

Taconic's International Health Monitoring System™

A worldwide standard of microbiological testing for laboratory mice and rats.

The Taconic International Health Monitoring System™ (IHMS™) gives scientists worldwide a standardized system to determine the microbiological profile of murine models used in their in vivo studies. IHMS™ combines two heralded standards for health monitoring: FELASA, long the European standard, and Taconic's testing program in the United States. The new IHMS™ meets or exceeds the individual standards of the FELASA and Taconic programs. The IHMS™ is defined by a comprehensive list of microbiological agents, test frequencies and test methods.

Incorporation of many of the Taconic test methods, for example histological examinations, surpasses existing FELASA guidelines.

Use of the International Health Monitoring System™ will facilitate worldwide collaboration between scientists by providing consistent, uniform data on the microbiological status of rats and mice. It also will assist veterinarians and facility managers in reviewing the health status of incoming animals by providing a unified format for testing and reporting on the microbiological profile of animals.

Monitored Organism	Species Tested	Test Frequency	Panel	Test Method
Viruses				
Mouse Hepatitis Virus (MHV)	Mice	2 weeks	IHMS-2	ELISA
Mouse Minute [parvo] Virus (MMV)	Mice	2 weeks	IHMS-2	ELISA
Mouse Parvovirus (MPV)	Mice	2 weeks	IHMS-2	ELISA
Mouse Rotavirus (EDIM)	Mice	2 weeks	IHMS-2	ELISA
Kilham's Rat Virus (KRV)	Rats	2 weeks	IHMS-2	ELISA
Rat Coronavirus (RCV)	Rats	2 weeks	IHMS-2	ELISA
Rat Minute Virus (RMV)	Rats	2 weeks	IHMS-2	ELISA
Rat Parvovirus (RPV)	Rats	2 weeks	IHMS-2	ELISA
Sialodacryoadenitis Virus (SDAV)	Rats	2 weeks	IHMS-2	ELISA
Toolan's H-1 Parvovirus (TH1)	Rats	2 weeks	IHMS-2	ELISA
Encephalomyelitis Virus (GD7)	Mice, Rats	6 weeks	IHMS-6	ELISA
Pneumonia Virus of Mice (PVM)	Mice, Rats	6 weeks	IHMS-6	ELISA
Sendai Virus	Mice, Rats	6 weeks	IHMS-6	ELISA
Lymphocytic Choriomeningitis Virus (LCM)	Mice	13 weeks	IHMS-13	ELISA
Murine Norovirus (MNV)	Mice	13 weeks	IHMS-13	ELISA
Ectromelia Virus	Mice	26 weeks	IHMS-26	ELISA
Hantaan Virus	Mice, Rats	26 weeks	IHMS-26	ELISA
Mouse Adenovirus (FL) (MAV1)	Mice, Rats	26 weeks	IHMS-26	ELISA
Mouse Adenovirus (K87) (MAV2)	Mice, Rats	26 weeks	IHMS-26	ELISA
Mouse Cytomegalovirus (MCMV)	Mice	26 weeks	IHMS-26	ELISA
Respiratory Enteric Virus III (REO3)	Mice, Rats	26 weeks	IHMS-26	ELISA
K Virus	Mice	52 weeks	IHMS-52	ELISA
Lactic Dehydrogenase Elevating Virus (LDHV)	Mice	52 weeks	IHMS-52	CHEM
Polyoma Virus	Mice	52 weeks	IHMS-52	ELISA
Thymic Virus	Mice	52 weeks	IHMS-52	IFA
Bacteria, mycoplasma, fungi				
<i>β hemolytic Streptococcus</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Bordetella bronchiseptica</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Citrobacter rodentium</i>	Mice	6 weeks	IHMS-6	CULT
<i>Clostridium piliforme</i>	Mice, Rats	6 weeks	IHMS-6	ELISA
<i>Corynebacterium kutscheri</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Klebsiella oxytoca</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Klebsiella pneumoniae</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Mycoplasma sp.</i>	Mice, Rats	6 weeks	IHMS-6	ELISA
<i>Pasteurella pneumotropica</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Pseudomonas aeruginosa</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Salmonella sp.</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Staphylococcus aureus</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Streptobacillus moniliformis</i>	Mice, Rats	6 weeks	IHMS-6	PCR
<i>Streptococcus pneumoniae</i>	Mice, Rats	6 weeks	IHMS-6	CULT
<i>Cilia Associated Respiratory Bacillus (CARB)</i>	Mice, Rats	13 weeks	IHMS-13	ELISA
<i>Corynebacterium bovis</i> ‡	Mice, Rats	13 weeks	IHMS-13	CULT
<i>Helicobacter hepaticus</i> & <i>H. bilis</i>	Mice, Rats	13 weeks	IHMS-13	PCR
<i>Pneumocystis carinii</i>	Rat	26 weeks	IHMS-26	PCR
<i>Pneumocystis murina</i>	Mice	26 weeks	IHMS-26	PCR
Parasites				
<i>Aspiculuris sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Eimeria sp.</i>	Mice, Rats	6 weeks	IHMS-6	FLOT
<i>Entamoeba muris</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Giardia muris</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Hymenolepis sp.</i>	Mice, Rats	6 weeks	IHMS-6	FLOT
<i>Liponyssus sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Myobia sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Myocoptes sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Notoedres sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Polyplax sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Psorergates sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Radfordia sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Rodentolepis sp.</i>	Mice, Rats	6 weeks	IHMS-6	FLOT
<i>Spiroplasma sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Syphacia sp.</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Trichomonads</i>	Mice, Rats	6 weeks	IHMS-6	MICR
<i>Trichosomoides crassicauda</i>	Rats	6 weeks	IHMS-6	MICR
<i>Klossiella muris</i>	Mice, Rats	13 weeks	IHMS-13	HIST
<i>Encephalitozoon cuniculi</i>	Mice, Rats	52 weeks	IHMS-52	ELISA
Histopathology				
Ilium and Cecum	Mice, Rats	13 weeks	IHMS-13	HIST
Kidney	Mice, Rats	13 weeks	IHMS-13	HIST
Liver	Mice, Rats	13 weeks	IHMS-13	HIST
Lung	Mice, Rats	13 weeks	IHMS-13	HIST
Other		when required		
Gross Pathology				
Middle ear exam	Mice, Rats	6 weeks	IHMS-6	PATH
Necropsy Findings	Mice, Rats	6 weeks	IHMS-6	PATH

‡Corynebacterium bovis is tested in immunodeficient (mice with scid or nude mutation; rats with nude mutation) animals only.

Health Monitoring Test Methods

IHMS-2 Panel: Serology Performed every 2 weeks

Agent	Primary Method	Alternate Method	Species Tested
Mouse Hepatitis Virus (MHV)	ELISA	IFA	Mice
Mouse Minute [parvo] Virus (MMV)	ELISA	HAI	Mice
Mouse Parvovirus (MPV)	ELISA	IFA	Mice
Mouse Rotavirus (EDIM)	ELISA	IFA	Mice
Kilham's Rat [parvo]Virus (KRV)	ELISA	HAI	Rats
Rat Coronavirus (RCV)	ELISA	IFA	Rats
Rat Minute Virus (RMV)	ELISA	-	Rats
Rat Parvovirus (RPV)	ELISA	HAI	Rats
Sialodacryoadenitis Virus (SDAV)	ELISA	IFA	Rats
Toolan's H-1 Parvovirus (TH1)	ELISA	HAI	Rats

IHMS-6 Panel: Serology and Diagnostic Screen Performed every 6 weeks in addition to the IHMS-2 testing

- Physical examination involves inspection for exudates or abnormal discharges from the body orifices, character of haircoat, posture and attitudes of animals in diagnostic group.
- Gross necropsy examination includes complete dissection of each animal in the group with emphasis on discernment of gross lesions.
- Fecal culture is oriented to screening for *Salmonella sp.*, *Klebsiella sp.*, *Pseudomonas aeruginosa* and *Citrobacter rodentium* only, unless otherwise noted.
- Direct cecal examination under the microscope is used for nematode detection (*Aspiculuris tetraptera*, *Syphacia sp.*).
- Oropharyngeal culture is performed primarily to detect *Pseudomonas aeruginosa*, *Klebsiella sp.* and beta-hemolytic *Streptococcus sp.*. Throat swabs are cultured directly onto Tryptic Soy Agar with 5% sheep blood, PEA agar with 5% sheep blood and Tergitol 7 agar. Subculturing is completed as necessary.
- Culture is performed with nasopharyngeal washings for detection of aerobic bacteria (*Corynebacterium kutscheri*, *Pasteurella sp.*, *Bordetella bronchiseptica*, *Streptococcus pneumoniae*, *Staphylococcus aureus*). *Streptobacillus moniliformis* is tested for via PCR.
- If clinical signs dictate, middle ears are examined by puncture of tympanic membrane and aspiration of middle ear contents. Exudates, if any, are noted and cultured separately (e.g. for *Mycoplasma sp.* and other bacteria).
- The pelt is examined under direct, low powered microscopy for arthropod ectoparasites (*Myobia sp.*, *Mycoptes sp.*, *Radfordia sp.*, *Psoregates sp.*, *Notoedres sp.*, *Liponyssus sp.*, *Polypax sp.*).
- Fecal flotation is used to screen for *Rodentolepis sp.* and *Eimeria sp.*
- Ileal and cecal wet mounts are examined microscopically to screen for enteric protozoa. (*Spironucleus sp.*, *Trichomonads*, *Giardia sp.*, *Entamoeba sp.* Direct microscopic examination of rat urinary bladders is performed to screen for the presence of *Trichosomoides crassicauda*.

Agent	Primary Method	Alternate Method	Species Tested
Encephalomyelitis Virus (GD7)	ELISA	IFA	Mice, Rats
Pneumonia Virus of Mice (PVM)	ELISA	IFA	Mice, Rats
Sendai Virus	ELISA	IFA	Mice, Rats
Mycoplasma sp.	ELISA	IFA	Mice, Rats
<i>Clostridium piliforme</i>	ELISA	IFA, PCR	Mice, Rats

IHMS-13 Panel: Serology and Diagnostic Screen Performed every 12-14 weeks (quarterly) in addition to the IHMS-6 testing

- Skin and oral samples from immunodeficient animals (mice and rats with the nude mutation; mice with the scid mutation) are cultured for isolation of *Corynebacterium bovis*.
- Feces are collected for extraction of DNA and detection of *Helicobacter sp.* by PCR. If detected, the Helicobacter is speciated by restriction enzyme analysis.
- Histologic examinations of liver, lung, kidney and ileum are performed to detect microscopic lesions. Lung sections are observed for the presence of *Pneumocystis carinii* in immunodeficient rats and *Pneumocystis murina* in immunodeficient mice. Other organs examined as may be required by observation of gross lesions.
- Kidney sections are specifically examined for the presence of *Klosiella muris*.
- Microscopic examination is performed on perianal tape impression for diagnosis of *Syphacia sp* and pin worms.

Agent	Primary Method	Alternate Method	Species Tested
Lymphocytic Choriomeningitis (LCM)	ELISA	IFA	Mice
<i>Cilia Associated Respiratory Bacillus (CARB)</i>	ELISA	IFA	Mice, Rats
Murine Norovirus (MNV)	ELISA	IFA	Mice

IHMS-26 Panel: Serology and Diagnostic Screen Performed every 26 weeks (bi-annually) in addition to the IHMS-13 testing

- Lung tissue samples are collected for extraction of DNA and detection of *Pneumocystis carinii* and *Pneumocystis murina* by PCR.

Agent	Primary Method	Alternate Method	Species Tested
Ectromelia	ELISA	IFA	Mice
Hantaan Virus	ELISA	IFA	Mice, Rats
Mouse Adenovirus (FL) (MAV1)	ELISA	IFA	Mice, Rats
Mouse Adenovirus (K87) (MAV2)	ELISA	IFA	Mice, Rats
Mouse Cytomegalovirus (MCMV)	ELISA	IFA	Mice
Respiratory Enteric Virus III (REO3)	ELISA	HAI	Mice, Rats

IHMS-52 Panel: Serology and Diagnostic Screen Performed every 52 weeks (annually) in addition to the IHMS-26 testing

- Depending on their character, gross lesions observed at necropsy may be diagnostically pursued by requisite cultures and histopathology to determine causation.

Agent	Primary Method	Alternate Method	Species Tested
K Virus	ELISA	HAI	Mice
Lactic Dehydrogenase Elevating Virus (LDHV)	CHEM	PCR	Mice
Polyoma Virus	ELISA	IFA	Mice
Thymic Virus	IFA	-	Mice
<i>Encephalitozoon cuniculi</i>	ELISA	IFA	Mice, Rats

Test Method Abbreviations:
CHEM = Biochemical
CULT = Culture
ELISA = Enzyme Linked Immunosorbent Assay
FLOT = Flotation
HAI = Hemagglutination Inhibition
HIST = Histopathology
IFA = Indirect Fluorescent Assay
PATH = Gross Pathology
PCR = Polymerase Chain Reaction
MFI = Multiplex Fluorescent Immunoassay
MICR = Microscopy