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Review Article

Bovine ephemeral fever virus in cattle: clinical manifestations and diagnostic approaches

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Bovine ephemeral fever (BEF) also known as three-day Sickness, is acute viral disease that primarily infects cattle and leads to severe economic losses in the livestock industry in Iraq, as well as neighbouring countries. The manifestation of the disease can lead to sudden onset of fever, lameness, reduced milk production, and general lethargy. This disease is thought to spread via arthropod vectors (principally mosquitoes and biting flies); thus, high summer temperatures and high humidity enable the disease to spread quickly from animal to animal during periods of high vector activity. Periodic outbreaks of BEF occur in Iraq, Syria, Iran, Turkey and Saudi Arabia and, therefore; epidemic preparedness is essential in this area. The diagnosis of BEF is generally determined by clinical signs, geographical location, and case history; however, laboratory tests, such as RT-PCR and ELISA, can accurately confirm infection in animals suspected of being infected with BEF. Some of the control measures that can help manage BEF are vaccination, veterinary treatment of affected animals and vector control. While BEF is associated with low mortality, the economic implications resulting from losses in productivity and high veterinary expenses are severe. BEF control must therefore be a regional effort by all stakeholders willing to share their resources for the various ways of BEF surveillance, control and vaccination as well as to contain the spread of BEF and secure food supplies for livestock products.

Keywords: *Iraq, virus, BEF, PCR, disease, BEF*

Introduction

Livestock is an essential part of both food safety and agricultural economy in the Middle East region. Livestock farming is vital for the economy of many countries including Iraq, Syria, Iran, Turkey, and Saudi Arabia. The livestock sector is subject to a number of powerful threats posed by diseases including those which effect livestock productivity and livestock health. One of the most serious epidemiological problems for the cattle-farming sector in the Middle East is Bovine Ephemeral Fever (BEF). BEF is an acute viral infection which results from viruses of family Rhabdoviridae and is spread predominantly by blood-sucking insects (in particular mosquitoes and biting insects). The primary clinical symptoms of BEF are sudden onset of high fever, lameness (limping), arthritis, lethargy and anorexia, along with a marked decrease in milk production leading to substantial economic loss for farm owners and rural communities (Ghanem et al., 2026). Iraq's neighboring countries have faced similar challenges; research from Turkey and Iran shows seasonal outbreaks with very similar transmission dynamics (Faiz et al., 2026; Payami et al., 2026). Delays in accurate diagnosis have been shown to be a major factor in large-scale disease outbreaks. The most effective way to prevent such outbreaks is through the use of inactivated and/or live vaccines for routine immunization, combined with the use of biologically controlled vectors with appropriate pesticides and improved animal housing conditions (Macrae, 2026). Furthermore, livestock owners need ongoing education on how to properly manage and report suspected cases of infection as part of a comprehensive preventive approach to ensure the rapid eradication of infections from their herds. Ultimately, the current outbreak of BEF

virus in Iraq and surrounding areas presents a significant challenge requiring a coordinated (epidemiologically informed) response from the region through rapid diagnosis, the activation of vaccination programs, and field surveillance to monitor the extent of the outbreak. Support should be provided to local veterinary research institutions by strengthening collaboration with international agencies (such as the WOAH and the FAO) to ensure sustained disease control. This will allow for the continued health of livestock in the region (FAO, 2021; Özyörük et al., 2025). The aim of this review is to provide an insight into bovine ephemeral fever disease in cattle with specific emphasis on its clinical signs, epidemiology, transmission routes and diagnosis, specifically in Iraq and the nearby countries in the Middle East. Moreover, it covers the recent measures taken for its prevention and control.

Epidemiology of Bovine ephemeral fever in Iraq

BEF is a short-lived viral disease affecting cattle. In recent years, it has posed a problem for veterinarians and had economic consequences for farmers in Iraq. The disease is transmitted from animal to animal by insect vectors (such as mosquitoes and biting insects), with transmission limited by season, weather, and environment. In recent years, there have been recurrent outbreaks of BEF in Iraq, particularly in the southern and central governorates. This indicates that it has become a long-term epidemic problem affecting livestock numbers and their contribution to the agricultural economy (Kaya & Bulut, 2024). Available data suggest that BEF outbreaks in Iraq are seasonal, with peak incidence occurring during the summer months (June–September), when temperatures and humidity are at their highest. These conditions are ideal for increasing insect vector populations. Furthermore, the governorates with the highest incidence rates (Basra, Dhi Qar, Maysan and Diwaniyah) have the highest livestock densities and major water bodies suitable for insect vector breeding. Northern Iraq has witnessed sporadic cases of bovine ephemeral fever (BEF) in areas such as Ninewa and Salah ad-Din, although these cases are less frequent than in other regions. The increased incidence of this disease in these areas suggests the potential emergence of new infection zones due to animal movement and climate change. Several factors influence the spread of BEF in Iraq, the most significant being the inadequate veterinary vaccination systems, as sufficient vaccines are not available in most areas. Rural areas also suffer from a shortage of veterinary resources, including veterinarians and specialized laboratories capable of detecting the disease in its early stages. In clinical practice, BEF is often diagnosed clinically without laboratory confirmation, leading to an inaccurate understanding of its severity. Limited awareness among livestock breeders regarding the importance of early reporting and routine vaccination increases the risk of disease transmission to cattle herds (Gharban et al., 2023). A number of causes were responsible for the outbreak, such as transportation of animals within and between the borders with Syria and Iran, which lacked proper veterinary supervision and required veterinary health certificates. Through this kind of transportation, the virus finds its way into new areas which have not been affected previously. The lack of an early veterinary surveillance/alert system makes it impossible to detect the onset of an outbreak in a timely manner, leading to a delayed response, an increase in the number of infections, and increased economic losses due to BEF (Naderian et al., 2025). From an economic perspective, BEF causes severe losses for farmers because it decreases milk output, causes loss of weight, and long periods of treatment for affected animals. Veterinarians in Iraq report that average production losses in livestock from this disease in a single season are 400 million Iraqi dinars in some regions of the south of the country. It will also cause a decrease in sick animals' sales and hence affect farmers' income negatively. It can have some negative consequences on their mental well-being, as some feel pressure to kill sick animals or minimize their livestock. Most of the measures against this disease are based on symptomatic treatment (antipyretics) and antibiotics used on animals to prevent bacterial infections in addition to improving ventilation and minimizing contact with flies and other insects. However, these methods provide no full control over the disease. The proposed options that can help meet the challenges listed above are the incorporation of BEF into the National Immunization Program (NIP) with (provided) effective vaccines (at subsidized prices); Strengthening the rapid diagnostic capabilities of veterinary laboratories through the provision of RT-PCR devices and training for field veterinary personnel on the use of this technology; the creation of an integrated electronic surveillance system linking farmers with local veterinary clinics (for early reporting of suspected cases), thus allowing for prompt intervention and containment of the disease prior to widespread dissemination; and regional coordination with neighboring countries via implementation of joint surveillance and veterinary information exchange agreements, to limit the indiscriminate transfer of livestock (with potentially infected animals), (Kaya & Bulut, 2024). The epidemiological data of Iraq show that BEF cannot be classified as a seasonal or sporadic disease anymore; it has become endemic in nature. In this regard, it can be noted that comprehensive and systematic veterinary intervention will be necessary for the management of the disease and success of any measures depends on implementation of integrated animal health policy, awareness creation, in-field and laboratory monitoring, and cooperation between countries in order to protect animals and minimize economic losses caused by this viral infection.

Epidemiology of Bovine ephemeral fever in neighboring countries

BEF is a highly contagious viral disease affecting cattle and is transboundary. It is clear that in recent years this disease is moving smoothly from one country to another. All of the countries near Iraq, including Iran, Syria, Turkey, Saudi Arabia,

and Jordan, are increasingly impacted by the spread of the disease as they do not have enough power to manage livestock and cope with the influence of climate change. Research has shown that TBE has become endemic in these countries, no longer merely a rare or seasonal disease, but a persistent epidemic that threatens the sustainability of livestock production throughout the region (Payami et al., 2026). The southern and western provinces of Iran, particularly Khuzestan, Kermanshah, and Lorestan, are endemic areas for cow fever. The warm, humid climate in these regions contributes to the spread of disease-carrying insects. Several research studies were conducted in Iran between 2018 and 2022 using polymerase chain reaction (PCR) testing to confirm the presence of the virus in infected individuals during outbreaks in those years. These studies showed a link to viruses from India and Pakistan, suggesting the possibility of the virus spreading to other countries through cross-border trade or migratory insects (Rezatofighi et al., 2022). One of the biggest challenges Iran facing is the lack of locally produced, licensed commercial vaccines, leading to a failure to control diseases in some rural areas. The ongoing crisis in Syria has severely disrupted the livestock industry due to the continuing war, resulting in significant reductions in veterinary vaccination programs and a decline in diagnostic support capacity. The Syrian Ministry of Agriculture has reported multiple cases of bluetongue in several different regions, including Al-Hasakah, Deir ez-Zor, and Homs, over the past few years, with very low mortality and reduced productivity levels. According to local reports, poor veterinary services and business absence of diagnostics laboratories resulted in the delay of detected diseases as well as the outbreaks (Carew et al., 2025). Animal mobility is unregulated with respect to the countries' borders including Turkey and Iraq, which encourages new viral outbreaks on the borders. In Turkey, the southern and eastern border regions like Şanlıurfa and Diyarbakır undergo spikes in the cases of (BEF) each year from June to August. While the veterinary infrastructure in Turkey is notably better than that in its neighboring countries, it has also contributed to the ability to distinguish specific viruses responsible for the outbreaks of BEF and have them analyzed from the point of view of their genetic origins. Recent research indicates that viral isolates collected in Turkey are closely related to isolates found within neighboring countries; this reinforces the belief that BEF has occurred and may continue to occur within overlapping regions, thus preventing the implementation of any regulations to control the movement of animals across borders (Tokgoz et al., 2023). The situation is still unclear in Saudi Arabia with regards to the issue of seasonal infection in places like Asir, Najran, and Jazan. Moreover, the trade of livestock through the Hajj pilgrimage may increase the likelihood of viral disease importation into the Kingdom. According to a study done by King Faisal University, clinical signs alone can be enough for the identification of BEF, which is currently an uncontrolled disease in the Saudi Kingdom. Outbreaks have been reported in Jordan for various reasons, including sporadic outbreaks in areas such as Zarqa, Mafraq, and the northern Badia. The Jordanian Veterinary Directorate indicated that the majority of BEF cases originate from livestock imported from Saudi Arabia or from Bedouin herds entering Jordan without proper regulation (Aly et al., 2023). Despite the presence of some surveillance initiatives, the rapid identification and notification processes have been hampered by limited financial resources and a lack of veterinarians in rural regions. Moreover, there is a high level of ignorance regarding the seriousness of the disease and its prevention measures among farmers in the countries mentioned above and not a single one of those countries has any kind of trans-border animal surveillance system that would help with the identification and notification of animal diseases. In addition, the countries lack coordination in epidemiological data sharing that can be used for an effective and rapid response. The Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE) have endorsed the establishment of a shared regional database for monitoring the transboundary movement of animal diseases (particularly BEF), as this disease poses a common threat to the countries of the region (Lavon et al., 2023). Taking into account all of the above, it is apparent that BEF presents a challenge to the Veterinary Sector on a regional basis and that close collaboration will be needed among affected countries; Further, increasing veterinary laboratory capacity, intensifying breeders' education and developing appropriate vaccination strategies for local conditions in each country will help facilitate these efforts. Any disruption of these elements, in turn, would continue to provide opportunities for disease outbreaks, creating food security risks and undermining the sustainability of animal agriculture throughout the Middle East.

Clinical signs and diagnosis

BEF is a viral disease of cattle caused by a member of the Rhabdoviridae family. It is transmitted by blood-feeding insects such as mosquitoes and biting flies. Clinical signs of BEF play a crucial role in its detection, especially when advanced diagnosis is not possible. Clinical signs arise suddenly and rapidly after infection, which differentiates BEF from other viral illnesses in cattle. One of the most prevalent clinical findings is sudden high fever (greater than 41 °C), which is linked with clear indication of muscular pain, hind limb weakness, and inflexibility which finally leads to lying down without being able to stand. Symptoms usually last for 2–3 days, hence the name "ephemeral bovine". Other frequently occurring clinical indications are nasal discharge, excessive salivation, and lack of appetite, especially in case of milk-producing cows which results in a decline in the volume of produced milk. Clinical symptoms vary considerably in severity depending on the viral strain, the animal's immune status, and the speed of treatment (Paksoy et al., 2024). Although mortality associated with infection is low, significant direct economic losses occur due to decreased production, while indirect losses result from the death of a small number of infected animals, medical treatment costs, and weight loss. Diagnostic considerations begin with a thorough clinical assessment of the animal and the identification of a suitable

number of clinical symptoms that demonstrate a correlation with the time of year (spring and summer) and the geographic area (endemic versus non-endemic). When evaluating animals living in endemic areas, veterinarians often rely on clinical symptoms alone for diagnosis, especially if they observe multiple cases of the same infectious agent within a particular herd (Lavon et al., 2023). Nevertheless, diagnostic laboratory tests are often advised to verify the existence of an infection. The most reliable diagnostic method for diagnosing BEF is the use of molecular techniques such as the use of real-time polymerase chain reaction (RT-PCR) to detect the presence of the virus's genetic material in samples (blood, lymph nodes, or milk). A study in Japan demonstrated that the use of RT-PCR on day one of the onset of clinical symptoms yields positive results over 90% of the time, which makes RT-PCR a useful diagnostic method for early diagnosis of BEF (Solanki et al., 2025). The use of viral culture as a means of isolating the virus from acute blood samples can also be considered a reliable method of diagnosis, however, it has a longer turnaround time due to having to be grown in a cell culture, as well as needing a specialized laboratory to do so. Serological immunity tests can be a useful tool for diagnosis after the infection is established, especially in the case of large-scale epidemics. Serological immunity tests like the ELISA and VNT (viral neutralization assay) tests can detect whether or not specific antibodies against the BEF virus are present. Serological immunity tests can also be a useful epidemiological tool to measure the prevalence of the virus and the level of herd immunity in an area (Benevenia et al., 2024). However, the results of these tests are not useful in the early stages of infection, as antibodies develop several days after infection. In some cases, routine blood tests (CBC) help support the diagnosis, showing an increase in white blood cells, elevated levels of inflammatory proteins such as fibrinogen, and the presence of signs of general cellular stress. Some studies have also shown that the use of ultrasound techniques may help assess joint edema and lymphadenopathy in infected animals (Abdel-Hamied et al., 2026). The biggest challenge in diagnosis is the strong similarity between the symptoms of BEF and other viral diseases such as foot-and-mouth disease (FMD) and lumpy skin disease (LSD). This requires veterinarians to rely on clinical, epidemiological, and laboratory data to make an accurate diagnosis (FAO, 2021). For example, while BEF is characterized by a short illness period and intermittent fever, FMD is associated with ulcers in the mouth and hoof, which aids in clinical differentiation. In the regional context, some Middle Eastern countries, such as Syria and Iraq, still lack advanced laboratories capable of regularly performing molecular diagnostics, making clinical diagnosis a crucial tool, despite its limitations. Therefore, the World Organization for Animal Health (WOAH) has recommended that national laboratories be supported with PCR machines and specialized reagent kits to ensure rapid diagnosis and reduce waiting times (WOAH, 2023). The ability to accurately and early diagnose BEF is a crucial step in controlling the spread of the disease and reducing its economic losses. This requires integrating field clinical observation with molecular and immunological laboratory tests, as well as enhancing the competency of veterinary personnel in rural areas through training and awareness, and improving access to modern diagnostic tools. The development of rapid and low-cost field tests also remains an important goal in the future control of this disease.

Methods of prevention and control of bovine ephemeral fever in Iraq and neighboring countries

To prevent (BEF), a comprehensive approach is necessary in endemic regions such as Iraq and neighboring countries (Iran, Syria, Turkey, Saudi Arabia, and Jordan). BEF remains a regional veterinary health problem that needs coordinated efforts in vaccinations of animals, enhancement of surveillance systems, vector control, and management of suspected or proven cases. The veterinary situation and level of economic development may differ from country to country, but they are facing similar problems. The measures in Iraq include raising the standards of veterinary services and vector control (insecticides and mosquito nets in breeding areas). However, there should be a safe and economically viable vaccine being produced locally. Recent recommendations from studies conducted in Iraq suggest the need to implement seasonal vaccination programs before the summer months, when vector populations increase, and to raise awareness among livestock owners about the early signs or symptoms of BEF and how to report cases promptly (Payami et al., 2026). The Ministry of Agriculture in Iraq suggests implementing an early warning veterinary network that connects university veterinary research institutions to create a basis for upcoming disease control activities in the southern provinces of Basra and Maysan. In contrast, Iran has implemented more advanced procedures based on the operationalization of commercial vaccines imported from other countries. Iran also benefits from having sophisticated veterinary laboratories capable of performing reverse transcription polymerase chain reaction (RT-PCR) and gene sequencing to aid in the early detection and monitoring of the virus and its variants (Payami et al., 2026). Nonetheless, in some mountain areas and large grazing regions, vaccination is still quite challenging. In Turkey, administering dengue vaccination is not obligatory, but the government offers financial support to people living in areas with high risk of disease. Furthermore, various methods for controlling dengue carriers are applied in practice, especially in areas with a large number of farms. Some field research conducted in one of the regions of southeastern Türkiye showed that by using traps for catching insects and periodic spraying of pesticides, it is possible to reduce the infestations up to 60% during three years (Yilmaz et al., 2022). During periods of high disease risk, Turkish laws prohibit the movement of livestock, particularly along its borders with Syria and Iraq. No preventative measures have been implemented in Syria because the country has been devastated by war, and there are no restrictions on preventative vaccinations/vector control. There is currently significant community awareness that can help mitigate disease outbreaks; one example is community-led programs to educate rangeland farmers on

recognizing disease symptoms and temporarily isolating infected animals. Some reports suggest that supporting the rebuilding of laboratory capacity and increasing local vaccine production could be achieved through international veterinary assistance programs in Syria (Carew et al., 2025). In Saudi Arabia, there is substantial control capacity, particularly among large commercial operations. The Ministry of Environment, Water and Agriculture has developed an electronic monitoring system that provides real-time tracking information regarding any animal disease outbreaks to facilitate immediate response. Finally, some veterinarians in southern Saudi Arabia have identified (BEF) as a priority due to recent climate changes and increasing insect populations (Toulba et al., 2026). The use of Geographic Information Systems (GIS) techniques in mapping disease outbreaks and risk areas will help enhance the effectiveness of prevention efforts (Yilmaz et al., 2022). Despite these promising developments, the biggest gap is the lack of coordinated regional action, which significantly weakens the ability to respond effectively within shared border areas that serve as major hotspots for disease transmission. Therefore, there are international calls for the establishment of a unified platform for monitoring transboundary animal diseases, encompassing Iraq and its neighboring countries. This platform, under the auspices of the World Organisation for Animal Health (OIE) in collaboration with the Food and Agriculture Organization (FAO), would be responsible for data collection, livestock movement monitoring, coordination of vaccination campaigns, and facilitating the sharing of veterinary resources. To control BEF, effective international cooperation is needed to strengthen veterinary infrastructure, improve the efficiency of veterinary services, and enhance scientific research to develop vaccines specifically targeted at the high prevalence of different isolates in the Middle East. BEF should also be included on the list of epidemic diseases requiring immediate notification. Working with rural populations to raise awareness and promote preventive measures will be essential to limiting the cross-border spread of the BEF virus.

Conclusion

The increasing prevalence of BEF in Iraq and neighboring countries is of grave concern due to limited diagnostic capacity and varying control methods. Environmental and climatic conditions contribute to the transboundary spread of the disease, necessitating enhanced international cooperation in vaccination and surveillance. This assessment highlights the need for developing local vaccines, strengthening early warning systems, and activating diagnostic laboratories. Furthermore, raising awareness among veterinarians and community members provides valuable tools for reducing disease transmission and the resulting economic losses, particularly in rural and agricultural areas with high livestock density.

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Author contributions

A.H.M work scientific revision, data collection, Z.N.M work on Literature review while MHK work on revision of the manuscript and all contributed in final manuscript.

Ethics approval

Not applicable.

AI tool usage declaration

Use of ChatGPT only for grammatical correction and no generate.

Conflict of interest

The researcher indicates that they have no financial, professional, research, or personal interests that could unbiasedly affect the study in any way (i.e., no funding received from any entities with interest/intention to gain from results, nor have they collaborated with other institutions/parties that could create a scientific/practical conflict).

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