



Infectious Diseases

Antibodies and antigens



Introduction

During the last decade, the number of deaths caused by infectious diseases has decreased thanks to considerable progress having been made in diagnostics, therapy and prevention. However, infectious diseases remain the second highest cause of death in the world. And in low and middle income countries, infectious diseases continue to be the main cause of death. According to the World Health Organization (WHO), the top three infectious diseases to cause death worldwide were (in ascending order) lower respiratory infections, HIV/AIDS and diarrheal diseases.

Since 1994, HyTest has developed and supplied immunological reagents for infectious disease diagnostics. We currently offer antibodies and antigens that cover a wide range of diseases causing acute respiratory infections and diarrhea. These include reagents for detecting the influenza A and B viruses, adenovirus, respiratory syncytial virus, rotavirus and salmonella. In addition, we have antibodies and antigens that enable, for example, the detection of some sexually transmitted diseases, tuberculosis and hepatitis B.

Note that in this brochure the monoclonal antibodies (MAbs) are listed only according to the analyte they recognize. In most cases there are several different MAbs available under one catalogue number. More detailed information regarding the performance of our products, full list of individual MAbs and recommendations for capture-detection antibody pairs (when available) can be found on our website – www.hytest.fi. You are also most welcome to contact our Tech Support Team directly by writing to support@hytest.fi.





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Influenza and other acute respiratory diseases

Influenza A

Each year, the influenza A and B viruses cause seasonal disease in human beings. Seasonal influenzas range from mild to severe and the viruses evolve quickly, limiting the effectiveness of vaccines developed to protect against influenza. In addition to seasonal influenza, new influenza A viruses can also cause pandemics and the last 100 years has seen a number of these occur. The most recent one was caused by the influenza A strain H1N1 in 2009. This strain has now established itself as a seasonal influenza virus.

Influenza A viruses are divided into subtypes based on the variations in the hemagglutinin (HA) and neuraminidase (NA) proteins on the surface of the virus. There are 18 known types of hemagglutinin and 11 known types of neuraminidase.

Influenza A viruses infect both human beings and animals.

Antibodies specific to different influenza A proteins

We have developed a broad selection of monoclonal antibodies (MAbs) with different specificities that enable the detection of influenza A from clinical samples. For example, monoclonal antibodies against the influenza A nucleoprotein (NP) detect different influenza A strains with high specificity and show no cross-reactivity to the NP of the influenza B virus (see Figure 1). On the other hand, some of these antibodies are specific to single HA subtypes, H1, H3, H5 or H7. Figure 2 shows that monoclonal antibodies specific to H1 do not cross-react with the influenza A H3 subtype and vice versa, or with a mixture of influenza B viruses.

Our anti-influenza A MAbs have been tested in different types of immunoassays including direct or sandwich ELISA and Western blotting.

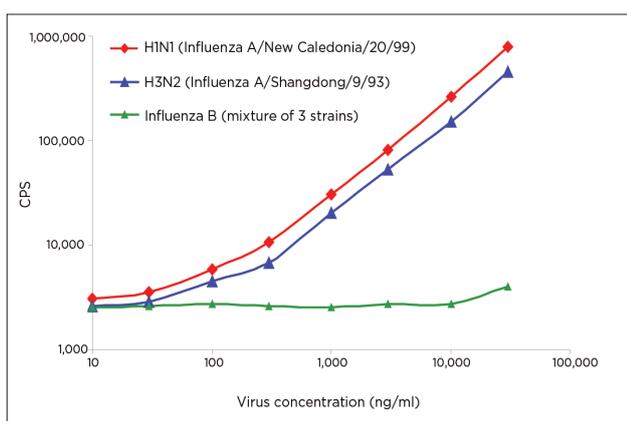


Figure 1. A calibration curve for the influenza A sandwich fluoroimmunoassay using MAbs specific to the nucleoprotein of influenza A. Capture-detection pair: InA108-InA245 (Cat.# 3IN5).

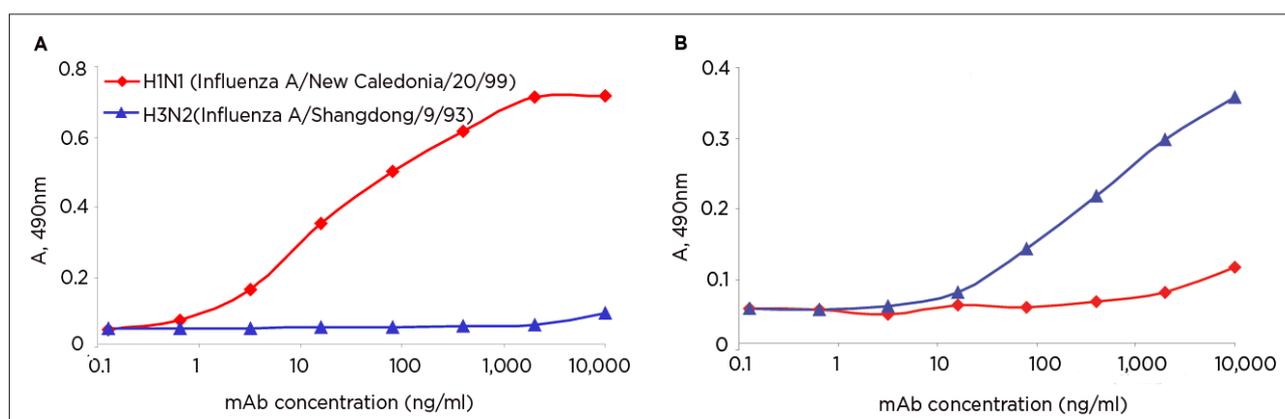


Figure 2. Titration curves of MAbs specific to hemagglutinins H1 (A) or H3 (B) of the influenza A virus in indirect ELISA. MAbs InA4 specific to H1 (Cat.# 3AH1) and mAb InA246 specific to H3 (Cat.# 3HG3) were used.

Inactivated viruses as antigens

We offer nine different strains of influenza A viruses (four of the H1N1 subtype and five of the H3N2 subtype). The antigens are purified and inactivated viruses that are grown in chicken eggs. Our studies found that these antigens are only detected with the antiserum raised against the corresponding antigen and they show no reactivity with other antisera (see Table 1).

Table 1. Hemagglutination test of selected influenza A antigens. H1N1 and H3N2 antigens are only detected with antiserum raised against the corresponding subtype and not with other antisera.

		Rabbit antisera to				
		A/New Caledonia/20/99 (H1N1)	A/St.Petersburg/186/00 (H3N2)	A/Singapore/1/57 (H2N2)	A/swine/1976/31 (Hsw1N1)	B/Tokio/53/99
Virus	A/New Caledonia/20/99 (H1N1)	640	<10	<10	<10	<10
	A/Panama/2007/99 (H3N2)	<10	320	<10	<10	<10

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3IN5*	Monoclonal mouse anti-influenza virus type A (nucleoprotein)	Enzyme immunoassays Immunohistochemistry Western blotting
3AH1*	Monoclonal mouse anti-Influenza A hemagglutinin H1	Enzyme immunoassays Western blotting
3HG3*	Monoclonal mouse anti-Influenza A hemagglutinin H3	Enzyme immunoassays Western blotting
3H5N*	Monoclonal mouse anti-influenza A hemagglutinin H5	Enzyme immunoassays Hemagglutinin inhibition test Dot blot assay
3HI7*	Monoclonal mouse anti-influenza A hemagglutinin H7	Enzyme immunoassays
3IH4*	Monoclonal mouse anti-influenza virus type A (hemagglutinin)	Enzyme immunoassays Hemagglutinin inhibition test Immunofluorescence Immunohistochemistry

* Several MAbs available under one catalogue number. Please see www.hytest.fi.

ANTIGENS

Cat.#	Product	Strain	Purity
8IN73	Influenza A (H1N1) virus	A/Taiwan/1/86	>90%
8IN73-2	Influenza A (H1N1) virus-2	A/Beijing/262/95	>90%
8IN73-3	Influenza A (H1N1) virus-3	A/New Caledonia/20/99 IVR 116	>90%
8IN73-4	Influenza A (H1N1) virus-4	A/Solomon Islands/03/06	>90%
8IN74	Influenza A (H3N2) virus	A/Shangdong/9/93	>90%
8IN74-1	Influenza A (H3N2) virus-1	A/Panama/2007/99	>90%
8IN74-2	Influenza A (H3N2) virus-2	A/Kiev/301/94	>90%
8IN74-3	Influenza A (H3N2) virus-3	A/Wisconsin/67/05	>90%
8IN74-4	Influenza A (H3N2) virus-4	A/Brisbane/10/07	>90%

Influenza B

Similarly to influenza A, influenza B also circulates as a seasonal disease among human beings. Although influenza B viruses evolve more slowly than influenza A viruses, a vaccination will not provide long-term immunity against the virus. Influenza B viruses are not divided into subtypes. Instead they are named after the areas where they were first identified. The influenza B virus only infects human beings.

Monoclonal antibodies suitable for assay development

HyTest offers a panel of monoclonal antibodies specific to nucleoprotein (NP), hemagglutinin (HA) and the matrix protein M1 of the influenza B virus. These MAbs work with high affinity and specificity in different immunoassays including direct or indirect ELISA, sandwich immunodetection systems and in Western blotting.

Anti-NP MAbs are highly specific to influenza B nucleoprotein and do not bind to the NP of the influenza A virus or to any other viral proteins that we have tested (see Figure 4). The low detection limit of these MAbs allows the detection of the influenza B virus in samples with low influenza B titer. Due to the high specificity and affinity they are recommended to be used in rapid influenza B immunodetection systems.

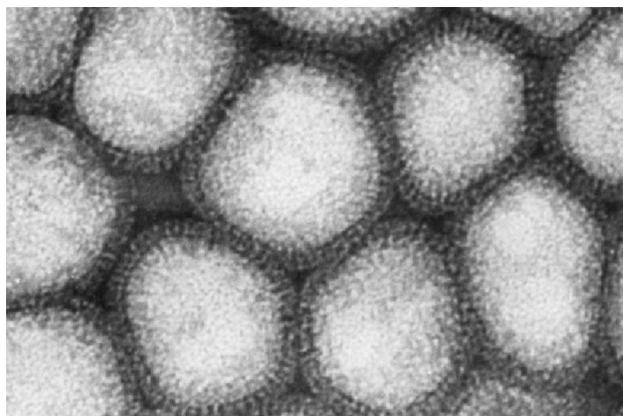


Figure 3. Electron microscopic image of influenza B virus.
The diameter of the virus particles is 100-120 nm. Magnification 110,000x.

Anti-HA MAbs are specific to the influenza B haemagglutinin HA2 and equally detect different strains of the influenza B virus (see Figure 5). Anti-matrix protein MAbs are highly sensitive to the M1 matrix protein of influenza B viruses and detect the M1 of different influenza B strains in EIA and Western blotting.

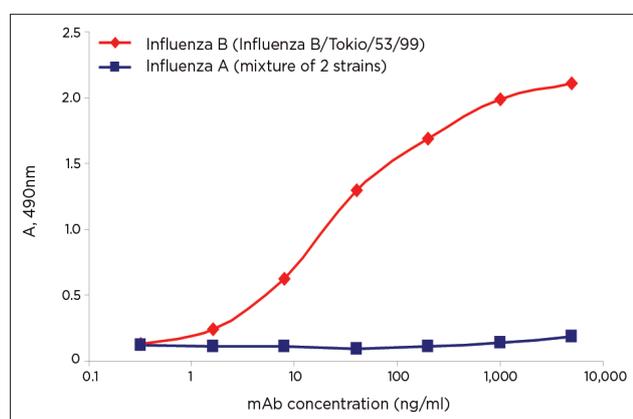


Figure 4. Titration curve of MAb InB114 (Cat.# 31F18) specific to the NP of the influenza B virus.

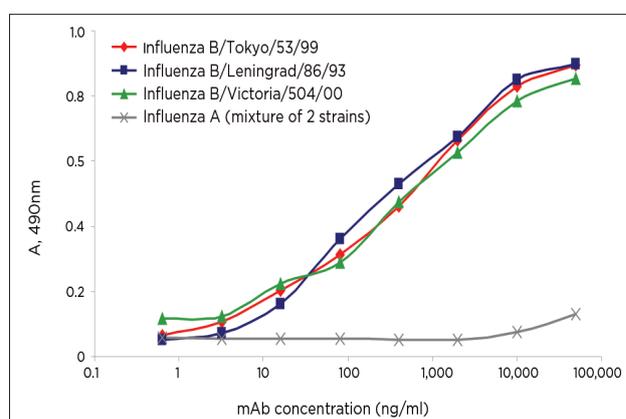
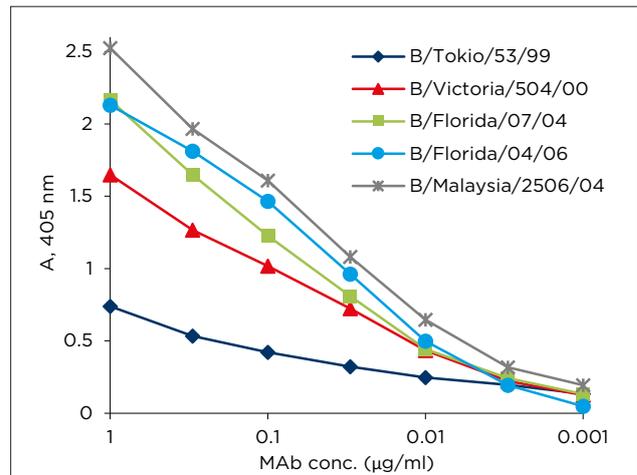


Figure 5. Titration curve of MAb InB190 (Cat.# 3BH9) specific to the HA of the influenza B virus.

In vitro produced monoclonal mouse anti-influenza virus B group antigen (Cat.# RIF17)

We provide an *in vitro* -produced monoclonal antibody that is specific to the influenza B virus. This antibody detects the nucleoprotein of the virus and has been tested with several influenza B strains (see Figure 6). No cross-reactivity was detected when it was tested with nine influenza A strains, three parainfluenza strains, adenovirus (type 6) or respiratory syncytial virus.

Figure 6. A direct ELISA analysis of the anti-influenza B group antigen (Cat.# RIF17) with different influenza B strains. Antigens were absorbed to the plate in 5 µg/ml concentration and antibody binding was tested using a dilution series of the antibody from 1 µg/ml to 1 ng/ml concentration.



Inactivated viruses as antigens

We offer five different influenza B viruses as antigens that are suitable for the detection of antibodies specific to influenza B in assays including ELISA, hemagglutinin inhibition tests and Western blotting. The antigens are purified and inactivated viruses that are grown in chicken eggs. Our studies found that these antigens are only detected with the antiserum raised against the corresponding antigen and they show no reactivity with other antisera (see Table 2).

Table 2. Hemagglutination test of selected influenza B antigens. The antigens are only detected with antiserum raised against the corresponding virus and not with other antisera.

		Rabbit antisera to				
		B/Tokio/53/99	B/Victoria/504/00	A/New Caledonia/20/99	A/St.Petersburg/186/00	A/swine/1976/31
Virus	B/Tokio/53/99	320	<10	<10	<10	<10
	B/Victoria/504/00	<10	320	<10	<10	<10

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3IF18*	Monoclonal mouse anti-influenza virus B group antigen	Enzyme immunoassays Immunofluorescence Western blotting
3BH9*	Monoclonal mouse anti-influenza B haemagglutinin	Enzyme immunoassays Western blotting
3BM17*	Monoclonal mouse anti-influenza B Matrix protein M1	Enzyme immunoassays Western blotting
RIF17	Monoclonal mouse anti-influenza virus B group antigen	Enzyme immunoassays

* Several MAbs available under one catalogue number. Please see www.hytest.fi.

ANTIGENS

Cat.#	Product	Strain	Purity
8IN75-2	Influenza B virus-2	B/Tokio/53/99	>90%
8IN75-3	Influenza B virus-3	B/Victoria/504/00	>90%
8IN75-4	Influenza B virus-4	B/Malaysia/2506/04	>90%
8IN75-5	Influenza B virus-5	B/Florida/07/04	>90%
8IN75-6	Influenza B virus-6	B/Florida/04/06	>90%

Adenovirus

Adenoviruses are common viruses that infect both human beings and animals. They cause respiratory illnesses but the symptoms can also include diarrhea, fever and conjunctivitis. Most adenovirus infections are mild although some adenoviruses (for example type 6) are endemic and at least one infection is usually acquired during childhood. Approximately 10% of the acute respiratory diseases (ARDs) during childhood are caused by adenoviruses.

Some virus types spread in military units cause ARDs among recruits and a considerable proportion of these diseases result in hospitalization. A few

adenovirus types are known as causative agents of epidemic keratoconjunctivitis while others provoke outbreaks of gastroenteritis.

HyTest offers monoclonal antibodies that are specific to the hexon antigen of adenovirus. These antibodies react with the hexon antigen of (at the very least) human, dog, cow, monkey and rat adenoviruses and can be used in various enzymatic immunoassays including ELISA, immunodiffusion and immunohistochemistry. We also offer an inactivated adenovirus type 6 that could be used in serological assays.

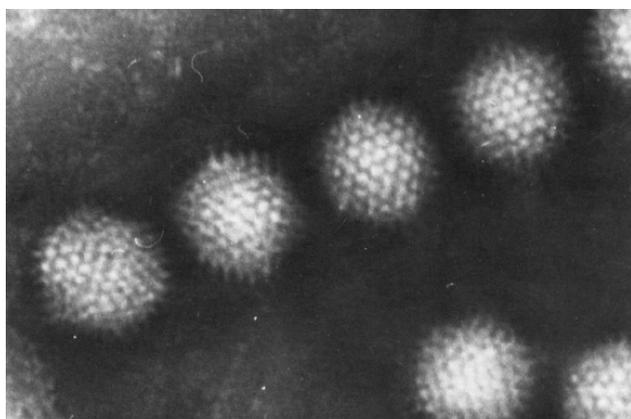


Figure 7. Electron microscopic image of adenovirus type 6. The diameter of the virus particles is 80 nm. Magnification 110,000x.

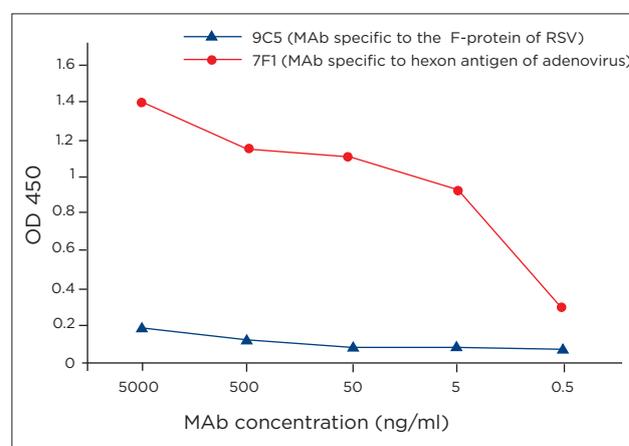


Figure 8. Control of specific activity and cross-reactivity of adenovirus in ELISA with MAbs specific to different viruses.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3AV13*	Monoclonal mouse anti-adenovirus hexon	Enzyme immunoassays Immunodiffusion Immunohistochemistry

* Several MAbs available under one catalogue number. Please see www.hytest.fi.

ANTIGENS

Cat.#	Product	Strain	Purity
8AV13	Adenovirus, type 6	Tonsil 99	>90%

Respiratory syncytial virus (RSV)

Respiratory syncytial virus is one of the most important respiratory pathogens in infants and young children and it provokes considerable morbidity and often requires bed care. In older children and adults the symptoms are usually milder. The more severe diseases caused by the respiratory syncytial virus are most common among infants during the first six months of life and patients with immunodeficiency.

Repeated infections are common and result in neutralizing antibody formation.

We offer *in vitro*-produced monoclonal antibodies and an inactivated virus as an antigen for the development of immunoassays.

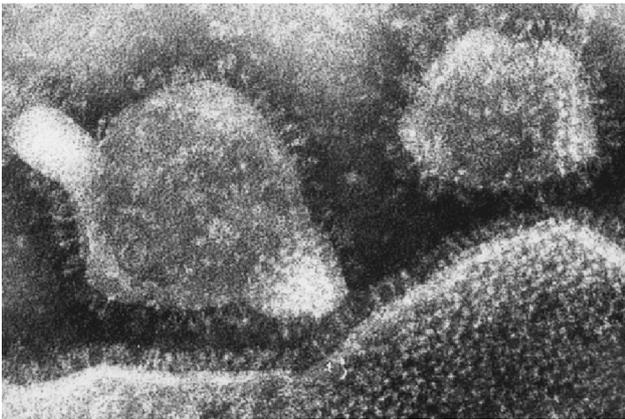


Figure 9. Electron microscopic image of respiratory syncytial virus. The diameter of the virus particles is 150-300 nm. Magnification 110,000x.

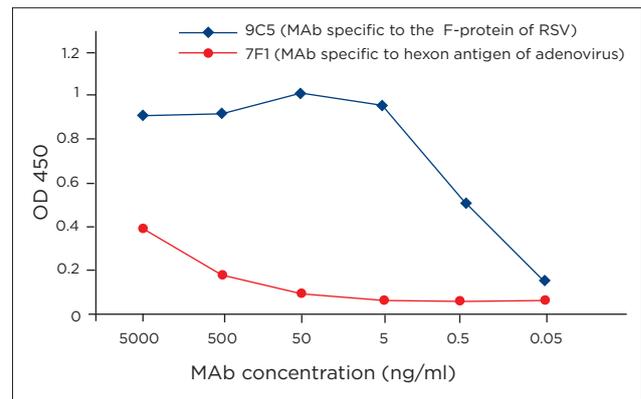


Figure 10. Control of specific activity and cross-reactivity of respiratory syncytial virus in ELISA with MAbs specific to different viruses.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3ReS21	Monoclonal mouse anti-respiratory syncytial virus (RSV)	Enzyme immunoassays
3ReS21cc	Monoclonal mouse anti-respiratory syncytial virus (RSV), <i>in vitro</i>	Enzyme immunoassays Western blotting

ANTIGENS

Cat.#	Product	Strain	Purity
8RSV79	Respiratory syncytial virus	Long	>90%

Parainfluenza

Parainfluenza viruses cause acute respiratory infections and this typically affects young children. Four different virus types have been identified and all of them can cause upper and lower respiratory track illnesses with a variety of symptoms. In addition to mild diseases, parainfluenza viruses can also cause severe croup, bronchitis, bronchiolitis and pneumonia (parainfluenza virus type 3) in infants.

Antigens for serological tests

We offer three purified and inactivated parainfluenza viruses that are suitable for serological tests: type 1 (strain Sendai), type 2 (strain II ALTB cc2056) and type 3 (strain 3v2932). Our studies found that these antigens are detected with corresponding antisera and show little to no cross-reactivity with other antisera (see Figure 11 and Table 3).

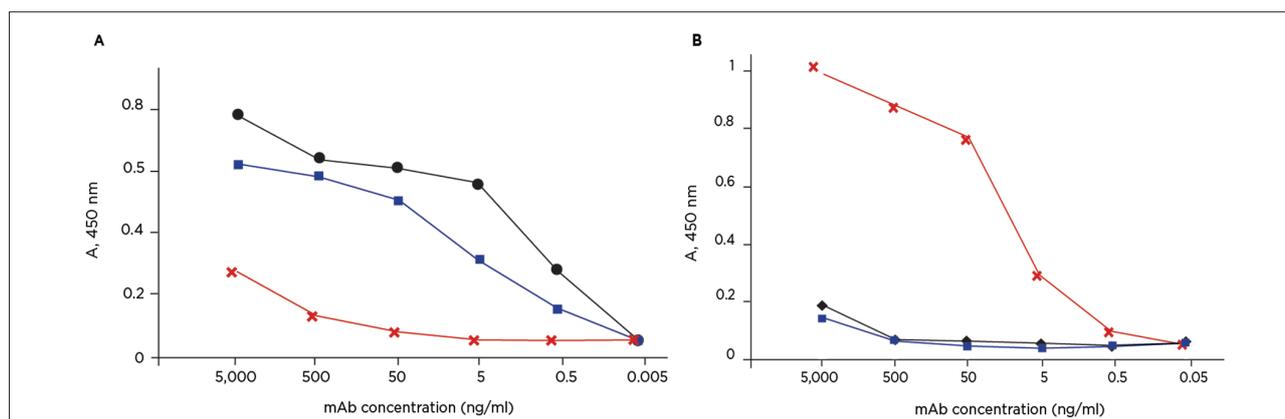


Figure 11. Control of specific activity and cross-reactivity of the parainfluenza virus type 2 (A) or type 3 (B). Virus type 2: Cat.# 8P73-2, virus type 3: Cat.# 8P73-3. Assay: ELISA with MAbs specific to parainfluenza viruses type 2 (circle and square) and type 3 (cross).

		Rabbit antisera to		
		Type 1 (Sendai)	Type 2 (II ALTB cc2056)	Type 3 (3v2932)
Virus	Type 1 (Sendai)	320	<20	<20
	Type 2 (II ALTB cc2056)	<20	320	<20
	Type 3 (3v2932)	<20	<20	640

Table 3. Hemagglutination inhibition test of parainfluenza virus types 1-3. The antigens are only detected with antiserum raised against the corresponding virus type and not with other antisera.

ANTIGENS

Cat.#	Product	Strain	Purity
8P76	Parainfluenza virus, type 1	Sendai	>90%
8P76-2	Parainfluenza virus, type 2	II ALTB cc2056	>90%
8P76-3	Parainfluenza virus, type 3	III v2932	>90%

Foodborne pathogens

Rotavirus

By the age of five, almost every child will have suffered from a diarrhea caused by a rotavirus. Rotavirus is the number one cause of severe diarrhea in young children worldwide. It has been estimated that the rotavirus infection leads to approximately 500,000 deaths each year, most of which occur in developing countries.

Our anti-rotavirus MAbs have been shown to detect numerous human rotavirus field strains. In addition, they cross-react well with rotaviruses that are infecting animals.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3R10*	Monoclonal mouse anti-rotavirus A	Enzyme immunoassays Immunohistochemistry Western blotting

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Calicivirus (norovirus)

Noroviruses are highly contagious viruses that cause vomiting and diarrhea. In fact, most nonbacterial gastroenteritis infections are caused by noroviruses. These viruses are transmitted by the fecal-oral route and the source of infection is often contaminated food or water. The virus also spreads easily when one comes into contact with infected individuals and from surfaces that they have touched. This means that the virus easily spreads among groups of people, for example in schools, in hospitals or even at home.

Calicivirus infects also cats. Approximately half of the upper respiratory infections found in cats are caused by feline calicivirus (FCV). Infecting virus strains differ in their virulence and pathogenicity, and the symptoms also vary from mild to severe. Despite vaccines having been available for decades and a systematic vaccination program, the virus remains a common cause of infection. The prevalence of FCV is higher in facilities that house several cats, such as catteries and shelters, although the virus can also be found in approximately 10% of cats that are kept as pets.

We provide five different monoclonal antibodies that detect caliciviruses. The antibodies were developed using the FCV and rabbit hemorrhagic disease virus (RHDV) as immunogens in order to obtain antibodies that would detect the most common

epitopes of different caliciviruses. All MAbs detect human norovirus, feline calicivirus and the rabbit hemorrhagic disease virus.

Immunological activity of monoclonal antibodies

The antibodies were tested for their ability to detect a field strain of human norovirus in a sandwich ELISA (see Figure 12).

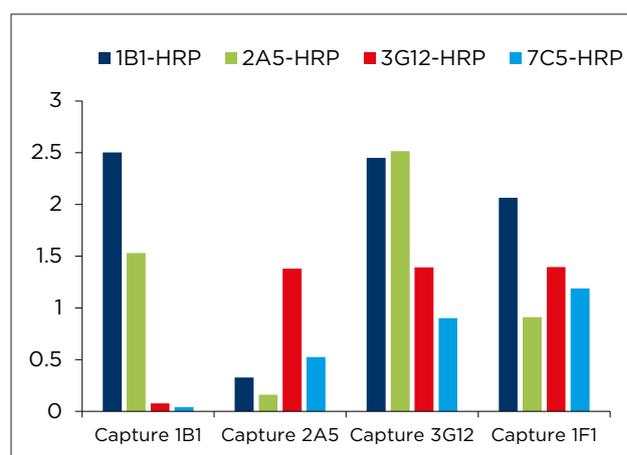


Figure 12. Immunological activity of several antibody pairs (capture-detection) in a sandwich immunoassay. A native human norovirus was used as the antigen.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3CNV1*	Monoclonal mouse anti- <i>Caliciviridae</i> (norovirus)	Enzyme immunoassays Western blotting Hemagglutinin inhibition test

* Several MAbs available under one catalogue number. Please see www.hytest.fi.

Salmonella

Salmonella is an enteric pathogen which – depending on the bacterium serotype – can cause salmonellosis or typhoid fever. Salmonellosis is one of the most common foodborne gastroenteritis and it affects tens of millions of human beings every year. The infection typically lasts for a few days and requires no treatment. However, the more severe forms of the disease can be life threatening and must be attended to accordingly. Young children, the elderly and people with a compromised immune system are more at risk of developing the severe form of the infection.

The infection is often contracted through the consumption of contaminated poultry or meat. Salmonella is a robust pathogen and it can survive for several weeks in a dry environment and several months in water.

For the development of monoclonal antibodies against Salmonella O-antigens, we used *Salmonella* Paratyphi, *Salmonella* Typhimurium and *Salmonella* Enteritidis as immunogens. Some of the antibodies are specific to single serogroups while others have broader specificity (see Tables 4 and 5).

For the development of monoclonal antibodies against *Salmonella* Typhimurium, we used the lipopolysaccharides of *S. Typhimurium* as an immunogen. This antibody has a broad reactivity range recognizing *E. coli* 1234 and *Listeria monocytogenes* (ATCC 7644) species as well, which means that it is a potential positive control antibody for a variety of assays.

Table 4. O-antigen specificity of the anti-salmonella MAbs.
Salmonella serogroups are given in parenthesis.

MAb	<i>S. Paratyphi</i> A (A)	<i>S. Typhimurium</i> (B)	<i>S. Choleraesuis</i> (C1)	<i>S. Newport</i> (C2)	<i>S. Enteritidis</i> (D)	<i>S. Anatum</i> (E1)	<i>S. Senftenberg</i> (E2)	<i>E. coli</i> O55:B5	<i>E. coli</i> K12	<i>Klebsiella pneumoniae</i>	Tentative LPS antigenic determinant
10B10G	+	-	-	-	-	-	-	-	-	-	O-2
5D12A	+	+	+	+	+	+	+	-	-	-	core
1E6	-	+	-	-	-	-	-	-	-	-	O-4
4G7C	-	-	-	-	+	-	-	-	-	-	O-9
10D9H	+	+	-	-	+	†	†	-	-	-	O-12

Table 5. Binding constants (K_a; unit M⁻¹) for MAbs with lipopolysaccharides (LPS) of serogroups A, B, D and E.

MAb	A	B	D	E
10B10G	2.0 x 10 ⁷	n/a	n/a	n/a
5D12A	1.0 x 10 ⁹	1.0 x 10 ⁷	1.0 x 10 ⁷	1.0 x 10 ¹⁰
4G7C	n/a	n/a	2.0 x 10 ⁷	n/a
10D9H	2.1 x 10 ⁹	1.1 x 10 ⁹	6.5 x 10 ⁸	1.0 x 10 ⁶

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3SO22*	Monoclonal mouse anti-A, B, D group specific <i>Salmonella</i> O-antigens	Enzyme immunoassays Dot blot assay Immunofluorescence
3S9	Monoclonal mouse anti- <i>Salmonella</i> Typhimurium	Enzyme immunoassays

* Several MAbs available under one catalogue number. Please see www.hytest.fi.

Listeria monocytogenes

Listeria monocytogenes is a bacterium that is normally found in the environment but it is also one of the organisms that can cause severe foodborne diseases. Listeriosis is among the leading causes of death from foodborne illness. In addition to the severe, invasive form of the illness that causes septicemia and meningitis, the *L. monocytogenes* infection can result in a milder, non-invasive gastroenteritis. Risk groups

for the severe, life-threatening form of this illness are people with impaired immune systems, the elderly, pregnant women and newborn babies.

Our anti-*L. monocytogenes* MAbs show high immunoreactivity against the outer membrane (OM) fraction of *L. monocytogenes* as well as against the whole cells (see Figure 13).

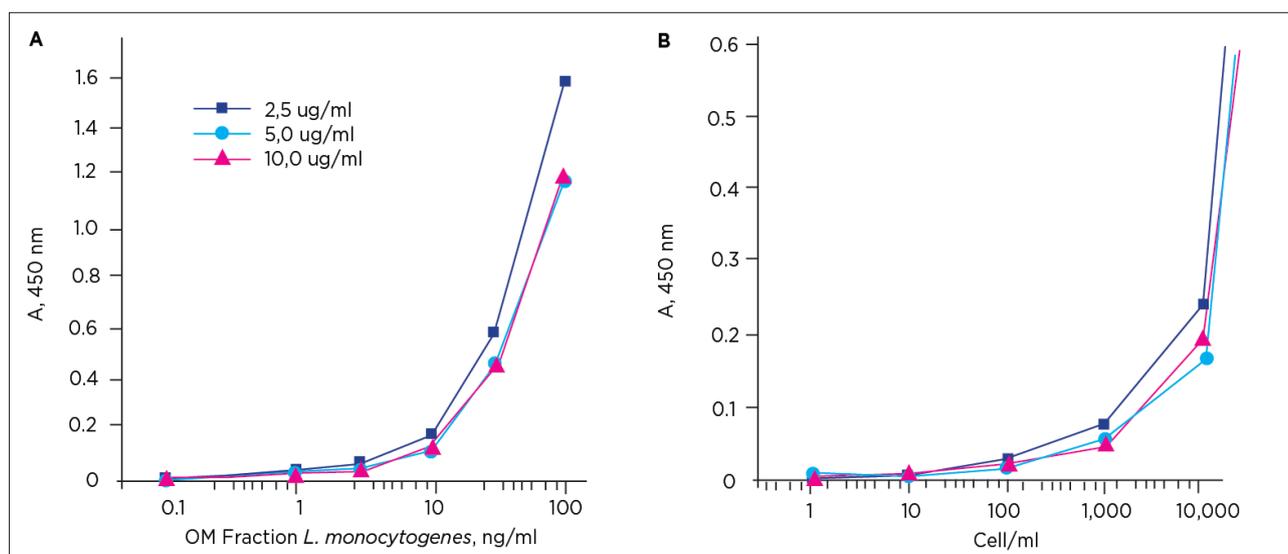


Figure 13. Calibration curves for the detection of the OM fraction of *L. monocytogenes* (A) or whole cells (B).
Capture-detection pair: LZH1-LZF7 (Cat.# 3L1).

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3L1*	Monoclonal mouse anti- <i>Listeria monocytogenes</i>	Enzyme immunoassays Western blotting

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Clostridium botulinum

Clostridium botulinum is an anaerobic, spore-forming bacterium that produces a very potent neurotoxin and causes a life-threatening disease called botulism. Of the seven types of botulism toxins (A-G), types A, B, E and F cause an illness in human beings. Meanwhile, types C and D cause most cases of botulism in animals.

C. botulinum is found in soil but since it can only grow in anaerobic conditions, the bacteria are mostly present as spores. Spores do not produce neurotoxins and are therefore not harmful per se. *C. botulinum*

becomes dangerous when the conditions are suitable for growth as active and growing cells produce endotoxins. This can occur, for example, in a wound that is contaminated with soil containing spores or in foods that are either incorrectly or minimally processed.

We have used formaldehyde inactivated *C. botulinum* toxins (toxoids) A, B, D and E to generate monoclonal antibodies that are specific to these toxins. In addition, we provide monoclonal antibodies (Cat.#3Cb19) that recognize the natural and non-inactivated toxin A.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3Cb19*	Monoclonal mouse anti- <i>Clostridium botulinum</i> toxin A	Enzyme immunoassays Western blotting
3Cb20*	Monoclonal mouse anti- <i>Clostridium botulinum</i> A toxoid	Enzyme immunoassays
3Cb21*	Monoclonal mouse anti- <i>Clostridium botulinum</i> B toxoid	Enzyme immunoassays

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Astrovirus

Human astroviruses are a common reason for a gastroenteritis infection in young children. The viruses have low pathogenicity and symptoms are usually mild. Transmission takes place via the fecal-

oral route but also through contaminated food and water. Of the eight different astrovirus serotypes, the serotype 1 appears to be the one most often associated with gastroenteritis.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3AS6	Monoclonal mouse anti-astrovirus, serotype 1	Enzyme immunoassays Western blotting

Campylobacter jejuni

Campylobacter jejuni is one of the most common causes of diarrhea. The infection is often caught by eating raw or undercooked poultry, or by drinking raw milk or contaminated water. In most cases people recover in a few days and no special drugs (antibiotics) are needed. However, in some cases the infection can become severe and even life-threatening.

Our anti-*Campylobacter jejuni* MAb shows no cross-reaction with *Salmonella* spp or *Escherichia coli*.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3CJ2	Monoclonal mouse anti- <i>Campylobacter jejuni</i>	Enzyme immunoassays Western blotting

Other infectious diseases

Hepatitis B virus

The hepatitis B virus (HBV) can cause acute or chronic hepatitis B. The hepatitis B infection affects the liver and in a subset of cases may lead to the development of cirrhosis and liver cancer. Hepatitis B is a major global health problem and according to WHO the consequences of this illness result in the death of more than 780,000 people every year.

We offer four different hepatitis B virus surface antigens. These can be used, for example, in developing hepatitis B serological tests. In addition, we have developed a panel of monoclonal antibodies. These MABs are specific to different hepatitis B virus antigens: the surface antigen HBsAg, the core antigen HBcAg or the “e” antigen HBeAg. An example of a calibration curve for the hepatitis B virus is given in Figure 14.

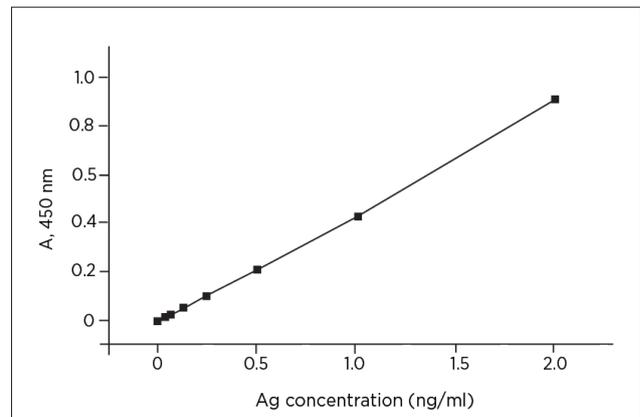


Figure 14. Calibration curve for the hepatitis B virus sandwich ELISA. Capture-detection pair: Hs33-Hs41 (Cat.# 3HB12).

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3HB12*	Monoclonal mouse anti-hepatitis B virus surface antigen (HBsAg)	Enzyme immunoassays
3HB17*	Monoclonal mouse anti-hepatitis B virus core antigen (HBcAg)	Enzyme immunoassays Western blotting
3HBe24*	Monoclonal mouse anti-hepatitis B virus “e” antigen (HBeAg)	Enzyme immunoassays

* Several MABs available under one catalogue number. Please see www.hytest.fi.

ANTIGENS

Cat.#	Product	Source	Purity
8HS7ay	HBsAg, ayw subtype	Recombinant	>98%
8HS7-2ad	HBsAg, adw subtype	Recombinant	>98%
8HEV3	Hepatitis E virus (HEV), capsid protein (ORF2)	Recombinant	>95%
8HGR4	HBsAg, G145R escape mutant	Recombinant	>95%

Human papilloma virus

Human papillomavirus (HPV) belongs to Papillomaviruses, which are a diverse group of DNA-based viruses that infect the skin and mucous membranes of human beings and a variety of animals. Over 100 different HPV types have been identified. Types 16 and 18 are among the high-risk HPV and cause approximately 70% of cervical cancers. HPV type 11 is a low-risk HPV strain which seldom develops into cancer.

HyTest offers a wide spectrum of monoclonal antibodies specific to oncoprotein E7 of HPV types 11, 16 and 18. These MABs can be used in routine immunoassays including ELISA and Western blotting. Some MABs display high specificity to a single type of HPV while others can be used for the determination of E7 proteins of all four types of viruses. An example of a calibration curve for E7 HPV type 16 is given in Figure 15 and for E7 HPV type 18 in Figure 16. We also provide recombinant L1 proteins.

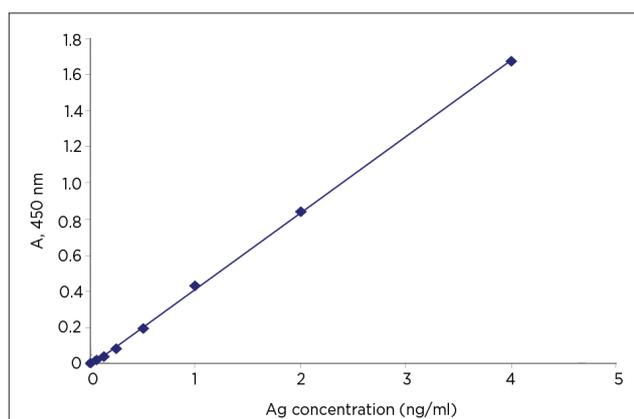


Figure 15. Calibration curve for the E7 HPV type 16 sandwich immunoassay. Capture-detection pair. 716-D1 – 716-332 (Cat.# 3HP16).

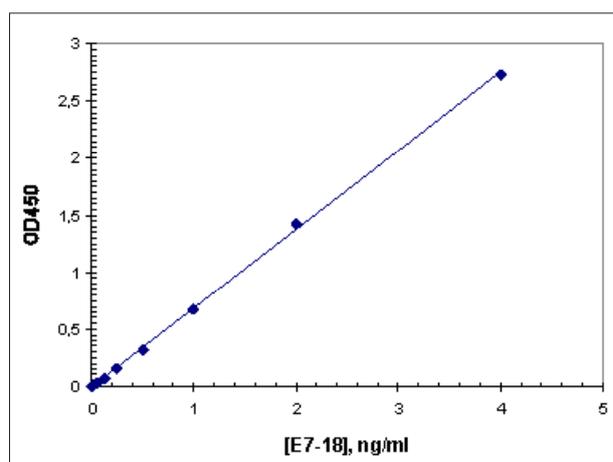


Figure 16. Calibration curves for E7 HPV type 18 sandwich immunoassays: 716-D1 – 718-238

Coating: MAb 716-D1 5 ug/ml, 0.1 M Carbonate buffer, pH 9.2
 Detection: HRP-conjugated MAb 716-238, 1/20 000
 Substrate: TMB

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3HP11	Monoclonal mouse anti-human papilloma virus (HPV), type 11, oncoprotein E7	Enzyme immunoassays Western blotting
3HP16*	Monoclonal mouse anti-human papilloma virus (HPV), type 16, oncoprotein E7	Enzyme immunoassays Western blotting
3HP18*	Monoclonal mouse anti-human papilloma virus (HPV), type 18, oncoprotein E7	Enzyme immunoassays Western blotting

* Several MABs available under one catalogue number. Please see www.hytest.fi.

ANTIGENS

Cat.#	Product	Source	Purity
8HPV16	Human Papillomavirus L1 protein (HPVL1), type 16, recombinant	Recombinant	>90%
8HPV18	Human Papillomavirus L1 protein (HPVL1), type 18, recombinant	Recombinant	>90%

Mycobacterium tuberculosis

Approximately one-third of the world population is infected with *Mycobacterium tuberculosis*. This bacterium spreads through the air and causes tuberculosis (TB), which mainly affects the lungs. TB infection can remain latent; it is estimated that about 10% of the infections lead to the disease. According

to WHO, over one million people die from TB each year. These people mainly come from low-income and middle-income countries.

We provide a broad selection of MAbs specific to different *M. tuberculosis* proteins.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3CFP1*	Monoclonal mouse anti- <i>Mycobacterium tuberculosis</i> CFP10	Enzyme immunoassays
3ES6*	Monoclonal mouse anti- <i>Mycobacterium tuberculosis</i> ESAT6	Enzyme immunoassays
3MT16	Monoclonal mouse anti- <i>Mycobacterium tuberculosis</i> recombinant 16 kDa Ag	Enzyme immunoassays Western blotting
3MT38*	Monoclonal mouse anti- <i>Mycobacterium tuberculosis</i> recombinant 38 kDa Ag	Enzyme immunoassays Western blotting
3HSP70	Monoclonal mouse anti- <i>Mycobacterium tuberculosis</i> , heat shock protein 70 (HSP70)	Enzyme immunoassays Western blotting

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Rubella virus

Rubella is a contagious viral infection caused by the rubella virus. The virus is transmitted by airborne droplets entering the body via the respiratory tract. The infection is usually mild and lasts for just a few

days. However, in pregnant women rubella can result in the death of the fetus or the newborn baby can have congenital defects, a condition known as congenital rubella syndrome.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3R23*	Monoclonal mouse anti-rubella virus	Enzyme immunoassays Western blotting

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

ANTIGENS

Cat.#	Product	Source	Purity
8RVE1	Rubella virus E1, mosaic, recombinant	Recombinant	>80%
8RVE2	Rubella virus E2, recombinant	Recombinant	>80%

Helicobacter pylori

Helicobacter pylori is a gram-negative bacterium that can inhabit various areas of the stomach, in particular the antrum. It can cause a chronic, low-level inflammation of the stomach lining and is strongly linked to the development of duodenal and gastric ulcers and stomach cancer. *H. pylori* is a very

common bacterium of the stomach, although over 80% of individuals infected are asymptomatic.

CagA encoded by the cytotoxine-associated gene A is found in a subset of *H. pylori* strains. It is associated with the severe disease outcomes, most notably gastric carcinoma.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3HE70cc	Monoclonal mouse anti- <i>Helicobacter pylori</i> CagA-protein	Enzyme immunoassays Immunoprecipitation Western blotting

Toxoplasma gondii

Toxoplasmosis is a disease that is caused by *Toxoplasma gondii*, which is a very common parasite. Upon infection, healthy people usually show either no or just mild flu-like symptoms. However, if a woman is infected either during or shortly prior to pregnancy this can cause serious injury to the unborn baby. Prenatal infection with the virus is associated

with injury to the developing fetal nervous system. The severity of this condition is related to the stage of pregnancy during which the infection occurs; first trimester infections are associated with a greater degree of neurologic dysfunction. In addition to pregnant women, toxoplasmosis can cause severe illness in people with a compromised immune system.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3Tx19	Monoclonal mouse anti- <i>Toxoplasma gondii</i> p30 antigen	Enzyme immunoassays Immunofluorescence Western blotting

Additional products

Staphylococcus aureus endotoxins

Staphylococcus aureus is a bacterium that is commonly found on the skin and noses of both human beings and animals. Up to 25% of healthy people carry this bacterium.

When food is contaminated with *S. aureus*, the growing bacteria secrete different enterotoxins that are responsible for food poisoning. When ingested, enterotoxins usually cause a short-lasting illness

with symptoms that are typical of a gastrointestinal disease: nausea, diarrhea and vomiting.

We have developed monoclonal antibodies that are suitable for the detection of a subset of *S. aureus* enterotoxins. The MAbs are specific to a single enterotoxin (A, B, G or I).

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
2S7*	Monoclonal mouse anti- <i>Staphylococcus aureus</i> enterotoxin A	Enzyme immunoassays Western blotting
2S4*	Monoclonal mouse anti- <i>Staphylococcus aureus</i> enterotoxin B	Enzyme immunoassays
2S6*	Monoclonal mouse anti- <i>Staphylococcus aureus</i> enterotoxin G	Enzyme immunoassays Western blotting
2S5	Monoclonal mouse anti- <i>Staphylococcus aureus</i> enterotoxin I	Enzyme immunoassays Western blotting

* Several MAbs available under one catalogue number. Please see www.hytest.fi.

Escherichia coli heat-labile enterotoxin

Enterotoxic *E. coli* (ETEC) is a very common cause of diarrhea in developing countries and is the most common cause of travelers' diarrhea. The heat-labile enterotoxin is produced by ETEC and is the major disease causing agent of these strains. It is a hetero-oligomeric protein complex that is composed of one A subunit and five B subunits, and is closely related to the cholera toxin.

We provide monoclonal antibodies that are specific to the B subunit of the heat-labile enterotoxin.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
2LTB2*	Monoclonal mouse anti- <i>Escherichia coli</i> heat-labile enterotoxin B-chain	Enzyme immunoassays Western blotting

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Diphtheria toxin

Diphtheria is an acute disease that is caused by a bacterium called *Corynebacterium diphtheria*. This bacterium produces a toxin that can spread through the bloodstream to various organs. Diphtheria usually infects the throat and nose, causing breathing problems. In more severe cases it can damage the nerves and also result in heart failure, paralysis and even death.

We provide monoclonal antibodies against the diphtheria toxin and anatoxin. The antibodies react with different determinants of the toxin and anatoxin or with the free A subunit. They are suitable for the detection of diphtheria toxin using different immunoassays.

Diphtheria spreads by droplet transmission and it is a highly contagious and potentially life-threatening infection. Nowadays, diphtheria is very rare or has even been eradicated in many countries as a result of systematic vaccination. However, cases still occur and this is particularly relevant in areas where vaccinations are inadequate.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
2DT13*	Monoclonal mouse anti-Diphtheria toxin	Enzyme immunoassays Western blotting
2DT14*	Monoclonal mouse anti-Diphtheria toxin, A-subunit	Enzyme immunoassays

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Aflatoxins B1 and B2

Aflatoxins are mycotoxins that are produced by *Aspergillus flavus* and *Aspergillus paraciticus*. These fungi are widespread in nature and can contaminate crops and other foods either before or after harvesting. Aflatoxins are toxic to both human beings and animals. They are potent carcinogenic, mutagenic and immunosuppressive toxins that are

found, for example, in groundnuts, maize and rice contaminated with the fungi or in the milk of animals that have been fed contaminated food.

Our anti-aflatoxin MAb recognizes the free aflatoxins B1 and B2 in immunoassays.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
3Af27	Monoclonal mouse anti-aflatoxin from <i>Aspergillus flavus</i>	Enzyme immunoassays

Microcystin-LR

Microcystins are toxins that are produced by cyanobacteria that live in different water bodies and proliferate in warm and nutrient rich conditions. Microcystins can damage the liver and are generally considered as hepatotoxins. Either swimming in or ingesting water that has been contaminated with microcystins has resulted in the deaths of dogs, cattle and wild animals.

Microcystin-LR is considered to be the most toxic compound of the microcystin family. We provide antibodies that can be used for the detection of microcystin-LR in immunoassays.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
2MC2*	Monoclonal mouse anti-microcystin-LR	Enzyme immunoassays

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Tetanus toxin

Tetanus toxin (which is also known as tetanospasmin or TeNT) is a neurotoxin that causes tetanus. It is produced by *Clostridium tetani*, the spores of which are commonly found in soil and the feces of different animals. *C. tetani* only grows and concomitantly produces toxins in anaerobic conditions. A wound can offer a suitable environment for the spores to germinate and this is the common mechanism for an infection to occur.

We provide monoclonal antibodies that are specific to tetanus toxin. These antibodies display toxin neutralization activity and are suitable for immunoassays aimed at detecting tetanus toxin.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
2TE8*	Monoclonal mouse anti-tetanus toxin	Enzyme immunoassays Western blotting

* A few MAbs available under one catalogue number. Please see www.hytest.fi.

Cholera toxin

Cholera toxin is an enterotoxin that is secreted by *V. cholerae*. This toxin induces a massive efflux of water and ions from cells that line the intestine and thereby creates a watery diarrhea characteristic to the cholera.

We offer monoclonal antibodies that are specific to the B-subunit of cholera toxin.

MONOCLONAL ANTIBODIES

Cat.#	Product	Tested applications
2C4*	Monoclonal mouse anti-cholera toxin, B-subunit	Enzyme immunoassays Western blotting

* Several MAbs available under one catalogue number. Please see www.hytest.fi.



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