



FERRET INFLUENZA STUDIES

Efficacy Studies • Preclinical Development • Clinical Support

The Ferret Influenza Model

Ferrets are widely considered to be the ideal models for influenza vaccine or therapeutic studies, due to their natural susceptibility to infection with human seasonal and pandemic subtypes of influenza A and influenza B viruses. In addition, the clinical course of influenza infection and the immune response in ferrets closely reflects that in humans, with ferrets mimicking strain-specific symptoms observed in humans.

IITRI is the leading provider of ferret influenza studies to characterize the pathogenesis of influenza viruses, and to evaluate the efficacy of vaccines, adjuvants and antiviral agents. The laboratory space in IITRI's Chicago facility includes

animal biosafety level 2 and 3+ (ABSL-2/3+) facilities that are well-equipped to handle pathogenic agent studies. We also offer aerosol infection capabilities to mimic the natural transmission route.

We provide complete bioanalytical services for advanced study analysis, including kinetics of viral replication in the upper respiratory tract, viral load in the lungs and extrapulmonary organs, and immunophenotyping. All studies are conducted at one site for optimized efficiency and continuity.

Mouse models and *in vitro* screening assays are also available.



THE IITRI ADVANTAGE

- A highly experienced and integrated study team from a broad range of disciplines including virology, bacteriology, immunology, molecular biology and toxicology
- Direct partnership with PhD-level study directors for seamless communication
- Proprietary bioaerosol program with BSL-2/3+ facilities and vivarium
- Flexible, collaborative approach to study design, optimizing cost and quality
- All studies conducted at one site, with all functions located under one roof

IITRI Ferret Influenza Studies

INFLUENZA STRAINS

- Seasonal (H1N1, H3N2, influenza B)
- Highly pathogenic and low-pathogenic avian influenza viruses (H5N1, H7N9)
- Novel influenza virus strains
- Antiviral resistant influenza strains

VIRAL CHALLENGE ROUTES

- Intranasal
- Aerosol

STUDY TYPES

- Antiviral and vaccine efficacy screening
- Immunogenicity and safety assessment of vaccines and therapeutics
- Transmission model and pathotyping testing
- Antiviral resistance testing
- Antiviral PK and preclinical toxicology

THERAPEUTIC DOSING ROUTES

- Intranasal
- Intraperitoneal
- Subcutaneous

CLINICAL READOUTS

- Mortality and moribundity
- Clinical observations
- Activity level
- Body weight changes
- Body temperature fluctuations
- Gross necropsy and histopathology

SUPPORTING ASSAYS

- Viral titers (nasal washes and tissues)
- Hemagglutination inhibition assay (HAI)
- Immunological assays (ELISA, ELISpot, virus neutralization assays)
- Complete blood cell count with differential
- Immunophenotyping by flow cytometry

Preclinical Development

- Bioanalytic method development and validation
- Pharmacokinetic modeling/tissue distribution
- Repeat dose toxicology
- Immunogenicity
- Safety pharmacology
- Genetic toxicology
- Reproductive toxicology
- All routes of administration, including inhalation

Ferret Influenza Model Publications

- Hatta Y, Boltz D *et al.* M2SR, a novel live influenza vaccine, protects mice and ferrets against highly pathogenic avian influenza. *Vaccine*. 2017. Epub.
- Bayne AC, Boltz D *et al.* 2013. Vaccination against influenza with recombinant hemagglutinin expressed by *Schizochytrium* sp. confers protective immunity. *PLoS One* 8 (4):e61790.
- Castillo R, Holland LE, Boltz DA. 2010. Peramivir and its use in H1N1 influenza. *Drugs Today (Barc)* 46(6):399–408.



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