An animal model for studying Varicella-Zoster Virus infection and reactivation

Technology #cu14292

The varicella-zoster virus (VZV) causes varicella (chickenpox) in first-time hosts, and stays latent in the host until it reactivates for unknown reasons in the form of zoster (shingles). Though there are effective vaccines against varicella, zoster still relapses at an annual prevalence of 4 cases per 1000 US adults. Currently, there are no suitable animal models to study the latency and reactivation of VZV. This technology establishes a method of injecting VZV-infected T lymphocytes into the guinea pig enteric nervous system (ENS) to recapitulate the latent form of VZV infection in the animal model. Chemical induction of stress and/or immunosuppression can then reactivate the latent VZV in the guinea pigs to simulate a zoster event. Using this method to transform the guinea pig into a model of VZV latency and activation may help increase knowledge of the host-pathogen interaction, as well as facilitate future drug and vaccine research against zoster.

Guinea pigs injected with VZV-infected T-cells embody characteristics of human VZV infection.

Current animal models of VZV recapitulate only a few aspects of the human VZV infection. The host-specificity and neuronal cell requirements of the virus has limited scientists’ abilities to develop an adequate animal model. So far, the strongest replica of VZV infection is using the related simian varicella virus (SVV) in rhesus macaques, which is not a direct model of VZV infection. This technology describes the first animal model to exhibit latent infection in ganglion neurons after intravenously injected with VZV-infected T lymphocytes. Administration of chemicals to induce stress and suppress immunity reactivated the VZV in these guinea pigs, and they developed rashes and physical symptoms in the liver, lung and spleen, similar to zoster in humans. Furthermore, one animal with latent VZV infection was inadvertently exposed to natural stress due to an overgrown tooth, which triggered symptoms characteristic of a zoster infection. These guinea pigs injected with VZV-infected T lymphoblasts represent the first animal model that exemplifies the latency and reactivation of human VZV infection.

Lead Inventor:

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Applications:

- In vitro cell model to study VZV infection in T lymphoblasts
- In vivo animal model to further investigate how VZV infects patient, stays latent, and reactivates
- Model organism to identify and test new drugs or vaccines against VZV

Advantages:

- Closely mimics VZV latency and reactivation
- Directly uses human VZV instead of related virus from different species
- GFP labeling allows tracking of virus expression during latency and infection
- Ability to induce VZV reactivation at desired times using drugs to mimic stress and suppress immunity
- Ability to visualize latency or activation on a cellular level using cytoplasm expression
- Natural stress is sufficient to trigger VZV reactivation in guinea pigs

Patent information:

Patent Pending

Tech Ventures Reference: IR CU14292

Related Publications:

- L Gan, M Wang, JJ Chen, MD Gershon, AA Gershon. Infected peripheral blood mononuclear cells transmit latent varicella zoster virus infection to the guinea pig enteric nervous system. Journal of NeuroVirology, Inc., 26 June 2014

Inventors

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