

Immunodeficiency viruses (Feline, Simian) (Infection with)

Aetiology Epidemiology Diagnosis Prevention and Control
Potential Impacts of Disease Agent Beyond Clinical Illness References

AETIOLOGY

Classification of the causative agent

Immunodeficiency viruses are highly species-specific lentiviruses (enveloped, single-stranded RNA) that, as a group, are able to infect many species and cause immune dysfunction. Most notable are feline immunodeficiency virus (FIV), simian immunodeficiency virus (SIV), bovine immunodeficiency virus (BIV), and human immunodeficiency virus (HIV). Most often, CD4⁺ and CD8⁺ T cells are infected, but there are variations based on the specific infecting virus and host. Some infected individuals are able to suppress viral replication, but the majority of individuals progressively decline and develop what is referred to in humans as an acquired immunodeficiency syndrome (AIDS). Some primate species are known to be unaffected carriers of their respective SIV strain, and phylogenetic analyses have suggested a long co-evolutionary relationship that supports viral replication without harming the host.

Resistance to physical and chemical action

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|--------------------------|---|
| Temperature: | Not determined |
| pH: | Not determined |
| Chemicals/Disinfectants: | Disinfection with a 10% bleach solution |
| Survival: | Unstable in the environment |

EPIDEMIOLOGY

Hosts

- BIV's species range is currently poorly understood, but it has been confirmed in cattle across the globe. Buffalo in India have tested positive for BIV.
- FIV can be detected in domestic cats worldwide. Other susceptible felid species include: lions (*Panthera leo*), *Puma* species, bobcats (*Lynx rufus*), leopards (*Panthera pardus*), cheetahs (*Acinonyx jubatus*), jaguarundis (*Herpailurus yagouaroundi*), tigers (*Panthera tigris*), jaguars (*Panthera onca*), the Pallas cat (*Oocolobus manul*), and many *Leopardus* species.
 - Striped and spotted hyaenas (*Crocuta crocuta*, *Hyaena hyeana*) are also susceptible.
- SIV infects a multitude of primate species; over 40 natural host species have been identified and include: African green monkeys (*Chlorocebus* species), sooty mangabeys (*Cercocebus atys*), chimpanzees (*Pan troglodytes*), and baboons (*Papio* species).
 - Gorillas (*Gorila gorilla*) and bonobos (*Pan paniscus*) do not appear to carry SIV.

Transmission

- There is no evidence to confirm the mode of transmission of BIV.
- FIV and SIV are primarily transmitted thru saliva in bite wounds or while grooming. In utero exposure is possible.

Sources

- Other infected animals

Occurrence

Immunodeficiency viruses appear to have a worldwide prevalence. Information on BIV is lacking, as it is often not tested for or mistaken for another disease process. FIV is found in wild felid species across the globe, but is most strikingly prevalent in African lions and Mongolian Pallas cats. Lions and pumas appear to resist development of chronic disease after infection. SIV is very prevalent in African primates, many of which are natural hosts of the virus.

DIAGNOSIS

BIV does not appear to be a primary cause of disease in bovids, but more data are needed to fully understand its pathogenesis. FIV-infected felids may present with fever, lymphadenopathy, and neutropenia but recover clinically and remain healthy in appearance for months to years before the immune system begins to fail. Many wild free-ranging and captive felids do not develop clinical signs after FIV infection. SIV typically does not cause disease in natural hosts, as strains are highly species-specific and host-adapted, but CD4⁺ T-cell numbers may be abnormal and viral loads high. Rarely, primates may develop AIDS-like symptoms if chronically infected.

Clinical diagnosis

Lesions

- BIV
 - Persistent lymphocytosis
 - Haemolymphadenopathy
 - BLV-negative lymphosarcoma
 - General weakness, emaciation
- FIV
 - Gastrointestinal disease including gingivitis and stomatitis
 - Respiratory disease
 - Urinary tract disease
 - Dermatopathies
 - Lymphadenopathy
 - Anorexia and weight loss
- SIV
 - Not pathogenic in natural hosts
 - Susceptible hosts may be immunosuppressed for weeks to years, and individuals may develop encephalitis, thrombocytopenia, and lymphoma (AIDS-like symptoms).

Differential diagnoses

- BIV
 - Lymphoma
 - Bovine leukaemia virus
- FIV
 - Feline leukaemia virus (FeLV)
 - Feline panleukopenia virus
 - Toxoplasmosis
 - Dry form of feline infectious peritonitis (FIP)
 - Gastrointestinal infection
 - Upper respiratory infection
 - Urinary tract infection
- SIV

- Immune-mediated thrombocytopenia
- Upper respiratory infection
- Infectious encephalitis or meningitis
- Lymphoma

Laboratory diagnosis

Samples

For isolation of agent

- Tissues from spleen, brain, lung, testes, thymus, and kidney

Serological tests

- Blood, saliva

Procedures

Identification of the agent

- Viral isolation via peripheral blood mononuclear cells (PBMC)

Serological tests

- Polymerase chain reaction (PCR) detection of viral genetic material
- Enzyme-linked immunosorbent assay (ELISA) to detect virus-specific antibodies
 - Prior vaccination may be a confounding factor.
- Other techniques include western blot and immunofluorescence (IFA) assays.

PREVENTION AND CONTROL

Unfortunately, the early stages of infection are often subclinical, which complicates control efforts. Limiting FIV-positive domestic cat access to the outdoors can prevent transmission to other felids. If FIV is a concern for a region of study, regular seroprevalence surveys may need to be considered.

Sanitary prophylaxis

- FIV will not survive more than a few hours in most environments. Cleaning and disinfecting with a 10% bleach solution is effective for contaminated areas.

Medical prophylaxis

- Vaccines are available for domestic cats to prevent infection with FIV, but their efficacy in wild free-ranging or captive felids is not well documented
 - It is recommended that FIV-infected captive felids should be spayed/neutered and confined to prevent the spread of FIV infection
- SIV vaccines are constantly in development for experimental primate colonies, primarily as a model for HIV vaccine development.

POTENTIAL IMPACTS OF DISEASE AGENT BEYOND CLINICAL ILLNESS

Risks to public health

- While SIV strains are not directly pathogenic to humans, it is important to recall that HIV-1 and HIV-2 originated from primate species and therefore the possibility of another cross-species transmission event cannot be eliminated
- There is currently no evidence that FIV or BIV can directly infect or cause disease in humans.

Risks to agriculture

- BIV is poorly understood and therefore must be further characterised before its impact on bovids can be determined.

REFERENCES AND OTHER INFORMATION

- Bhatia, S., Gangil, R., Gupta, D.S., Sood, R., Pradhan, H.K., Dubey, S.C. (2010). Single chain fragment variable antibody against the capsid protein of bovine immunodeficiency virus and its use in ELISA. *J Virol Methods*, 167, 68–73.
- Bhatia, S., Patil, S. S., & Sood, R. (2013). Bovine immunodeficiency virus: a lentiviral infection. *Indian Journal of Virology : an Official Organ of Indian Virological Society*, 24(3), 332–341.
- Brown, M. A., Munkhtsog, B., Troyer, J. L., Ross, S., Sellers, R., Fine, A. E., O'Brien, S. J. (2010). Feline immunodeficiency virus (FIV) in wild Pallas' cats. *Veterinary immunology and immunopathology*, 134(1-2), 90–95.
- Cornell University College of Veterinary Medicine. (2019). Feline Immunodeficiency Virus. Website accessed in 2019: <https://www.vet.cornell.edu/departments-centers-and-institutes/cornell-feline-health-center/health-information/feline-health-topics/feline-immunodeficiency-virus>
- Fenner, F. J. (2011). Members of the subfamily *Orthoretroviridae*, genus *Lentivirus*. In N. J. MacLachlan & E. J. Dubovi (Eds.), *Fenner's Veterinary Virology* (4th ed., pp. 270-273). Elsevier.
- Tizard, I. (2019). Feline Immunodeficiency Virus (FIV). The Merck Veterinary Manual. Website accessed in 2019: [https://www.merckvetmanual.com/cat-owners/disorders-affecting-multiple-body-systems-of-cats/feline-immunodeficiency-virus-fiv?query=immunodeficiency virus](https://www.merckvetmanual.com/cat-owners/disorders-affecting-multiple-body-systems-of-cats/feline-immunodeficiency-virus-fiv?query=immunodeficiency%20virus)
- Tizard, I. (2019). Secondary Immunodeficiencies. The Merck Veterinary Manual. Website accessed in 2019: <https://www.merckvetmanual.com/immune-system/immunologic-diseases/secondary-immunodeficiencies#v3277197>
- VandeWoude, S., and Apetrei, C. (2006). Going Wild: Lessons from Naturally Occurring T-Lymphotropic Lentiviruses. *Clinical Microbiology Reviews*, 19(4), 728-762.

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The OIE will periodically update the OIE Technical Disease Cards. Please send relevant new references and proposed modifications to the OIE Science Department (scientific.dept@oie.int). Last updated 2019. Written by Marie Bucko and Samantha Gieger with assistance from the USGS National Wildlife Health Center.