

豬流行性下痢疫苗研發概況

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摘要

豬隻感染流行性下痢 (Porcine Epidemic Diarrhea, PED) 於1971年首次在英國被發現, 1980年代至1990年代普遍流行於歐洲, 2010年間再次於亞洲國家如泰國、中國大陸及菲律賓, 隨後北美洲大爆發, 我國於2013年10月起也爆發嚴重疫情, 造成仔豬死亡, 重創台灣養豬產業, 造成重大經濟損失, 也導致國內豬價嚴重失衡。美國於2013年4月爆發PED的疫情後迅速蔓延, 超過8百萬隻仔豬死亡, 導致世界豬肉供應失調, 價格高漲。我國爆發的PED病毒, 經比對與美國發生之病毒株同為新型變異株, 該病毒株(PEDV / Taiwan / 2014)毒力較舊型(CV777)病毒株強且排毒天數較長, 造成仔豬隻感染後, 嚴重下痢, 嘔吐及脫水, 其死亡率高且傳染性強。目前國外已有少數上市的疫苗, 但尚無安全且有效的保護豬隻感染本病, 為防範PED感染再度侵襲養豬產業, 各國專家利用傳統方法及遺傳工程技術研發安全有效之PED疫苗。由於PED病毒主要侵襲小腸絨毛腺窩細胞, 對初生哺乳仔豬的致病性最大。因此, 開發出安全有效保護10日齡以內小豬的疫苗, 係目前主要的努力方向。我國在PED疫苗開發方面, 係利用傳統方式開發活毒疫苗以及死毒疫苗, 免疫母豬及仔豬以達到防疫效果, 進而降低PED的經濟損失。目前PEDV疫苗株方面, 為開發安全有效且高力價之種毒株, 利用PEDV / Taiwan / 2014分離株經過連續繼代採用Vero細胞來減毒。比較田間菌株與減毒菌株之間PEDV序列的以發現毒力因子, 基於這些數據來選擇高PED病毒力價毒株, 進行連續繼代後篩選為種毒株。建立PEDV動物試驗之攻毒方法。並針對疫苗的佐劑, 抗原製備和給藥途徑的進一步研究, 建立實驗室試驗(如特性試驗、無菌試驗、病毒迷入試驗及安全及效力試驗等)資料。並按照規定向主管機關申請進行田間安全及效力試驗。利用各種新技術以開發良好的新型PEDV疫苗以預防豬隻感染, 提供養豬農民使用, 減少養豬業者經濟損失。

Research and development of a Porcine Epidemic Diarrhea Virus Vaccine

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Abstract

Porcine epidemic diarrhea virus (PEDV) was first discovered in the UK in 1971, and was identified throughout Europe in the 1980s and 1990s. In the 2010s, a new variant strain of PEDV (nvPEDV) emerged in the Southeast Asian countries, Thailand, Vietnam, Philippines, as well as China. In April 2013, the first outbreak of nvPEDV occurred in the United States and spread rapidly, leading to the death of more than 8 million piglets, resulting in disarray among the world's pork suppliers, affecting prices considerably. In October, 2013 an outbreak also occurred in Taiwan caused by a similar strain of nvPEDV (PEDV Taiwan / 2014) to that of the US. The virulence and shedding duration of this nvPEDV outbreak strain was stronger and longer compared with the older CV777 strain of PEDV viruses. In general, nvPEDV infected piglets display more pronounced symptoms of severe diarrhea, vomiting and dehydration, accompanied with high mortality. At present, there are a few commercialized PEDV vaccines designed to combating classical PEDV. In order to control nvPEDV re-emergence among pig farms, a new PEDV vaccine by traditional virus attenuating methods or genetic engineering technology, is heavily required by the market. As the PED virus mainly invades the small intestinal villi cells, an effective vaccine should ideally protect the piglets within the first 10 days post-birth against the highest potential nvPEDV challenge. This nvPEDV vaccine will be developed using traditional methods to develop a live attenuated virus vaccine as well as an inactivated vaccine, and to inoculate sows and piglets, thereby reducing the economic losses of PEDV. This nvPEDV vaccine will take the PEDV / Taiwan / 2014 isolates and adapting them to Vero cells in order to develop safe, effective, and high-titre PEDV vaccine strains. We will then compare the PEDV sequences between the field strains and the attenuated strains. Based on these results, we will select and screen the strains producing highest nvPEDV virus titers. Further studies are then planned concerning the adjuvant, antigen preparations, administration routes and laboratory tests (e.g., characterization tests, aseptic tests, viral contamination tests, safety and efficacy trials, etc.). Finally, safety and efficacy tests for the nvPEDV vaccine in field trials will be performed according to regulations in Taiwan. To develop an effective and safe nvPEDV vaccine, we are constantly innovating and using a variety of new technologies in order to protect swine from nvPEDV infection and thus help reduce economic losses for Taiwanese pig farmers.