetii infection presenting as fever of unknown origin: a retrospective case series from Bulgaria

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Coxiella burnetii infection presenting as fever of unknown origin: a retrospective case series from Bulgaria



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Purpose: Fever of unknown origin (FUO) is a perplexing medical problem. The causes for FUO are more than 200 diseases. The aim

of the study was to present human clinical cases of *Coxiella burnetii* infection debuting as FUO.

Methods & Materials: The following methods were conducted in the study: literature search, laboratory, imaging, and statistical methods. Criteria of David T. Durack and Alan C. Street were applied for FUO definition. For the etiological diagnosis indirect immunoenzyme assay (ELISA) for antibodies detection against *Coxiella burnetii* were used. *Coxiella burnetii* phase 1 IgA/IgG and *Coxiella burnetii* phase 2 IgG/IgM antibodies were detected in serum by indirect immunoenzyme assay (SERION ELISA classic, Virion/Serion, Würzburg, Germany).

Results: For the period of January 2008 to March 2015 nine patients with FUO caused by *Coxiella burnetii* were hospitalized at the Department of Infectious Diseases, Military Medical Academy, Sofia (Bulgaria). Male gender were predominant (male/female – 77.8%/22.2%), mean age was 48.78 ± 14.52 years (range: 26–67), hospital stay was 9.78 ± 2.95 days (range: 5–15), fever duration was 54.33 ± 56.23 days (range: 21–180). Laboratory investigations estimated elevation of ESR 49.11 ± 31.74 mm/h (95% CI: 13.09–111.31), CRP 37.68 ± 37.62 mg/L (95% CI: 36.07–111.42) and Fibrinogen 5.69 ± 1.59 g/L (95% CI: 2.57–8.81). Mean values of liver enzymes were in reference range. Abdominal ultrasound and X-ray demonstrated 33.3% each of them Contribution to the final diagnosis. Transthoracic echocardiography found 22.2% Contribution. Serological methods presented 100% Contribution.

Conclusion: *Coxiella burnetii* infection was accepted as a final diagnosis based on the integrated information from the applied methods. Active search and establishment of this pathogen in case of FUO should avoid potential complications and consequences in case of untreated *Coxiella burnetii* infection.

Serological evidence of hepatitis E virus infection in pigs from Northern Bulgaria

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Keywords

Hepatitis E virus,
Industrial farms,
Northern Bulgaria,
Pigs.

Summary

The purpose of the present study was to investigate pigs in Northern Bulgaria for serological evidence of hepatitis E virus (HEV). Sera from 225 individuals from three industrial farms were tested for anti-HEV IgG antibodies. The overall HEV seroprevalence was 36% (81/225); weaners 6.8% (5/74); fattening pigs 38.7% (29/75) and in sows 61.8% (47/76). Compared to weaners, HEV positivity was higher in fattening pigs and sows: OR = 8.70 (95% CI: 3.14-24.12) and OR = 22.37 (95% CI: 8.07-61.96), respectively. These data confirm that HEV is endemic in pigs throughout Bulgaria, and can be a Public Health problem due to the transmission of HEV to humans through the consumption of pork meat and pork products.

**SEROPREVALENCE OF *ANAPLASMA PHAGOCYTOPHILUM*,
EHRlichia spp. AND *BORRELLIA BURGDORFERI* INFECTIONS
IN HORSES: FIRST REPORT FROM NORTHERN BULGARIA –
SHORT COMMUNICATION**

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Lyme borreliosis, granulocytic anaplasmosis and monocytic ehrlichiosis are well studied in humans and dogs. In horses, these diseases are not widely investigated and limited information is available about their occurrence. The purpose of this study was to present the first ELISA-based report on the seroprevalence of *Anaplasma phagocytophilum*, *Ehrlichia* spp. and *Borrelia burgdorferi* in horses from Northern Bulgaria. A total of 192 horses were investigated from three regions in Northern Bulgaria (Northwestern, North-Central and Northeastern Bulgaria). All equine sera were tested for *A. phagocytophilum*, *Ehrlichia* spp. and *B. burgdorferi* antibodies by a commercial rapid ELISA test. Antibodies against *A. phagocytophilum* were found in all the three regions at a mean frequency of 12% (23/192), ranging from 9.38 to 15.63% by region. Antibodies against *Ehrlichia* spp. were found in horses from one region (Northeastern) at a rate of 0.5% (1/192). Anti-*B. burgdorferi* antibodies were detected in all the three regions with a mean frequency of 15.1% (29/192), ranging from 14.06 to 17.19% by region. A co-exposure to *A. phagocytophilum* and *B. burgdorferi* was observed in 6.3% of the cases (12/192). This is the first report on the natural exposure of horses to these bacteria (*A. phagocytophilum*, *Ehrlichia* spp. and *B. burgdorferi*) in Northern Bulgaria.

Key words: Seroprevalence, *Anaplasma phagocytophilum*, *Ehrlichia* spp., *Borrelia burgdorferi*, horses, Bulgaria



Article

Students' Attitudes toward COVID-19 Vaccination: An Inter-University Study from Bulgaria

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Abstract: In Bulgaria, vaccination coverage against the SARS-CoV-2 virus is low. The reasons for this fact are many and varied. The aim of the present study was to establish what the attitudes towards the COVID-19 vaccination process are among students from various specialties from several Bulgarian universities. In this research, 600 students participated, divided into two groups: Doctor of Medicine (MD) students ($n = 300$) and non-MD students, i.e., students of specialties, such as mathematics, engineering, finance and economics, law, human sciences, etc. ($n = 300$). Each respondent completed a questionnaire which was divided into three parts with closed questions. The mean age of all students was 21.19 ± 1.87 years (95% CI: 20.48–21.90). The female sex dominated among the analyzed participants (sex ratio: female/male = 1/0.85). Nearly 62% (371/600) of individuals declared that they have been COVID-19 vaccinated with at least one dose ($p < 0.001$). Overall, 33% of the participants sought information on vaccines from video sharing platforms and 36.0% (216/600) from social media platforms. From the conducted multivariable logistic regression the odds of vaccination against COVID-19 were 6.225 times higher in individuals with a positive attitude towards these vaccines than in people with a negative attitude towards them ($p < 0.001$). We have found that those students who trust the international health organizations had an OR of 2.365 ($p = 0.004$) to be SARS-CoV-2 vaccinated. We estimated that the odds of vaccination against SARS-CoV-2 among children were 4.794 times higher in parents (students) who had been vaccinated than in non-vaccinated parents (students) ($p < 0.001$). Our results could support the national public health organizations, the national educational/scientific systems, and the management of Bulgarian universities in making future decisions about the field of COVID-19 control and prevention.

Keywords: Bulgaria; COVID-19; questionnaire-based survey; students; vaccines

Seroprevalence of Hepatitis E Virus Infection in Pigs from Southern Bulgaria

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Abstract

Hepatitis E virus (HEV) has been isolated from humans and several animals' species. During the last years, the knowledge of HEV infection dramatically changed and enriched. The aim of this study was to estimate the seroprevalence of HEV in industrial pigs in different districts of Southern Bulgaria. Three hundred sixty swine serum samples were tested for anti-HEV IgG antibodies. The samples were collected from four industrial farms from three districts of Southern Bulgaria. HEV-specific antibodies in porcine serum were detected by enzyme-linked immunosorbent assay (PrioCHECK HEV Ab porcine). The overall HEV seroprevalence was 60.3%. The seropositivity varied widely depending on age groups and investigated farms. The overall prevalence in weaners was 25%, in fattening pigs 75.8%, and in group of sows was found the highest HEV positivity of 80%. The occurrence of HEV positivity in sows and fattening pigs presented odds ratio (OR) = 17.200 (95% confidence interval [CI]: 8.8–33.7) and OR = 11.342 (95% CI: 6.1–21.0), respectively, compared to weaners. The study indicated that HEV is widespread in industrial farms in Bulgaria and presented high seroprevalence in pigs. The results found that HEV seropositivity showed age dependency. The National Health Authorities should raise awareness of HEV and its zoonotic potential.

Keywords: hepatitis E virus, pigs, industrial farms

Article

Metabolic Markers Associated with Progression of Type 2 Diabetes Induced by High-Fat Diet and Single Low Dose Streptozotocin in Rats

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Simple Summary: Our experimental model of T2DM in rats is based on the development of insulin resistance induced by a four-week high-fat diet leading to obesity and pancreatic β -cell dysfunction caused by streptozotocin (STZ). Changes in anthropometric parameters, glucose, insulin, lipids, uric acid, advanced oxidation protein products (AOPP), as well as the histological changes in the liver and pancreas, were recorded. To assess insulin resistance, we used the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) and beta cell function (HOMA- β) and visceral obesity—adiposity index (AI). The data demonstrate that the increasing values of glucose, HOMA-IR, AI, total cholesterol, triacylglycerols, low- and very-low-density lipoproteins are important markers of the pre-diabetic state induced by a long-term intake of a high-fat diet. Early metabolic markers of the disease were persistent hyperglycemia and hypercholesterolemia, as well as increased uric acid, HOMA-IR and decreased HOMA- β . The progression of T2DM in rats was characterized by hyperglycemia, hypercholesterolemia, hypertriacylglyceridaemia, an increase in lipoproteins, AI, uric acid, AOPP, HOMA-IR and decreased HOMA- β . A precise combination of several easily accessible metabolic markers is necessary to provide accurate information about T2DM in rats.

Abstract: Science is still searching for readily available, cost-effective biomarkers to assess metabolic disorders occurring before the onset and during the development of type-2 diabetes (T2DM). The aim of the present study was to induce T2DM in rats through a high-fat diet, followed by a single administration of low dose streptozotocin (STZ), and make an assessment of the development of the disease. The rats were divided into two groups—experimental and control—and were monitored for a period of 10 days. Changes in anthropometric parameters, glucose, insulin, lipids, uric acid, advanced oxidation protein products (AOPP), as well as the histological changes in the liver and pancreas, were recorded. To assess insulin resistance, we used the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) and beta cell function (HOMA- β) and visceral obesity—adiposity index (AI). The data demonstrate that the increasing values of glucose, HOMA-IR, AI, total cholesterol, triacylglycerols, low- and very-low-density lipoproteins are important markers of the pre-diabetic state. The stable hyperglycemia and increased levels of TC, TG, VLDL, LDL, uric acid and AOPP in experimental rats strongly suggest the development of T2DM. HOMA-IR, HOMA- β , AI, and uric acid are reliable criteria for T2DM in rats.

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Research Note

Human dirofilariasis in Bulgaria between 2009 and 2018

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Article info

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Summary

Autochthonous *Dirofilaria repens* infections have been found in dogs and other carnivores in most European countries. In the same countries, reports of human dirofilariasis are becoming increasingly prevalent. We present 18 cases of people infected with *D. repens* for a 10-year period traced in our hospital. The data was collected from the observations and tests of all 18 patients from the whole country treated at the Specialized Hospital for Infectious and Parasitic Diseases in Sofia in the period 2009 – 2018. We used a morphological method, serology test and Knott's method for microfilariae. The patients were 11 to 74 years of age, 12 female and 6 male. In most cases, patients have subcutaneous nodules or face, eyelid and eyes localization. The trend of increasing incidence in Bulgaria continues, with age and sex distribution and localization of the larva being similar to those in other European countries.

Keywords: *Dirofilaria repens*; dirofilariasis; dogs; subcutaneous nodules

Hepatitis E Virus (HEV) Infection Among Immunocompromised Individuals: A Brief Narrative Review

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Abstract: Hepatitis E virus (HEV) is a single-stranded positive-sense RNA virus that belongs to *Hepeviridae* family. HEV is the most common cause of acute viral hepatitis worldwide. According to the World Health Organization (WHO), there are estimated 20 million HEV infections worldwide every year, leading to estimated 3.3 million symptomatic cases of HEV infection. The WHO estimates that HEV infection caused approximately 44,000 deaths in 2015, which represents 3.3% of mortality rates due to viral hepatitis. In low-income (LI) countries and lower-middle-income (LMI) countries, HEV is a waterborne infection induced by HEV genotype (gt) 1 and HEV gt 2 that cause large outbreaks and affect young individuals with a high mortality rate in pregnant women from South Asian countries and patients with liver diseases. HEV gt 3, HEV gt 4, and HEV gt 7 are responsible for sporadic infections with zoonotic transmission mainly through the consumption of raw or undercooked meat from different animals. Acute HEV infection is relatively asymptomatic or mild clinical form, in rare cases the disease can be moderate/severe clinical forms and result in fulminant hepatitis or acute liver failure (ALF). Furthermore, HEV infection is associated with extrahepatic manifestations, including renal and neurological clinical signs and symptoms. Pregnant women, infants, older people, immunocompromised individuals, patients with comorbidities, and workers who come into close contact with HEV-infected animals are recognized as major risk groups for severe clinical form of HEV infection and fatal outcome. Chronic HEV infection can occur in immunocompromised individuals with the possibility of progression to cirrhosis.

Keywords: acute and chronic infection, cancer, cirrhosis, hepatitis E virus, HEV, HIV, solid organ transplants

Review

The Re-Emergence of Hepatitis E Virus in Europe and Vaccine Development

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Abstract: Hepatitis E virus (HEV) is one of the leading causes of acute viral hepatitis. Transmission of HEV mainly occurs via the fecal-oral route (ingesting contaminated water or food) or by contact with infected animals and their raw meat products. Some animals, such as pigs, wild boars, sheep, goats, rabbits, camels, rats, etc., are natural reservoirs of HEV, which places people in close contact with them at increased risk of HEV disease. Although hepatitis E is a self-limiting infection, it could also lead to severe illness, particularly among pregnant women, or chronic infection in immunocompromised people. A growing number of studies point out that HEV can be classified as a re-emerging virus in developed countries. Preventative efforts are needed to reduce the incidence of acute and chronic hepatitis E in non-endemic and endemic countries. There is a recombinant HEV vaccine, but it is approved for use and commercially available only in China and Pakistan. However, further studies are needed to demonstrate the necessity of applying a preventive vaccine and to create conditions for reducing the spread of HEV. This review emphasizes the hepatitis E virus and its importance for public health in Europe, the methods of virus transmission and treatment, and summarizes the latest studies on HEV vaccine development.

Keywords: hepatitis E virus; emerging disease; HEV transmission; HEV epidemiological studies; HEV vaccines; HEV control and prevention; zoonosis

Review



Global warming and mosquito-borne diseases in Africa: a narrative review

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Keywords: Africa, global warming, mosquito-borne diseases, mosquitoes, public health

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Global warming and mosquito-borne diseases in Africa: a narrative review

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Abstract

Human activity has a direct influence on the climate on our planet. In recent decades, the greater part of the scientific community has united around the concept of Global Warming (GW). This process highly impacts the geographical distribution of mosquitoes and Mosquito-Borne Diseases (MBD). The examined scientific publications show that Africa, especially sub-Saharan countries were and still hot spot of MBD globally. The economic, social, and environmental conditions prevailing in most African countries have effectively contributed to the spread of MBD. The current situation is very worrying, and it will get even more complicated as GW gets worse. In this regard, health systems in developing countries will have serious difficulties in health policies and public health activities to control the spread on MBD. Therefore, the governments of

African countries should do more to combat MBD. However, a part of the responsibility lies with the international community, especially countries that contribute to GW. In conclusion, the analysis of the scientific literature showed that with increasing importance of GW leads to an increase in the prevalence of MBD

Hepatitis E Virus Infection in Bulgaria: A Brief Analysis of the Situation in the Country

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Abstract

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Keywords: HEV infection; Bulgaria; Public health

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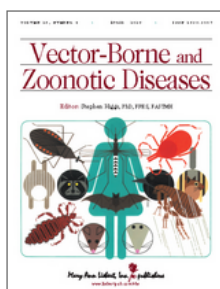
BACKGROUND: Over the past two decades, more thorough investigations for hepatitis E virus (HEV) infection have been done in the world. Reports from Southeast European countries have increased.

AIM: The current article presents a critical analysis of all studies for HEV in Bulgaria.

MATERIAL AND METHODS: A literature search was done using available medical databases. We analysed the literature in PubMed databases and Bulgarian medical databases for English and Bulgarian languages sources. Preference was given to the sources published within the past 24 years (January 1995 – September 2018).

RESULTS: Two thousand two hundred and fifty-seven blood serums were tested for the analysed period (1995 – 2018), and 13.1% of them were positive for acute HEV (Mean $\pm$ SD: 20.38 $\pm$ 25.77%; 95% CI: 1.29 – 39.47%). The following subtypes were established in the country – HEV Subtype 3e, HEV Subtype 3f, HEV Subtype 3c, HEV Subtype 3i, HEV Subtype 3hi and HEV Subtype 1.

CONCLUSION: We hope that the National Health Organizations will take adequate and timely measures to increase the knowledge and research for HEV among Bulgarian citizens.



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VECTOR-BORNE AND ZOOLOGICAL DISEASES

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First Insight into the Seroprevalence of Hepatitis E Virus and Associated Risk Factors Among Liver Transplant Recipients from Bulgaria

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Abstract

Introduction: Hepatitis E virus (HEV) infection is caused by viruses belonging to the *Hepeviridae* family. HEV infection can be self-limiting; however, extrahepatic manifestations may be present. The purpose of the current study was to establish the seroprevalence of HEV among Bulgarian liver transplant recipients (LTRs) and to identify associated risk factors.

Materials & Methods: The present study was conducted between April 1, 2023, and October 30, 2023, at the Military Medical Academy, Sofia, Bulgaria. All serum samples were tested for anti-HEV IgG/IgM using HEV IgG/IgM enzyme-linked immunosorbent assay on Dia.Pro (Milan, Italy). Each participating LTR completed a detailed paper-based closed-ended questionnaire regarding the associated risk factors for HEV infection.

Results: The study included 73 LTRs with a mean age of 47.0 ± 14.0 years. Anti-HEV IgG antibodies were detected in 25 LTRs (34.2%), including 20 males (37.7%) and 5 females (25%). All participants were HEV-IgM negative. HEV seropositivity rates were higher but not statistically significant in LTRs aged >60 years than in those aged <60 years (40% vs. 32.7%). A significant factor by logistic regression was “high level of education” (odds ratio [OR] = 2.917; $p = 0.038$).

Conclusion: To the best of our knowledge, this is the first seroepidemiological HEV study among LTRs from Bulgaria that found a high seroprevalence (34.2%).

Keywords: hepatitis E virus, HEV, liver transplant recipients, liver transplant, seroprevalence, risk factors

Letter to the editors



Sellers of unpasteurized animal milk in unregulated markets: a key factor for human brucellosis control in El-Oued province, Algeria

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Keywords: Animals, brucellosis, humans, public health, unpasteurized milk, zoonoses

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Sellers of unpasteurized animal milk in unregulated markets: a key factor for human brucellosis control in El-Oued province, Algeria

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Hybrid peer-reviewed journals and publishing model: Bias or impartiality in editorial policy

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Abstract

In recent years, there has been a significant increase in scientific productivity—an increased number of published original articles, reviews, short communications, case reports, and letters to the editor. In this regard, there is a large number of peer-reviewed journals in all fields of scientific knowledge, including in the field of biomedical sciences. Many studies indicate the existence of so-called journal editorial board bias and acknowledge the difficulty of eliminating it. We present our brief opinion on an important topic such as how publishing policy in some peer-reviewed journals leads to feelings of bias and inequality among authors and how to address this.

Keywords

bias, editorial policy, hybrid journals, impartiality, publishing model



Article

Enhanced Production of IL-10 in PCR-Positive Dogs Infected with *E. canis* and *A. phagocytophilum* Facilitate Specific Immune Responses

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Abstract: Infection of dogs with the tick-borne rickettsiae *Ehrlichia* and *Anaplasma* provokes an immune response mediating the pathology and bacterial resistance. IL-10 is the main anti-inflammatory cytokine and plays a multifaceted role in host protection. The study aimed to investigate circulating IL-10 in 32 dogs naturally infected with *A. phagocytophilum* and *E. canis*, identified by PCR positivity, and 33 PCR-negative animals which tested positive for antibodies against these pathogens, as well as 22 healthy animals. The highest quantity of IL-10, measured by ELISA, was observed among dogs positive simultaneously for anti-*E. canis* and anti-*A. phagocytophilum* IgG antibodies, followed by dogs positive for anti-*E. canis* only. The concentration of IL-10 in PCR-positive dogs was almost three and a half times higher than that measured in the control group (77.09 ± 23.61 pg./mL vs. 21.55 ± 4.61 pg./mL; $p = 0.0015$) and five times higher than the concentration of interleukin in PCR-negative animals (77.09 ± 23.61 pg./mL vs. 14.86 ± 3.01 pg./mL; $p = 0.000016$). The highest level of IL-10 was observed in PCR-positive dogs with mixed infection (120.54 ± 44.18), followed by the level in PCR-positive dogs for *E. canis* only (78.81 ± 16.92). The lowest level of IL-10 was observed in PCR-positive dogs for *A. phagocytophilum* only (56.32 ± 12.68). We may suggest that infection with *E. canis* and *A. phagocytophilum* stimulates the IL-10 production in dogs, which may facilitate specific antibody responses.

Keywords: cytokine; IL-10; Anaplasmatidae; antibody synthesis; *Ehrlichia*; *Anaplasma*; *E. canis*; *A. phagocytophilum*



Article

First Insight into the Prevalence of *Coxiella burnetii* Infection among Veterinary Medicine Students in Bulgaria

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Abstract: The aim of this study was to assess the prevalence of *Coxiella burnetii* infection among veterinary medicine students from two Bulgarian Universities, located in Sofia and Stara Zagora. Blood samples were collected from a total of 185 veterinary students for the detection of *C. burnetii* phase II antibodies and presence of DNA using an enzyme-linked immunosorbent assay (ELISA) and end-point PCR test. Out of all samples, 29.7% were positive for at least one *C. burnetii* phase II antibody marker or by the result of the PCR test. Veterinary students from Stara Zagora showed a significantly high seropositivity for Q fever (33.6%), as compared to the students in Sofia (23%; $p < 0.05$). Evidence of recent exposure with detection of anti-*C. burnetii* phase II IgM (+) antibodies was observed in 14.6% of the students under study. Seroprevalence among students in Stara Zagora was higher (15.3%). Anti-*C. burnetii* phase II IgG antibodies were detected in 21.6% of examined samples. Our study revealed a higher seropositivity among the male students (32.8%) as compared to females (16.0%; $p < 0.05$). The end-point PCR assay detected 5.9% blood samples as positive. The relative risk (RR) of Q fever exposure for male students was 40.7%, whereas it was 24.6% in females ($p < 0.05$). The findings from this study indicate that the *C. burnetii* infection is widely distributed amongst veterinary students in Bulgaria. This study emphasizes the need for improved safety protocols and infection control measures in veterinary training programs.

Keywords: *Coxiella burnetii*; Q fever; veterinary medicine students; Bulgaria

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First molecular evidence of *Anaplasma platys* infection in a dog (Labrador retriever) from Bulgaria

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ABSTRACT

Background: In recent years, the One Health approach and vector-borne diseases have become an increasingly topical problem around the world. In addition, climate change has a significant impact on zoonoses and public health. We present a case report of tick-borne disease in a dog.

Case Description: A clinical case of *Anaplasma platys* infection in a 10-year-old female dog (Labrador retriever) is described. Clinical, hematological, biochemical, serological, cytological, and polymerase chain reaction tests supporting the diagnosis have been performed.

Conclusion: To the best of our knowledge, this is the first report of *A. platys* from Bulgaria. This report adds to the overall knowledge of *Anaplasma* spp. in our country and the region of Southeastern Europe.

Keywords: *Anaplasma platys*, Bulgaria, Dog, Molecular evidence.

Article

Questionnaire-Based Survey on Risk Factors and Prevalence of Major Vector-Borne Diseases in the Aegean Region of Türkiye

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Simple Summary

Vector-borne diseases are a growing concern for dog health worldwide, as they can cause severe illness and sometimes death. Understanding where and why these infections occur is essential for protecting both animals and people. This study investigates how common these diseases are in dogs living in the Aegean Region of Türkiye and which factors increase their risk. Medical records from 781 dogs examined between 2019 and 2024 were analyzed, along with information about their living conditions and outdoor exposure. Approximately one in four dogs tested positive for at least one infection, and some were infected with more than one disease at the same time. The most frequent infections were Ehrlichiosis and Leishmaniasis, both affecting the blood and immune system. Interestingly, geographic location played a larger role in disease risk than the dog's age, breed, or daily activities. These findings highlight the importance of targeted prevention programs in high-risk areas within the Aegean Region (particularly Aydın and the surrounding districts) and underline the need for regular tick control and monitoring to reduce infection rates and protect the health of dogs and their owners.

Abstract

This study aims to investigate the prevalence and risk factors associated with canine vector-borne diseases (CVBDs) in the Aegean Region of Türkiye. Using a questionnaire-based approach, this study intends to fill the gaps in existing knowledge regarding the prevalence and determinants of these infections. A retrospective analysis of 781 dogs presented to Aydın Adnan Menderes University Small Animal Clinic from 2019 to 2024 was conducted. Among these, 205 dogs were confirmed to have at least one CVBD using rapid diagnostic tests (SNAP 4DX PLUS and SNAP Leishmania) with confirmatory methods. Data on dog demographics, lifestyle, and environmental exposure were collected using structured questionnaires. Prevalence rates were calculated based on the at-risk population, and logistic regression determined associations between risk factors and disease occurrence. Overall CVBD prevalence was 26.3%, with Ehrlichiosis (9.9%) and Leishmaniasis (7.4%) being the most common infections. Co-infections were present in 8.3% of cases. Geographical factors significantly influenced infection rates, particularly in Aydın compared to Izmir and Muğla, while demographics like age, breed size, gender, and outdoor activity had no significant impact. This highlights the necessity for region-specific control measures and



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the need for consistent adherence to preventive protocols to mitigate CVBD prevalence in high-risk areas.

Keywords: co-infection; dog; ehrlichiosis; geographical distribution; leishmaniasis



Article

Assessment of Oxidative Stress and DNA Damage in Dogs with Visceral Leishmaniasis Using Urinary 8-Hydroxy-2'-Deoxyguanosine

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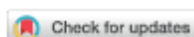
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Simple Summary

Canine leishmaniasis is an important parasitic disease that affects dogs and can also be transmitted to humans. This disease can cause oxidative stress, which may damage cells and DNA. In this study, we evaluated oxidative stress and DNA damage in dogs with leishmaniasis by measuring oxidative stress markers in blood and a DNA damage marker in urine. We found that dogs with leishmaniasis exhibited alterations in oxidative balance, characterized by increased total oxidant capacity (TOC) along with a concurrent increase in total antioxidant capacity (TAC), but urinary DNA damage levels were not significantly different from healthy dogs. These results suggest that oxidative stress is involved in the disease, while urinary DNA damage markers measured by ELISA may not be reliable diagnostic tools.

Abstract

Canine leishmaniasis (CanL) is a major vector-borne disease with zoonotic potential, and oxidative stress plays an important role in its pathogenesis. CanL is a chronic, progressive disease in which clinical signs may develop gradually over months or even years, depending on host immune response and parasite burden. This study aimed to evaluate oxidative DNA damage in dogs with CanL by measuring urinary 8-hydroxy-2'-deoxyguanosine (8-OHdG) levels and oxidative stress markers. A total of 54 dogs, including 34 dogs with CanL and 20 healthy controls, were included. Urinary 8-OHdG and serum malondialdehyde (MDA) were measured using ELISA method, whereas serum TAC and TOC were determined using automated colorimetric method. Dogs with CanL showed significantly higher TAC (1.30 ± 0.05 vs. 1.04 ± 0.06 mmol/L, $p = 0.001$) and TOC levels (18.91 ± 3.29 vs. 8.23 ± 1.61 $\mu\text{mol H}_2\text{O}_2$ Eq/L, $p = 0.002$) compared with healthy controls. Although urinary 8-OHdG and MDA levels were higher in infected dogs, these differences were not statistically significant ($p > 0.05$). These findings indicate a disturbance in oxidative balance in dogs with CanL, characterized by simultaneous increases in both oxidant and antioxidant parameters, while urinary 8-OHdG, as measured by ELISA, may have limited ability to reflect cellular oxidative DNA damage in dogs with CanL, rather than indicating an absence of DNA damage.



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LETTER TO THE EDITOR

DOG DOMESTICATION AND ZONOTIC DISEASES AMONG URBAN COMMUNITIES IN ARAB COUNTRIES: A GROWING THREAT TO PUBLIC HEALTH

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Dear Editor,

The domestication of dogs by humans began more than 15,000 years ago, and since then, they have been closely tied to human activities, such as guarding, hunting, and herding¹. In addition to being a social companion and partner in work, dogs have entered homes and spent more time with humans. Hence, their relationship was strengthened over time in many cultures². Humans gained many benefits from dogs' domestication. However, scientific research indicates that dogs can transmit many pathogens (including bacteria, viruses, parasites, and fungi)^{3,4}. Othman and Abuseir counted more than 60 dangerous zoonotic diseases related to dogs, especially echinococcosis, rabies, and leishmaniasis⁵. Many peer-reviewed articles have reported on the involvement of dogs in disease transmission. For example, Kocon et al. indicate that dogs contributed to spreading ticks (*Acar: Ixodida*) in both recreational and urban areas in Southern Poland⁶.

Relationships between humans and animals, particularly dogs, vary according to human cultures, customs, and even religious beliefs. This relationship ranges from being predominantly negative in many developing countries to being overwhelmingly positive in developed countries⁶. Dogs occupy an important place in the family lifestyle in developed countries. Further, the family shares most activities with their animals (home, shopping, holidays, playing sessions, and others). According to Chomel, dogs are sometimes used as a substitute for children⁴. Over time, these communities gained the necessary experience and knowledge about dog breeding, as well as providing the necessary health care. However, many incidents of infection have been documented, primarily through certain behaviors such as sleeping, kissing, being licked, or sharing food or kitchen utensils. Simply put, the dogs' domestication is an integral part of the culture of these communities. In general, the situation is similar both in urban and rural areas.



FELINE BARTONELLOSIS – A MINI REVIEW

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Summary

Pepovich, R., I. Tsachev, M. Baymakova, G. Stoimenov, G. Krumova-Valcheva, B. Chakarova & P. Genova-Kalou, 2025. Feline bartonellosis – a mini review. *Bulg. J. Vet. Med.*, **28**, No 1, 18–28.

An up-to-date literature overview of bartonellosis in cats was made. Its seroprevalence, etiological characteristics, epidemiological features and clinical manifestations are outlined. The emphasis is placed on its laboratory diagnostics, therapy and prevention in cats. Human bartonellosis with data from Bulgaria is described.

Key words: *Bartonella henselae*, bartonellosis, cats, zoonosis

Medicinal plants used in the treatment of brucellosis

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Abstract

Brucellosis is a widespread zoonotic disease caused by bacteria of the genus *Brucella*. It is a real challenge for the economy and public health. This chapter explores the most important medicinal plants used in the treatment of brucellosis. For this aim, the search and analysis included three types of studies: ethnobotanical investigations, in vitro studies, and in vivo studies. The analysis of ethnobotanical investigations shows that more than 97 medicinal plants can treat fever, which is the most common symptom of brucellosis. In vitro studies listed 64 plants approved for their effectiveness against the most dangerous species of *Brucella*. Only a few experiences were carried out as in vivo studies. We believe that plants and their derived products are promising future sources of safe medication through which we can make tangible progress in treating many serious and incurable diseases, including brucellosis. On the other hand, the current situation requires us more than ever to preserve our heritage of medicinal plants, especially endangered species.

Keywords: Antibiotic; *Brucella*; Brucellosis; Conservation; Extract; Medicinal plants; Traditional knowledge; Treatment.

21.1 Brucellosis: An overview

21.1.1 History

Brucellosis is a widespread zoonotic infectious disease caused by a genus of bacteria called *Brucella* belonging to the family Brucellaceae [1,2]. Brucellosis is a disease rooted in human history. It affected humankind about 2.3–2.5 million years ago. The earliest published case dates back to the late Pliocene and was discovered in the partial skeleton of *Australopithecus africanus* [3,4]. Brucellosis is known by many synonyms, mainly related to the geographical locations where the disease occurred, such as Malta fever, Cyprus fever, Mediterranean fever, Gibraltar fever, Crimean fever, undulant fever, and Bang's disease. However, from 1940, the most common name is brucellosis [5,6].

In 1859, while working in Malta, Dr. Marston from the British Army described for the first time the clinical manifestation of human brucellosis as "Mediterranean gastric remittent fever" [7]. The pathogen was first isolated and identified in 1887 by David Bruce from the spleen of a British soldier who died of Malta fever. It was initially named *Micrococcus melitensis* and later named *Brucella melitensis* [8–10]. Subsequently, 12 *Brucella* species were identified and classified, nine of which affect terrestrial animals (Table 21.1) [31,32].



MOLECULAR DETECTION OF *EHRlichia canis* AND *ANAPLASMA PHAGOCYTOPHILUM* IN BLOOD SAMPLES FROM DOGS IN BULGARIA

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Summary

Gospodinova, K., I. Stanilov, L. Miteva, I. Tsachev & V. Petrov, 2024. Molecular detection of *Ehrlichia canis* and *Anaplasma phagocytophilum* in blood samples from dogs in Bulgaria. *Bulg. J. Vet. Med.*, 27, No 3, 375–386.

The aim of the study was to develop a molecular diagnosis protocol of monocytic ehrlichiosis and granulocytic anaplasmosis in dogs by conventional polymerase chain reaction (PCR) and to compare the results from PCR and a rapid serological test. One hundred and six blood samples from dogs were tested by the rapid serological test SNAP 4Dx Plus (IDEXX Laboratories, Westbrook, ME) and by conventional PCR. Sixty-two of them (58.49%) were positive for antibodies to *Ehrlichia canis*/*Ehrlichia ewingii* and 14 (13.21%) for antibodies to *Anaplasma phagocytophilum*/*Anaplasma platys*. In 24 (22.64%) blood samples, antibodies against both pathogens were simultaneously detected. Six (5.66%) samples were seronegative. Forty-six of the 106 tested samples (43.4%) were positive for a 345 bp segment of the ribosomal gene of family *Anaplasmataceae*. In 28 of them the presence of a 444 bp fragment of the *ankA* gene of *A. phagocytophilum* was detected, and in 26: a 409 bp fragment of the gene of *E. canis*. Nine samples were simultaneously positive for genetic sequences of *E. canis* and *A. phagocytophilum*. The target DNA fragments specific for the two studied pathogens were not detected in one of the *Anaplasmataceae*-positive samples. In the remaining 60 cases (56.6%), the presence of a 345 bp segment of the ribosomal gene was not detected. In the present study, the DNA of *E. canis* and of *A. phagocytophilum* was detected for the first time in Bulgarian dogs by the conventional PCR.

Key words: 16S rRNA, *Anaplasmataceae*, *ankA*, antibodies, canine blood

Applicability of biosensor technologies in the detection of *Coxiella burnetii* infection in clinical samples

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ABSTRACT

Q fever is a zoonosis distributed worldwide; it is caused by obligate intracellular bacterium *Coxiella burnetii*. Q fever is considered challenging for diagnosis and treatment. Clinical manifestations can vary among patients, which makes differential diagnosis difficult. In addition, in animals, the infection often remains latent, thus, creating a risk of uncontrolled dissemination and transmission to humans. Hence, the need for rapid and accurate identification of the pathogen to take timely and adequate therapeutic and prophylactic measures, including on-site testing. Current strategies for the detection of *C. burnetii* are molecular assays, e.g. polymerase chain reaction (PCR) or next-generation sequencing (NGS), and traditional serological tests. The conventional pathogen detection methods have serious limitations that make them not suitable for on-site analysis, as it requires level three biosafety laboratory conditions for cultivation in eukaryotic cell culture and poses significant health risks. In this review, we highlight the problems related to the application of biosensors in the detection of *C. burnetii* infection and their place among the standard diagnostic methods, given the potential of biosensors to provide rapid and quantitative diagnosis. We consider the applicability of surface plasmon resonance (SPR)-based biosensors for *C. burnetii* detection. The elaboration of an SPR biochip with an immobilized structural *C. burnetii* protein as a recognition molecule is described. The SPR assay is based on the binding reaction 'infectious structural protein – anti-*C. burnetii* antibodies'. We discuss our preliminary results addressing their application in *C. burnetii* detection.

ARTICLE HISTORY

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KEYWORDS

Biosensors; Q-fever; laboratory diagnostics; surface plasmon resonance (SPR) assay



A REVIEW OF WILD AND SYNANTROPIC BIRDS RECORDED AS RESERVOIRS OF AVIAN INFLUENZA VIRUSES IN BULGARIA

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Summary

Nikolov, S., M. H. Marinova, B. Murad & I. Tsachev, 2020. A review of wild and synantropic birds recorded as reservoirs of avian influenza viruses in Bulgaria. *Bulg. J. Vet. Med.*, **23**, No 3, 271–284.

The aim of the present review is to summarise the information about the species diversity of wild and synanthropic birds, which have been recorded as reservoirs of influenza in Bulgaria until 2018. A total of 17 species of wild and synantropic birds were reported. They belong to 16 genera, 11 families and 10 orders of the class Aves. A list of wild and synantropic birds – potential reservoirs of influenza in Bulgaria is also presented.

Key words: Bulgaria, influenza, wild birds, synantropic birds



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LETTER TO THE EDITOR

An open letter to veterinarians: Professional ethical violations as a risk factor for the spread of brucellosis in Algeria



Keywords Brucellosis; Ethical violations; Veterinarians

Dear Editor,

Brucellosis is among the most widespread zoonotic diseases globally and it is caused by bacteria belonging to the genus *Brucella* [1,2]. Although ten species of the genus *Brucella* are capable of causing brucellosis, only a few of them can affect humans [3]. The disease is transmitted to humans by derived food products or contact with fluids from infected animals [4].

Governments are making great efforts to eradicate brucellosis and protect livestock and human communities. However, this disease is still prevalent in many parts of the world. Rev.1 vaccine, which is a live attenuated *Brucella melitensis* strain, is systematically used to vaccinate small ruminants worldwide – for example Alpine ibex (*Capra ibex*), domestic goat (*Capra hircus*), etc. [5]. However, there is no adequate vaccine for humans [6].

A recent our research carried out in El-Oued province, Algeria indicates that some veterinarians in the private sector often avoid vaccinating animals against brucellosis by themselves; on the contrary, they entrust this task to unskilled people or the breeders themselves [7]. Indeed, this behaviour is not limited only to the studied region, and it may be widespread in many world regions, especially in developing countries.

The observed behaviour of veterinarians may be due first to fear of infection, especially that the Rev.1 vaccine is a live attenuated version of *B. melitensis*. A few studies worldwide have shown that the possibility of accidental infection with *Brucella* while using the live vaccine is high among the veterinary community [8–10]. For example, Wallach et al. reported that 21 out of 30 employees were with active brucellosis as a result of their working in vaccine-manufacturing plants (vaccine strain *Brucella abortus* S19) [8].

Second, the weakness or absence of legal legislation governing and regulating this process is another cause that helps spread such behaviour. This behaviour leads first to the failure of the animal vaccination process and secondly to the possibility of infection of the person performing the vaccination process with *Brucella*. The main reason in both cases is that the vaccinator is not a specialist.

Veterinarians are the first defensive line against brucellosis because they are the most knowledgeable persons about this infectious disease and its danger to humans and animals. This unethical behaviour would undermine the efforts made by the health authorities to eradicate animal brucellosis. On the other hand, it undermines trust between the veterinarians and the livestock owners, which will lead to the continuation of the brucellosis outbreak, which threatens public health.

In conclusion, we recommend in this letter veterinarians to adhere to the ethical principles of the profession, even in the absence of adequately legislation, while taking all necessary precautions for the safety of all parties. This letter also serves as an invitation to policymakers and public health specialist, who should be aware of such unethical behaviour and must work to combat it in all of its forms and by all means.

Authors' contributions

B.K., M.B., A.N.A., and I.T. contributed to study design, data collection, data interpretation, article preparation, and literature search. All authors read and approved the final version of the article.

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Disclosure of interest

The authors declare that they have no competing interest.

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КОНСКА ГРАНУЛОЦИТНА АНАПЛАЗМОЗА

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EQUINE GRANULOCYTIC ANAPLASMOSIS

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Резюме:	Гранулоцитната анаплазмоза е една от водещите векторно предавани инфекции в света. В настоящата статия е представен кратък преглед на научната литература относно конската гранулоцитна анаплазмоза (КГА). Разгледани са различни аспекти на тази инфекция: обща характеристика, клинично протичане, лабораторна диагностика, терапия и превенция. Подобряването на познанията за КГА е важна стъпка към справянето с тази инфекция.
Ключови думи:	гранулоцитна анаплазмоза, <i>Anaplasma phagocytophilum</i> , обзор
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Abstract:	Granulocytic anaplasmosis is one of the leading vector-borne diseases in the world. This article presents a brief review of the scientific literature about Equine granulocytic anaplasmosis (EGA). Various points of view have been considered: general characteristics, clinical manifestation, laboratory diagnosis, therapy and prevention. Improving the knowledge of the EGA is an important step in dealing with this infection.
Key words:	granulocytic anaplasmosis, <i>Anaplasma phagocytophilum</i> , review
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ОБЩА МЕДИЦИНА GENERAL MEDICINE

НАСТОЯЩИ ПОЗНАНИЯ ЗА ANAPLASMA PHAGOCYTOPHILUM

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CURRENT KNOWLEDGE ON ANAPLASMA PHAGOCYTOPHILUM

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Резюме. Инфекцията с *Anaplasma phagocytophilum* е сред най-често срещаните векторнопреносими инфекции. Целта на настоящата статия е да се направи преглед на научната литература относно различни аспекти на *Anaplasma phagocytophilum* – обща характеристика, епидемиологичен цикъл, вектори, резервоари и гостоприемници, инфекцията при диви животни и гризачи. Обзорът на литературата показва, че за последните 30 години познанията за *Anaplasma phagocytophilum* са нараснали в значима степен.

Ключови думи: *Anaplasma phagocytophilum*, обзор, векторнопреносими инфекции

Abstract. *Anaplasma phagocytophilum* infection is one of the most common vector-borne diseases. The aim of this article is to review the scientific literature on various aspects of *Anaplasma phagocytophilum* – general characteristics, epidemiological cycle, vectors, reservoirs and hosts, an infection in wild animals and rodents. The review of the literature has shown that over the last 30 years, knowledge of *Anaplasma phagocytophilum* has increased significantly.

Key words: *Anaplasma phagocytophilum*, review, vector-borne diseases

ОБЩА МЕДИЦИНА GENERAL MEDICINE

ЧОВЕШКА ГРАНУЛОЦИТНА АНАПЛАЗМОЗА

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HUMAN GRANULOCYTIC ANAPLASMOSIS

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Резюме. Човешката гранулоцитна анаплазмоза (ЧГА) е една от водещите векторно предавани инфекции в света. В настоящата статия е представен кратък преглед на научната литература. Разгледани са различни аспекти на тази инфекция: етиология, клинично протичане, лабораторна диагностика, етиологична диагностика, терапия и превенция. Подобряването на познанията за ЧГА е важна стъпка към справянето с тази инфекция.

Ключови думи: човешка гранулоцитна анаплазмоза, *Anaplasma phagocytophilum*, обзор

Abstract. Human granulocytic anaplasmosis (HGA) is one of the leading vector-borne diseases in the world. This article presents a brief review of the scientific literature. Various points of view have been considered: etiology, clinical manifestation, laboratory diagnosis, etiologic diagnosis, therapy and prevention. Improving the knowledge of the HGA is an important step in dealing with this infection.

Key words: human granulocytic anaplasmosis, *Anaplasma phagocytophilum*, review

ОБЩА МЕДИЦИНА GENERAL MEDICINE

ЕРЛИХИОЗИ И АНАПЛАЗМОЗИ

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EHRLICHIOSES AND ANAPLASMOSES

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Резюме. През последните 30 години науката се занимава активно с представителите на семейство Anaplasmataceae. Anaplasmataceae са агенти със зоонозен характер и засягат както животните, така и хората. Целта на настоящата статия е да бъдат представени някои от характеристиките на *Ehrlichia chaffeensis* и *Anaplasma phagocytophilum*, както и особеностите на заболяванията, до които водят те. Разгледани са етиологията, патогенезата, диагностиката, клиниката и лечението на човешката моноцитна ерлихиоза и човешката гранулоцитна анаплазмоза. Извършен е системен анализ на достъпните литературни източници по отношение на ерлихиозите и анаплазмозите.

Ключови думи: *Ehrlichia chaffeensis*, *Anaplasma phagocytophilum*, обзор

Summary. Over the past 30 years, researchers have been actively investigated the species of family Anaplasmataceae. Anaplasmataceae are zoonoses agents and affect both animals and humans. The purpose of this article is to present some etiological and epidemiological characteristics of *Ehrlichia chaffeensis* and *Anaplasma phagocytophilum*, and also the clinical features of the diseases. Etiology, pathogenesis, diagnosis, clinical manifestation and treatment in case of Human Monocytotropic Ehrlichiosis and Human Granulocytotropic Anaplasmosis are discussed. Systemic review of the literature is done.

Key words: *ehrlichia chaffeensis*, *anaplasma phagocytophilum*, review

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Лейшманиоз у собак. Актуальные аспекты

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Актуальные трансмиссивные болезни у собак:
*Болезнь Лайма, Гранулоцитарный анаплазмоз, Моноцитарный эрлихиоз,
Висцеральный лейшманиоз, Гепатозооноз и др.*

I. БОЛЕЗНЬ ЛАЙМА *Lyme Disease, Lyme Borreliosis*

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Ключевые слова: Болезнь Лайма, Lyme Disease, Lyme Borreliosis, боррелии, спирохеты.

Болезнь Лайма заболевание, переносчиком которого являются клещи, оно встречается у большого количества животных – собак, кошек, лошадей, овец и др. У собак протекает часто бессимптомно или с анорексией, усталостью и артритом. Возбудители заболевания боррелии. Болезнью Лайма болеет и человек.



Review

YERSINIA PESTIS - OLD AND NEW CHALLENGES IN HUMANS AND IN ANIMALS

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ABSTRACT

The influence of environmental, dynamics in the evolution of the vectors and the susceptibility of the human organism are the most important factors for the infectious and epidemic process of *Y. pestis*. Travel, tourism, business etc. play a significant role in the emergence and spread of communicable, especially in the so-called "emerging" diseases, incl. plague. Persistence of the plague epizootic process is a function of dynamic interactions between flea vectors of disease and infected animals- reservoirs. The plague epidemic has followed climatic changes over the years. Increased humidity and temperature, associated with the global warming, could lead to an increase in the population of the reservoirs by increasing food supplies and flea population and could activate the epidemic process of plague, over the coming decades.

Key words: Plague, epidemiology, global warming, *Yersinia pestis*

Article

Prevalence of Norovirus (NoV), Hepatitis A Virus (HAV), and Hepatitis E Virus (HEV) in Mussels (*Mytilus galloprovincialis*) from Bulgarian Black Sea Coast

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Abstract

Bivalve mollusks efficiently bioaccumulate human enteric viruses, posing significant food safety risks. This study assessed the prevalence of Norovirus (NoV GI and NoV GII), Hepatitis A virus (HAV), and Hepatitis E virus (HEV) in 59 samples of live mussels (*Mytilus galloprovincialis*) collected from the Bulgarian Black Sea coast between July 2022 and July 2023. Viral detection was performed using one-step real-time reverse transcription-polymerase chain reaction (RT-qPCR) following ISO 15216-2 standards, with a mean extraction efficiency of 4.06%. Norovirus GII was the most prevalent pathogen, with detection peaks following intense rainfall events in July 2023. In contrast, all samples tested negative for HAV and HEV. The analysis showed no significant correlation between *E. coli* contamination levels and the presence of NoV (Mann–Whitney U test, $p = 0.565$). The viral RNA was detected in several samples that otherwise complied with regulatory bacterial standards for direct consumption (≤ 230 MPN/100 g). In conclusion, within the limitations of the evaluated sample size and the specific geographically unbalanced sampling design, NoV GII was the predominant genogroup detected. These results suggest that current bacterial indicators may be insufficient to ensure viral safety in these products. In this regard, national control authorities need to undertake timely policies and measures for better and adequate surveillance, control and prevention of viruses in the different parts of the food chain.

Туларемия – зооноза №1 за 2015 г. и 2016 г. в България

„Нападение“ в кабинет, „Отмъщение“ на терен, „Паника“ в лаборатория: „Жертви“ от една пренебрегвана „Заплаха“ и у нас



„Нападение“ в кабинет. Ветеринарна лекарка в САЩ е ухапана на дясната длан при преглед на котка в кабинет (Weinberg and Branda, 2010). По протокол „жертвата“ приема амоксициклин и промива ухапаната рана. Котката е била с иктерус и анемия, и ваксинирана за бяс. На 5-и ден след „нападението“ лекарката постъпва в болница със зачервена, топла и болезнена отекла длан. Ваксинирана е за тетанус /дifterия/ коклюш и е започнато лечение с ампицилин-сулбактам. Направени са серологични изследвания за бартонелоза, лептоспироза, лаймска болест, токсоплазмоза, хепатит А, хепатит С, ерлихиоза и анаплазмоза – всичките отрицателни. Положителен серологичен титър 1:128 е установен за *Francisella tularensis*. Взета е и кръв и за хемотоксигура – резултатът е бил отрицателен. Развил се целулит, лекарският екип свързва с най-вероятния бактериален агент от устната кухина на котката – *Pasteurella multocida*, а не откриването му в кръвта със започнатото лечение. Поставени са две диагнози: туларемия и целулит. Лечението е продължено успешно с доксициклин и левофлоксацин.

„Отмъщение“ на терен. Туларемията е типично природоогнищно заболяване, от което най-често биват смъртоносно засягати дивите зайци. В литературата болестта е известна и като „отмъщението“ на дивите зайци – The Rabbit's Revenge. Случаите на туларемия при хора датират отдавна: Русия, 1920; САЩ, 1968/1978/1984. По-нови данни показват избухвания и в Швеция, 1996/2006; Франция, 2006;

Германия, 2007; Норвегия, 2011 и др. Като цяло туларемията засяга Северното полукълбо – Северна Америка, Европа, Русия, Китай, Япония.

„Паника“ в лаборатория. Туларемията винаги е повод за „паника“ за всяка лаборатория, защото е известно, че тя е втората по честота на срещане инфекциозна болест сред лабораторните работници в САЩ и трета в световен мащаб. Има и отбелязан фатален случай при лабораторен изследовател – пулмонарна форма при 43 г. мъж (лаборатория в Martha's Vineyard, САЩ). През март 2015 г. в секцията по „Епидемиология, инфекциозни болести и превантивна медицина“ на ВМФ при Тракийския университет в Стара Загора бе изолира-



КОРОНАВИРОЗА ПРИ КОНЕ

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История

- Заболяването е доказано за първи път през 2000 г. в САЩ.

Етиология

- Причинител е Equine coronavirus (ECoV), род Betacoronavirus, семейство Coronaviridae.

Разпространение

- САЩ, Япония и Франция.
- Серопревалентност – от 10 до 83%.

Епидемиология

- Източник на инфекция – клинично болни коне и латентни.
- Излъчтелство – с фекалии, 3–4 дни след инфектирането; продължителност – 3–25 дни, понякога до 99 дни.
- Предавателен механизъм – фекално-орален.
- Чувствителност – коне над 5-годишни; рядко под 1-годишна възраст.
- Протичане – спорадично до ензоотично.
- Леталитет – от 0 до 7%.

Клинична картина

- инкубационен период – 48 и 72 часа;
- анорексия;
- летаргия;
- треска – до 41° C;
- количен пристъп;
- меки до воднисти фекалии;
- енцефалопатия (рядко) – маневжни движения, атаксия, нарушена чувствителност, нистагъм, залежаване и припадък;
- левкопения, неутропения и лимфопения;
- хипербилирубинемия,

хипергликемия и хиперлипидемия.

Коронавирозата протича и като латентна инфекция.

Диагностика

- Real-Time Polymerase Chain Reaction (фекални проби).

Терапия

- Нестероидни противовоспалителни средства.
- Перорално или интравенозно вливане на течности и електролити.
- При ендотоксемия или септицемия – Sulfamethoxazole с Trimethoprim.

Превенция

- Спазване на мерки за биосигурност.
- Карантинизиране на всички новопостъпили коне – 3 седмици.
- Редовни дезинфекции – етилов алкохол, натриев хипохлорид, глутаров алдехид, пероксидни препарати.

„ЗАБОЛЯВАНЕТО“ НЕ СЕ ПОЗНАВА ДОБРЕ, ЛЕКАРИТЕ НЕ МИСЛЯТ ЗА НЕГО, НЕ СЕ И РЕГИСТРИРА

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„Заболяването“ не се познава добре, лекарите не мислят за него, не се и регистрира е извод, направен от доц. д-р Ангел Кунчев, относно Ку-треската сред хората, базиран на системни негови проучвания за близо 50-годишен период от преди 2015 г. (2017). В голяма степен бихме могли да отбележим, че и във ветеринарната медицина реалността е почти идентична (2020). Отбелязаните случаи при хора у нас през февруари 2022 г. в Етрополе и през май същата година в област Габрово, даде достатъчно основания тази зооноза отново да бъде обект на нови научни становища, актуални статии, академични лекции, конгресни дискусии и др.

За съжаление от последните години липсват достатъчно проучвания в нашата страна, които биха могли да подпомогнат научната активност на академичните среди и ежедневната сервизна дейност на практикуващите български ветеринарни лекари. В тази връзка добре е да се отбележат някои интересни и важни аспекти на Ку-треската, които биха могли да бъдат от полза както на хуманната, така и на ветеринарната медицина в

името на „Едно здраве“:

► Германски учени установяват заразяване при хора на 7 реципиента от Канада, Германия и САЩ, подложени на терапия с живи стволови клетки от овце, заразени с *C. burnetii* (2017)?

► В Германия след доказване на огнище на инфекцията са били унищожени 1200 лабораторни животни (2021)!

► Американски изследователи ясно дефинират важни епидемиологични и лабораторни особености на Ку-треската в продуктивното животновъдство (2018):

- ниска корелация сред овцете и козите при показателя серопозитивни животни/животни-излъчители, както и висока корелация – серопозитивни животни/животни-неизлъчители.

- ниска ефективност от приложението на тетрациклини при контрола и терапията на Ку-треската при преживните животни.

► Затвърдена е важната роля на ваксинацията за предотвратяване на абортите и редуциране на излъчелството чрез млякото, фекалиите и вагиналният секрет при преживните животни.

► Еднократният положителният титър на коксиелните антитела е доказателство за инфекция с *C. burnetii*, но е недостатъчно показателен каква е тя – настояща или предишна!

► Серологичните и PCR методите е желателно да се използват едновременно в диагностиката на Ку-треската.

► Лабораторният резултат е важен, но е недостатъчен. Съществува много често и риск от свръх-диагностика както при хора, така и при животни (2008, 2013)!

► Серонегативни животни могат активно да отделят *C. burnetii*.

► Студентите по ветеринарна медицина са със средно до високо ниво на серопревалентност (IgG) – 10 – 40% (Испания, Бразилия, САЩ), 18,7 – 19,5% Холандия, 14,3 % Канада (2012, 2017, 2020).

► Ваксиналното покритие срещу Ку-треската при хората в Австралия е 22%.

► Носителство на *C. burnetii* е установено във вагинални и маточни тъкани при здрави котки (8,5%) и в плаценти от кучета (7%).

Nullius rei scientia vilis est!
Няма безполезни знания.

„ОТМЪЩЕНИЕТО“ НА ПРОФЕСИЯТА

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Зад това плашещо заглавие „Отмъщението“ на професията, се крият пренебрегваните бактериални патогени, известни като бартонели. Те не се изучават задълбочено нито в хуманната нито във ветеринарната медицина. От тях най-често се споменава само един представител – *Bartonella henselae* – причинителя на болестта кошешко одраскване при човека или известна още и като фебриноза. В направената справка за *Bartonella henselae* в родната литература се установява за съжаление критичен минимум на научни съобщения – не повече от пет. Липсват и български публикации в авторитетни задгранични списания. Оказва се още, че проблеми има и с диагностиката на болестта при хората у нас и др.

Същевременно няколко задгранични изследователски американски и европейски центрове повече от 20 години работят с „бартонелите“ основно при хора, а някои и с домашни любимци – кучета и котки. Тези патогени наскоро бяха открити и в необичайни домашни резервоари като паяци и мокрици. Бартонели бяха доказани и при кръвопреливания, като те бяха заподозрени и за менталните дискомфортни сред американските войници, връщащи се от войната в Ирак. Като етиологични агенти на много клинични диагнози се оказват съпричастни тези, труднодо-

казващи се високо адаптирани, еритроцитни, моноцитни, не-утофилни и ендотелиотропни грам-негативни бактерии. Оказва се, че понастоящем бартонелите са 38 вида, от които проучени приоритетно при човека са: *B. henselae*, *B. quintana*, *B. bacilliformis*, *B. alsatica*, *B. clarridgeiae*, *B. doshiae*, *B. elizabethae*, *B. grahamii*, *B. koehlerae*, *B. mayotimonensis*, *B. melophagi*, *B. rochlimaea*, *B. schoenbuchensis*, *B. tamiae*, *B. vinsonii* subsp. *arupensis*, *B. vinsonii* subsp. *berkhoffii*, *B. volans*, *B. washoensis*. Заразяването при човека се реализира или чрез ухапване от вектор – бълхи, а също и кърлежи – или чрез одраскване или ухапване – обикновено от котка. Резервоари на бартонели могат да бъдат котки, кучета, говеда, коне, морски бозайници и костенурки и др. Клинико-патологичните прояви са изключително разнообразни при човека: бациларна ангиоматоза, пелиозен хепатит, ендокардит, миокардит, аневризми, васкулит, тромбози, хемоангиосаркоми, тромбоцитопения, хемолитична анемия, енцефалит, увеит, невморетинит и др. Много често напоследък бартонелите се свързват и с тежки състояния като: церебрални инфаркти, шизофрения, мултипленна склероза, хронична обструктивна белодробна болест, биполарно разстройство, постурален ортостатичен тахикардиялен синдром, осте-

омилит и др.

През 2014 г. в рейтингово списание бяха публикувани „плашещи“ данни от САЩ за доказване на бартонели в кръвта на 32-ма ветеринарномедицински специалисти от 114 (28%), корелиращи с епидемиологични характеристики и симптоми от минали и настоящи клинични оплаквания. В някои от случаите сред болната ветеринарномедицинска колегия нивото е кореспондирало до 50%!

През 2015 г. на страниците на друго високо авторитетно научно издание беше представен още по-зловещ материал със заглавие „Did *Bartonella henselae* contribute to the deaths of two veterinarians? (Дали *Bartonella henselae* е допринесла за смъртта на двама ветеринарни лекари?). Събраните данни и направените дискусии ясно подчертават ежедневния риск във ветеринарномедицинската професия и необходимостта от нови знания, умения и приложения на най-доброто днес. Нека не се връщаме към времето на Волтер (1694 – 1778) „Doctors put drugs of which they know little, into our bodies of which they know less, to treat diseases of which they know nothing at all.“ Наши изследвания от 2022 г. на клинични пациенти от Северна България показват, че всяка четвърта котка е заразена с бартонели!