

Pig Macrophage-Derived Single-Cell Clones: Development, Characterization, and Applications in Veterinary and Biomedical Research

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Biotech and Life Science

Abstract

This technology presents three porcine macrophage-derived single-cell clones that express the porcine reproductive and respiratory syndrome virus (PRRSV) entry receptor, CD163. Each clone permits viral entry but differs in its ability to support post-entry steps. They provide a physiologically relevant in vitro system to study how host interferon-stimulated genes influence PRRSV replication.

What It Is

Problem: PRRSV causes severe disease and economic loss. Research is constrained by a lack of physiologically relevant porcine macrophage models, limiting study of viral replication, host responses, and slowing vaccine/therapeutic development.

Solution: This technology provides a pig macrophage-derived cell line that expresses CD613 and varies in post-entry stages of viral replication. This presents a better template for in vitro PRRSV research.

Value Proposition

USU researchers developed a physiologically relevant pig-macrophage cell-platform that improves preclinical relevance and discovery of actionable host targets to support development of PRRSV vaccines, antivirals, and diagnostics.

Applicable Markets

This can be applied in the animal health biotechnology market, specifically in the porcine reproductive and respiratory syndrome (PRRS) vaccine sector, as a research tool to help develop treatments and understand PRRSV.

Benefit

PRRSV causes serious reproductive and respiratory disease in pigs and imposes substantial economic losses on the global swine industry. Research is hampered by a critical shortage of physiologically relevant cell models because PRRSV has a very narrow host range and primarily infects porcine macrophages. Most existing cell lines are not derived from the virus's natural target cells, limiting the physiological relevance of experimental findings. This lack of suitable macrophage-derived, PRRSV-susceptible cell lines makes it difficult to study viral replication, pathogenesis, and host antiviral responses. As a result, identifying host factors and antiviral pathways is challenging. The gap in reliable cell models also slows the development of effective vaccines and diagnostics, reducing the predictive power of preclinical studies.

This work provides physiologically relevant porcine macrophage single-cell clones that directly fill the critical

gap in PRRSV research models. By offering distinct host-cell contexts that differ in their ability to support the post-entry stages of viral replication, these clones enable pinpointing which host factors and antiviral responses control PRRSV permissiveness. Their long-term reproducibility overcomes the variability and short lifespan of primary cells, enabling consistent experimental comparisons. As a result, researchers can more accurately study viral replication dynamics and host defense mechanisms, which in turn supports more reliable development of therapeutics, vaccines, and diagnostics.

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This advancement offers a reliable, physiologically relevant platform that addresses a major bottleneck in PRRSV research by providing consistent, reproducible tools that improve the predictive value of laboratory studies. By enabling direct investigation of virus-host interactions in the natural target cell type, this approach shortens development timelines and enhances the identification of host targets and biomarkers. These resources improve the success rate of preclinical screening for vaccines, antivirals, and diagnostics, supporting more focused investment and faster translation to practical solutions.

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Intellectual Property