Molecular diagnostics of respiratory pathogens

Rapid and reliable detection by real-time PCR

- RIDA®GENE Flu / RIDA®GENE Flu LC2.0
- RIDA®GENE Flu & RSV
- RIDA®GENE RSV & hMPV
- RIDA®GENE Mycoplasma pneumoniae
- RIDA®GENE Pneumocystis jirovecii
- RIDA®GENE Parainfluenza
- RIDA®GENE Adenovirus
- RIDA®GENE Bordetella
- RIDA®GENE Legionella

Respiratory infections – peak season all year around

Respiratory infections are believed to be one of the main reasons why people seek medical support and treatment. Whereas mainly viruses lead to respiratory infections, also bacteria and fungi can cause infections of the respiratory tract. To contain spreading of those, most of the time, highly contagious infections, fast diagnosis is essential. The RIDA®GENE real-time PCR assays offer a reliable and efficient method for the detection of a broad variety of respiratory pathogens with results in less than 3 hours. An included extraction control (Internal control DNA/Internal control RNA) detects PCR inhibition, monitors reagent integrity and confirms that nucleic acid extraction was sufficient.

Influenza is the most common respiratory infectious disease. Worldwide, 3 - 5 million people are infected with influenza and approximately 250,000 - 500,000 die from this disease each year. Influenza types A and B cause the annually occurring influenza epidemics whereas infection with influenza C viruses cause milder disease.[1] Severe infections are accompanied by pneumonia and bacterial superinfections which may be fatal in older people and children[2].

Respiratory Syncitial Virus (RSV) is spread worldwide and can lead to an infection of the upper and lower respiratory tract, most often in small children. Seasonality and symptoms are similar to that of influenza infections. There are two groups of RSV, group A and group B, whereas RSV A is dominant in most years.3 Infants and small children often show an acute presentation which requires hospitalization. Worldwide, around 600,000 people die yearly from either direct or indirect infection with RSV.[4]

Human metapneumovirus (hMPV) is genetically related to RSV, however, the course of this infection is less severe compared to RSV infections. In many cases infants are affected by this, whereas 15 % of the annual cases of bronchitis are also caused by hMPV. Infants, elderly and immunosuppressed patients with severe affections of hMPV usually need hospitalization. The worldwide occurrence of hMPV is comparable with the seasonal occurrence of influenza in winter.

Human Parainfluenza viruses (HPIV) can cause both upper respiratory infections and lower respiratory infections. The four serogroups Parainfluenza 1, 2, 3 and 4 account for the major community-acquired respiratory pathogens worldwide. Infections with parainfluenza virus 1 and 3 most often occur in infants and small children, whereas parainfluenza virus 2 and 4 occur less frequently. In the US, hospitalization due to Parainfluenza virus 1 and 3 leads to yearly estimated costs of around 186 mio $.[5]

Adenoviruses account for a variety of different clinical pictures but mostly cause respiratory disease. The symptoms of an Adenovirus infection reach from cold, acute bronchitis to pneumonia and in immunocompromised patients, also acute respiratory distress syndrome (ARDS) is observed. Acute respiratory infections are mainly caused by serotypes 1-3, 4, 6, 7, 14 and 21, whereas serotypes 1-4 and 7 are the major causes of pneumonia. Many Adenoviruses are endemic with Adenovirus outbreaks being often described on military bases.[6]

Bordetella pertussis causes an acute respiratory infection called pertussis or whooping cough. *Bordetella holmesii*, *Bordetella parapertussis* and *Bordetella bronchiseptica* cause a whooping cough-like illness that is in general milder. However, also *B. holmesii* has been reported to cause invasive infections such as pneumonia and bacteremia. Pertussis can cause a serious illness in people of all age groups, which can be life-threatening particularly in infants. In 2008, the WHO (World Health Organization) estimated about 16 mio cases of pertussis worldwide, resulting in about 195,000 children deaths from the disease.[7]

Mycoplasma pneumoniae are highly contagious bacteria which are primarily transmitted via droplet infection or via direct or indirect contact through smear infections. The incubation time is 1 - 4 weeks. In 5 - 25 % of *M. pneumoniae* infections, pneumonia will develop which requires antibiotic treatment. In the US, there are 2 million cases yearly, of which 100,000 cases lead to hospitalization of the patient.

Legionella are pathogenic bacteria with over 40 species. *Legionella pneumophila* primarily causes Legionnaire's disease and *Legionella longbeachae* results in Pontiac fever. Legionnaire's disease is an acute respiratory infection which is caused by *L. pneumophila* in 90 % of cases. In the US, the mortality rate of hospital-acquired Legionella infections is between 15 - 20 %.

Pneumocystis jirovecii (former *P. carinii*) causes pneumonia and is the most common opportunistic illness in people with an HIV infection. It leads to 100 % mortality in patients without treatment and the mortality rate in immunocompromised patients is between 5 - 40 % in treated patients.[8] Until now, detection of Pneumocystis jirovecii was done by immunofluorescence staining. However, due to its low sensitivity, new detection formats such as real-time PCR allow for specific and more sensitive analysis.[9]

RIDA®GENE real-time PCR for respiratory infections – detection overview

	RIDA® GENE Flu LC2.0	RIDA®GENE Flu	RIDA®GENE Flu & RSV	RIDA®GENE Parainfluenza	RIDA®GENE RSV & hMPV	RIDA®GENE Adenovirus	RIDA®GENE Bordetella	RIDA®GENE Legionella	RIDA®GENE Mycoplasma pneumoniae	RIDA®GENE Pneumocystis jirovecii*
Detection		H1N1	RSV	Para-influenza 1	RSV	Adeno-virus	*B. pertussis*/ *B. holmesii*	*Legionella* spp.	*M. pneu-moniae*	*Pneumo-cystis jirovecii*
	Influenza A	Influenza B	Influenza B	Para-influenza 3			*B. holmesii*			
	Influenza B	Influenza A	Influenza A	Para-influenza 2/4	hMPV		*B. para-pertussis*	*Legio-nella pneu-mophila*		
Thermal profile	• RNA profile					• DNA profile				
Time to result	~ 60 min	~ 60 - 90 min**								
Controls	• Positive control • Negative control • Internal control RNA/DNA									

* Qualitative and quantitative detection of *P. jirovecii* possible.
** Dependent on the instrument used.

[1] www.who.int/mediacentre/factsheets/fs211/en/index.html
[2] *World Health Organisation* 2011, Manual for the laboratory diagnosis and virological surveillance of influenza.
[3] *Robert Koch Institut.* Respiratorische Synzytial-Viren-Infektionen. RKI-Rategeber fur Arzte, Stand Mai 2011.
[4] *Thorburn K.* Pre-existing disease is associated with a significantly higher risk of death in severe respiratory syncytial virus infection. Arch Dis. Child 2009; 94:99-103.
[5] *Henrickson KJ.* Parainfluenza viruses. Clin. Microbiol. Reviews. 2003; 16(2):242-263.
[6] *Sanchez J et al.* Epidemic of adenovirus-induced respiratory illness among US military recruits-epidemiologic and immunologic risk factors in healthy young adults. J Med Virol 2001; 65:710-718.
[7] *World Health Organization 2011.* Pertussis. http://www.who.int/immunization/topics/pertussis/en/index.html
[8] *Centers for Disease Control and Prevention*. Pneumocystis pneumonia Statistics 2012.
[9] *Tia T et al.* A highly sensitive novel PCR assay for the detection of Pneumocysits jirovecii DNA in bronchoalveolar lavage specimens from immunocompromised patients. Mycology. 2012; 18:598-603.

Ordering Information

Product	Description	Tests	Matrix	Art. No.
Viruses	**Real-time RT-PCR**			
RIDA®GENE Adenovirus	Real-time PCR for the direct qualitative detection of Adenovirus from human swabs (nose, throat), sputum, throat washes and BAL	100	Nasal swab/throat swab/nasopharyngeal swab/throat washes/BAL	PG1005
RIDA®GENE Flu	Real-time multiplex RT-PCR for the direct qualitative detection and differentiation of Influenza A, Influenza B and H1N1v in human nasal swabs and throat swabs	100	Nasal swab/throat swab	PG0505
RIDA®GENE Flu LC2.0	Real-time multiplex RT-PCR for the direct qualitative detection and differentiation of Influenza A and Influenza B in human nasal swabs and throat swabs on the LightCycler® 2.0	100	Nasal swab/throat swab	PG0525
RIDA®GENE Flu & RSV	Real-time multiplex RT-PCR for the direct qualitative detection and differentiation of Influenza A, Influenza B and RSV from human swabs (nose, throat) and BAL	100	Nasal swab/throat swab/BAL	PG0545
RIDA®GENE Parainfluenza	Real-time multiplex RT-PCR for the direct qualitative detection and differentiation of human Parainfluenza 1, 3 and 2/4 from human swabs (nose, throat, nasopharyngeal)	100	Nasal swab/throat swab/nasopharyngeal swab	PG5805
RIDA®GENE RSV & hMPV	Real-time multiplex RT-PCR for the direct qualitative detection and differentiation of RSV and hMPV from human swabs (nose, throat, nasopharyngeal), throat washes and BAL	100	Nose swab/throat swab/ nasopharyngeal swab/ throat washes/BAL	PG5905
Bacteria	**Real-time PCR**			
RIDA®GENE Bordetella	Real-time multiplex PCR for the direct qualitative detection and differentiation of *Bordetella pertussis, Bordetella parapertussis* and *Bordetella holmesii* from human nasopharyngeal swabs and aspirates	100	Nasopharyngeal swabs/nasopharyngeal aspirates	PG2505
RIDA®GENE Mycoplasma pneumoniae	Real-time PCR for the direct qualitative detection of *Mycoplasma pneumoniae* from human throat swabs, BAL and tracheal secretion	100	Throat swab/BAL/ tracheal secretion	PG4305
RIDA®GENE Legionella	Real-time multiplex PCR for the direct qualitative detection and differentiation of *Legionella spp.* and *Legionella pneumophila* from human throat swabs, BAL and tracheal secretion	100	Throat swab/BAL/ tracheal secretion	PG8005
Fungi	**Real-time PCR**			
RIDA®GENE Pneumocystis jirovecii	Real-time PCR for the direct qualitative or quantitative detection of *Pneumocystis jirovecii* in human bronchoalveolar lavage fluid samples	100	BAL	PG1905

For detailed information on respiratory pathogens follow us

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