



HeiQ Viroblock NPJ03

Data portfolio

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INSIDE**



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1. Background

- HeiQ Viroblock NPJ03 is an antiviral and antibacterial treatment for textiles.
- HeiQ Viroblock NPJ03 is a liquid formulation that can be applied to a range of textiles using standard continuous wet-processing methods (e.g. padding, kiss-roll etc.).
- HeiQ Viroblock NPJ03 can be applied to all types of fabrics and non-wovens. Examples include: Face masks, Air filters; Medical non-wovens (e.g. surgical gowns, scrubs, drapes etc.); Uniforms in clinical and care facilities; Bed sheets and liners; Curtains, carpets and room furnishings.
- *The purpose of this document is to provide a collation of test data for antiviral, antibacterial and barrier properties of various textile articles treated with HeiQ Viroblock NPJ03.*

2. Antiviral testing





a) ISO 18184

Method summary

- The ISO 18184 method ^[1] assesses the antiviral efficacy of textile samples
- Apply a defined volume and concentration of the target virus strain to textile sample
- Allow inoculum to remain in contact with the sample for a defined time
- Wash or rinse out the virus material from the sample
- Evaluate residual infectivity of recovered residues
- The reduction in infectivity compared to the starting inoculum is calculated as an indicator of effectiveness

[1] ISO 18184:2019, Textiles – Determination of antiviral activity of textile products, International Organization for Standardization.

ISO 18184



- Testing summary:

Sample	Polypropylene / Polyamide
Treatment	HeiQ Viroblock NPJ03
Handling	Tested as received
Test lab	Guangdong Detection Center of Microbiology (China)
Test method & strains	ISO 18184; Influenza H3N2

- Results:

Sample ID	Treatment	% reduction	Activity value (Log reduction)
LS20-00319-1	HeiQ Viroblock NPJ03; 10% wof	99.93%	3.18
LS20-00319-2	HeiQ Viroblock NPJ03; 20% wof	>99.99%	>4.72

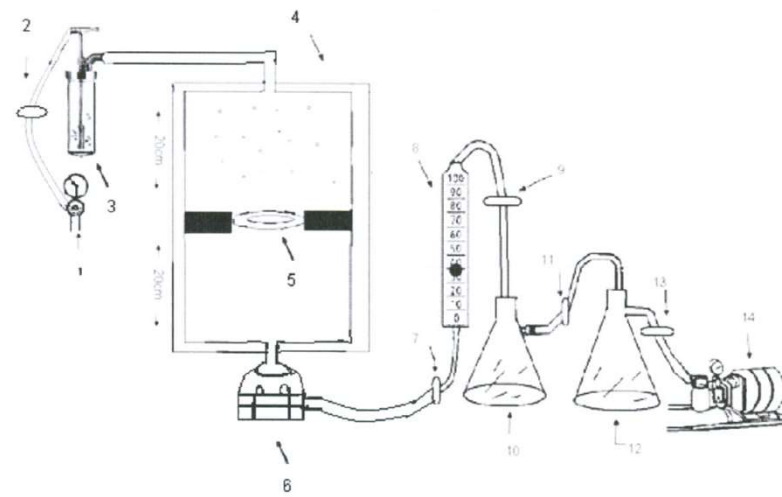
- HeiQ Viroblock NPJ03 treated fabrics consistently demonstrate an excellent antiviral effect at high dosage (20%), and very strong effect at lower dosage (10%)



b) ASTM F 2101 – Aerosol challenge test

Method summary

- Based on ASTM Method F 2101.01 [1] with modifications and customization to virus testing.
- Test mask mounted and sealed within a test chamber
- A nebulizer delivers an aerosol of the target virus inoculum to the upstream side of the mask
- A vacuum draws air through the mask
- A collection dish placed below the mask downstream collects aerosol droplets that pass through the mask sample
- The reduction in infectivity with and without mask is calculated as an indicator of effectiveness



Key

- | | | |
|-----------------------------|--------------------------------|-----------------|
| 1. High pressure air source | 7. Filter #2 | 13. Filter #5 |
| 2. Filter #1 | 8. Calibrated Flowmeter, L/min | 14. Vacuum pump |
| 3. Nebulizer | 9. Filter #3 | |
| 4. Mask chamber | 10. 4L Vacuum flask #1 | |
| 5. Test material location | 11. Filter #4 | |
| 6. Anderson Impactor | 12. 4L Vacuum flask #2 | |

[1] ASTM F2101, Standard Test Method for Evaluating the Bacterial Filtration Efficiency (BFE) of Medical Face Mask Materials, Using a Biological Aerosol of Staphylococcus aureus, American Society for Testing Materials

Studies: Aerosol challenge test



Study ID	Study title	Report date	Test method	Articles	Agent	Test articles	Reduction	95% CI
798-108	Evaluation of virus filtration efficiency of treated face masks against aerosolized influenza A virus	20/03/2013	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	VB-FFP2	4.33	0.27
						VB-FFP2-Control	2.73	0.16
						VB-SM	3.90	0.16
						VB-SM-Control	1.34	0.28
798-110	Evaluation of virus filtration efficiency of treated face masks against aerosolized influenza A virus	29/05/2013	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	FFP2	5.38	0.43
						FFP2 CTL	3.63	0.43
						FFP3	3.73	0.28
						FFP3 CTL	1.73	0.28
798-111	Evaluation of filtration efficiency of treated face masks against aerosolized virus avian influenza A virus (H5N1)	4/06/2013	Aerosol challenge test	Face mask	H5N1 (Avian Influenza A)	FFP2	4.86	0.16
798-112	Evaluation of filtration efficiency of treated face masks against aerosolized virus Human Coronavirus	13/06/2013	Aerosol challenge test	Face mask	229E (Human Coronavirus)	FFP2	4.48	0.16
						FFP2 CTL	2.90	0.16
798-114	Evaluation of filtration efficiency of treated face masks against aerosolized virus - 2013 Influenza A (H7N9) virus	19/07/2013	Aerosol challenge test	Face mask	H7N9 (2013 Influenza A virus)	FFP2	4.24	0.16
						FFP2 CTL	1.93	0.28
798-115	Evaluation of filtration efficiency of treated face masks against aerosolized virus - Respiratory Syncytial Virus	28/08/2013	Aerosol challenge test	Face mask	RSV (Respiratory Syncytial Virus)	FFP2	3.10	0.08
						FFP2 CTL	1.40	0.14
798-116	Evaluation of filtration efficiency of treated face masks against aerosolized mycobacterium Mycobacterium terrae	29/11/2013	Aerosol challenge test	Face mask	Mycobacterium terrae (ATCC 15755)	FFP2	1.98	0.00
						FFP2 CTL	0.26	0.01
798-117	Evaluation of virus filtration efficiency of treated face masks against aerosolized virus - influenza A virus (H1N1)	25/03/2014	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	Facemate classic (VB)	4.19	0.02
						Facemate classic (C)	2.39	0.43
798-120	Evaluation of virus filtration efficiency of treated face masks against aerosolized virus - influenza A virus (H1N1)	31/07/2014	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	Vflex 9105	2.15	0.25
						PFRP2-62408	1.95	0.14
						FFP2 NR-VR202	2.30	0.38
						FFP2D NR-VBHF002	3.55	0.38
						Control mask	1.90	0.25
798-121	Evaluation of virus filtration efficiency of treated face masks against aerosolized virus - influenza A virus (H1N1)	26/11/2014	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	FFP2 NRD-VBHF002 (old version)	5.22	0.00
						FFP2 NRD-VBHF002 (new version)	5.22	0.00
						FFP3 NRD 3M (reference mask)	5.11	0.11
798-122	Evaluation of virus filtration efficiency of treated face masks against aerosolized virus - influenza A virus (H1N1)	18/02/2015	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	VBHF002P	4.47	0.27
						VBHF002S	4.96	0.30
798-125	Evaluation of virus filtration efficiency of treated face masks against aerosolized virus - influenza A virus (H1N1)	17/07/2015	Aerosol challenge test	Face mask	H1N1 (Human Influenza A)	Viroblock 3P FFP3 Mask	3.57	0.29
						Valmy FFP3 Mask	2.54	0.46

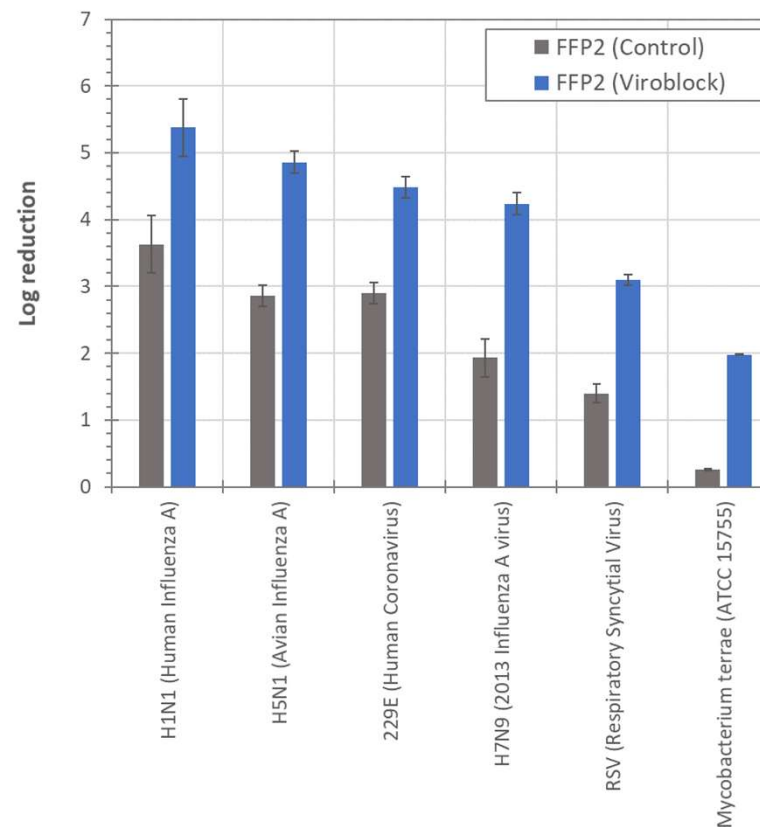


Aerosol challenge

- FFP2 face masks (Untreated control vs Viroblock treated)

Study ID	Agent	Log reduction		% reduction	
		Control	Viroblock	Control	Viroblock
798-110	H1N1 (Human Influenza A)	3.63	5.38	99.9766%	99.9996%
798-111	H5N1 (Avian Influenza A)	2.86	4.86	99.862%	99.999%
798-112	229E (Human Coronavirus)	2.90	4.48	99.874%	99.997%
798-114	H7N9 (2013 Influenza A virus)	1.93	4.24	98.825%	99.994%
798-115	RSV (Respiratory Syncytial Virus)	1.40	3.10	96.02%	99.92%
798-116	Mycobacterium terrae (ATCC 15755)	0.26	1.98	45.05%	98.95%

- Viroblock treated FFP2 mask shows dramatically improved antiviral effect
- Effective against key virus types: H1N1, H5N1, H7N9, Coronavirus (229E), and RSV





c) AATCC 100 – Misting study

Method summary

- Based on AATCC Test Method 100 ^[1] with customization for virus testing
- Spray mist of the target virus inoculum applied evenly onto the surface of the fabric (2 x 2 in. area) from a distance of 3 to 6 in.
- Let sample stand for the contact time of interest
- Recover residues into a 40 ml recovery (neutralizer) medium (stomacher; 5 minutes)
- Evaluate residual infectivity of recovered residues
- The reduction in infectivity compared to the starting inoculum is calculated as an indicator of effectiveness

[1] AATCC Test Method 100, Antibacterial Finishes on Textile Materials: Assessment of", American Association of Textile Chemists and Colorists, AATCC Technical Manual (2019).

Studies: Misting test



Study ID	Short title	Report date	Test method	Articles	Agent	Test articles	Time (mins.)	Reduction	95% CI
798-118	Assessment of virucidal effectiveness of treated fabric material using Influenza A virus (H1N1) misting study	27/03/2014	Misting spray test	Cotton fabric	H1N1 (Human Influenza A)	Cotton fabric (T)	10	1.59	0.33
							30	1.89	0.16
							60	3.12	0.31
						Cotton fabric (C)	10	2.04	0.33
							30	2.31	0.13
							60	2.16	0.00
798-119	Assessment of virucidal effectiveness of treated fabric material using Influenza A virus (H1N1) misting study	29/04/2014	Misting spray test	Cotton fabric	H1N1 (Human Influenza A)	Cotton fabric (T)	60	3.35	0.00
							120	2.47	0.00
							180	2.47	0.00
						Cotton fabric (C)	60	0.63	0.43
							120	0.15	0.16
							180	0.40	0.16
798-123	Assessment of virucidal effectiveness of treated fabric via direct contact Influenza A Virus (H1N1) misting study	29/04/2015	Misting spray test	Cotton fabric	H1N1 (Human Influenza A)	White Cotton #1	10	2.13	0.98
							30	2.04	0.24
							60	1.79	0.25
						White Cotton #2	10	2.21	0.49
							30	2.64	0.00
							60	2.64	0.00
						White Cotton #3	10	1.89	0.00
							30	2.79	0.25
							60	2.54	0.24
						White Cotton #4	10	2.29	0.25
							30	3.14	0.00
							60	3.04	0.24
						White Cotton #5	10	3.39	0.00
							30	3.77	0.29
							60	3.39	0.00
798-124	Assessment of bactericidal effectiveness of treated fabric via direct contact Staphylococcus aureus misting study	9/07/2015	Misting spray test	Cotton fabric	Staphylococcus aureus (ATCC 6538)	White Cotton #1	30	1.07	
							60	1.26	
							120	1.22	
						White Cotton #4	30	1.07	
							60	1.26	
							120	1.22	
						White Cotton #5	30	-0.08	
							60	0.53	
							120	0.38	
798-126	Assessment of virucidal effectiveness of treated fabric via direct contact Influenza A Virus (H1N1) misting study	24/11/2015	Misting spray test	Respirators	H1N1 (Human Influenza A)	FFP2 Respirator (Lot 31001)		4.18	
						FFP2 Respirator (Lot 31005)		3.61	
						FFP2 Respirator (Lot 31009)		3.43	
						FFP2 Respirator (Lot 31016)		3.61	
						FFP2 Respirator (Control fabric)		1.11	

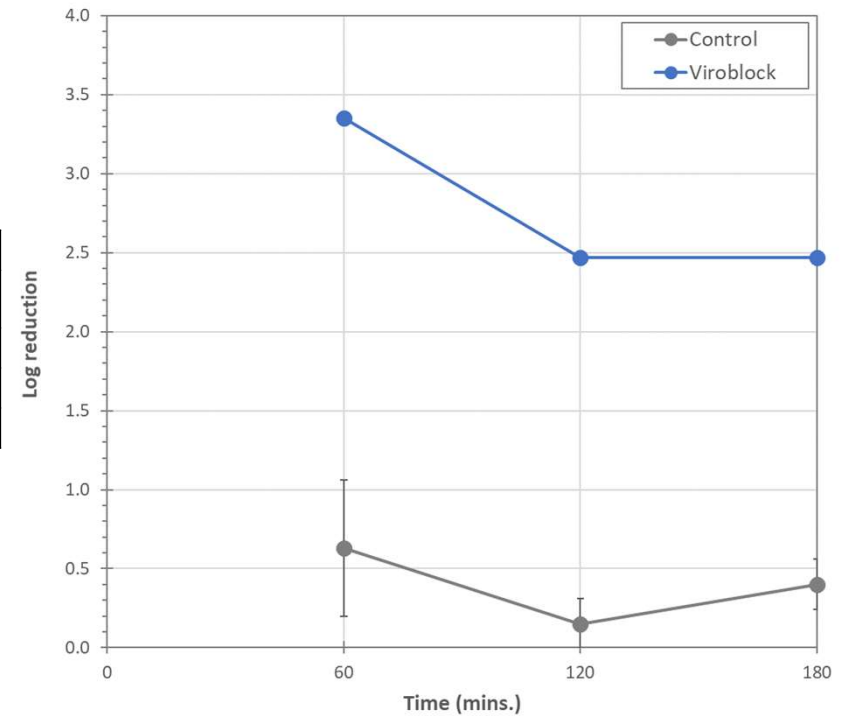


Misting study

- Cotton fabric (Untreated control vs Viroblock treated)
- Exposure to Human influenza A (H1N1)

Study	Agent	Time (mins)	Log reduction		% reduction	
			Control	Viroblock	Control	Viroblock
798-119	H1N1 (Human Influenza A)	60	0.63	3.35	76.5577 %	99.9553 %
		120	0.15	2.47	29.2054 %	99.6612 %
		180	0.40	2.47	60.1893 %	99.6612 %

- Viroblock treated fabric shows dramatically improved reduction in virus infectivity over a 3 hour period



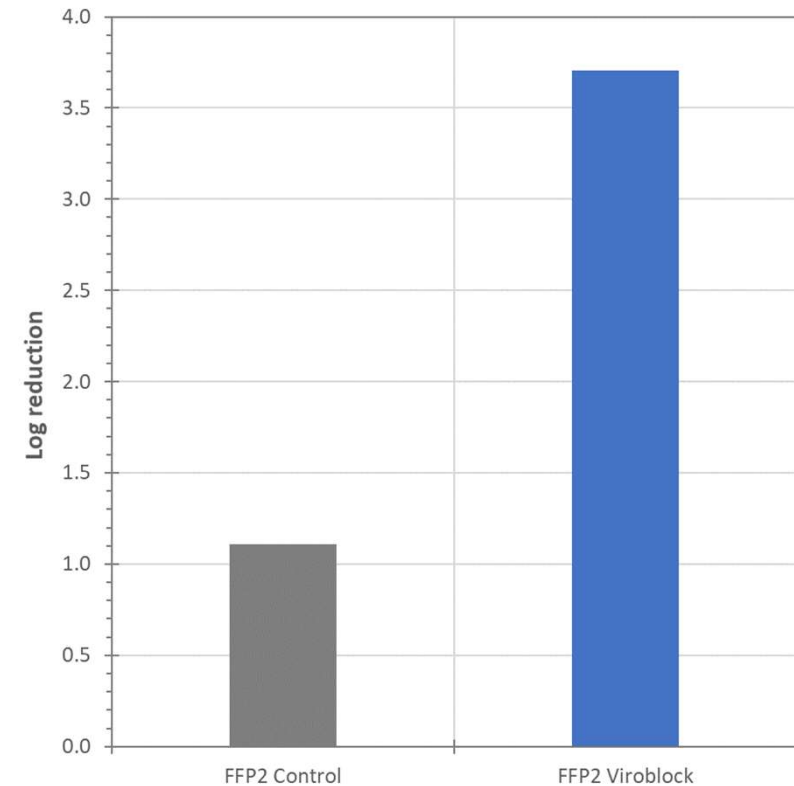


Misting study

- FFP2 face masks (Untreated control vs Viroblock treated)

Study	Agent	Log reduction		% reduction	
		FFP2 Control	FFP2 Viroblock	FFP2 Control	FFP2 Viroblock
798-126	H1N1 (Human Influenza A)	1.11	3.71	92.2375 %	99.9804 %

- Viroblock treated FFP2 mask shows dramatically improved reduction in virus infectivity (mist contact)



3. Antimicrobial testing





a) ISO 20743

Method summary

- The ISO 20743 method ^[1] assesses the antimicrobial efficacy of textile samples
- Apply a defined volume and concentration of the target bacteria strain to textile sample
- Allow inoculum to remain in contact with the sample for a defined time
- Wash or rinse out the bacteria from the sample
- Evaluate the remaining count of recovered bacteria
- The reduction in bacteria count compared to the starting inoculum is calculated as an indicator of effectiveness

[1] ISO 20743:2013, Textiles – Determination of antibacterial activity of textile products, International Organization for Standardization.

ISO 20743



- Testing summary:

Sample	100% polyester (PES) woven & 100% cotton (CO) knit
Treatment	HeiQ Viroblock NPJ03
Handling	Lab treatment (padding) and testing unwashed
Test lab	Microbe Investigations AG (LS20-00326)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P), Klebs. pneumoniae (ATCC 4352)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1	PES woven (20% HeiQ Viroblock NPJ03)	99.9994 %	5.2
2	CO knit (20% HeiQ Viroblock NPJ03)	99.9994 %	5.2

- Results - Klebsiella pneumoniae (ATCC 4352):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1	PES woven (20% HeiQ Viroblock NPJ03)	99.9997 %	5.5
2	CO knit (20% HeiQ Viroblock NPJ03)	99.9997 %	5.5

- Polyester woven and Cotton knit treated with HeiQ Viroblock NPJ03 show excellent antimicrobial activity against *Staph. aureus* and *Klebs. pneumoniae*.

ISO 20743



- Testing summary:

Sample	100% polyester (PES) woven
Treatment	HeiQ Viroblock NPJ03
Handling	Lab treatment (padding) and testing (washed 30x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00493)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
3-5	PES woven (10% HeiQ Viroblock NPJ03) ; 30x wash	99.9503 %	3.3

- Polyester woven treated with HeiQ Viroblock NPJ03 shows excellent antimicrobial activity against *Staph. aureus* after 30x washes at 40°C.**

ISO 20743



- Testing summary:

Sample	100% cotton (CO) knit
Treatment	HeiQ Viroblock NPJ03
Handling	Lab treatment (padding) and testing (washed 30x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00494)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
3-1	CO knit (10% HeiQ Viroblock NPJ03) ; 0x wash	99.9991 %	5.0
3-4	CO knit (10% HeiQ Viroblock NPJ03) ; 20x wash	99.9945 %	4.3
3-5	CO knit (10% HeiQ Viroblock NPJ03) ; 30x wash	99.9113 %	3.1

- Cotton knit treated with HeiQ Viroblock NPJ03 shows excellent antimicrobial activity against *Staph. aureus* after 30x washes at 40°C.

ISO 20743



- Testing summary:

Sample	Non-woven (unspecified composition)
Treatment	HeiQ Viroblock NPJ03
Handling	Pilot treatment. Tested as received
Test lab	Microbe Investigations AG (LS20-00528)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	Non-woven (50g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9989 %	5.0
1-2	Non-woven (80g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9989 %	5.0
1-3	Non-woven (100g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9989 %	5.0
1-4	Non-woven (Untreated reference) ; 0x wash	85.4356 %	0.8

- Non-woven treated with 50 to 100 g/l HeiQ Viroblock NPJ03 shows very good antimicrobial activity against *Staph. aureus*.

ISO 20743



- Testing summary:

Sample	100% polyester (PES) woven
Treatment	HeiQ Viroblock NPJ03
Handling	Lab treatment (padding @5% HeiQ Viroblock NPJ03) Testing (washed 0x, 5x, 20x, 30x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00538)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	PES woven (5% HeiQ Viroblock NPJ03) ; 0x wash	99.9981 %	4.7
1-2	PES woven (5% HeiQ Viroblock NPJ03) ; 5x wash	99.9846 %	3.8
1-3	PES woven (5% HeiQ Viroblock NPJ03) ; 20x wash	99.8188 %	2.7
1-4	PES woven (5% HeiQ Viroblock NPJ03) ; 30x wash	99.4904 %	2.3

- PES woven treated with 5% HeiQ Viroblock NPJ03 shows excellent antimicrobial activity against *Staph. aureus* beyond 5x washes at 40°C and good activity after 20x and 30x washes at 40°C.

ISO 20743



- Testing summary:

Sample	100% polyester (PES) woven
Treatment	HeiQ Viroblock NPJ03
Handling	Lab treatment (padding @7.5% HeiQ Viroblock NPJ03) Testing (washed 0x, 5x, 20x, 30x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00538)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
2-1	PES woven (7.5% HeiQ Viroblock NPJ03) ; 0x wash	99.9981 %	4.7
2-2	PES woven (7.5% HeiQ Viroblock NPJ03) ; 5x wash	99.9981 %	4.7
2-3	PES woven (7.5% HeiQ Viroblock NPJ03) ; 20x wash	99.9729 %	3.6
2-4	PES woven (7.5% HeiQ Viroblock NPJ03) ; 30x wash	99.9503 %	3.3

- PES woven treated with 7.5% HeiQ Viroblock NPJ03 shows excellent antimicrobial activity against *Staph. aureus* beyond 30x washes at 40°C.

ISO 20743



- Testing summary:

Sample	100% cotton (CO) woven
Treatment	HeiQ Viroblock NPJ03
Handling	Pilot treatment (padding) and testing (washed 0x, 5x, 10x 60°C; ISO 6330 6N)
Test lab	Microbe Investigations AG (LS20-00575)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	CO woven (100g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9987 %	4.9
1-2	CO woven (100g/l HeiQ Viroblock NPJ03) ; 5x wash	99.9987 %	4.9
1-3	CO woven (100g/l HeiQ Viroblock NPJ03) ; 10x wash	99.9987 %	4.9

- Cotton woven treated with HeiQ Viroblock NPJ03 shows excellent antimicrobial activity against *Staph. aureus* beyond 10x washes at 60°C.

ISO 20743



- Testing summary:

Sample	100% cotton (CO) knit
Treatment	HeiQ Viroblock NPJ03
Handling	Pilot treatment (padding) and testing (washed 0x, 25x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00618)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	CO knit (200g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9991 %	5.0
1-2	CO knit (200g/l HeiQ Viroblock NPJ03) ; 25x wash	99.9931 %	4.2

- Cotton knit treated with HeiQ Viroblock NPJ03 shows very good antimicrobial activity against *Staph. aureus* beyond 25x washes at 40°C.

ISO 20743



- Testing summary:

Sample	95% cotton (CO) / 5% elastane (EL) knit
Treatment	HeiQ Viroblock NPJ03
Handling	Pilot treatment (padding) and testing (washed 0x, 25x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00619)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	CO/EL knit (200g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9991 %	5.0
1-2	CO/EL knit (200g/l HeiQ Viroblock NPJ03) ; 25x wash	99.9809 %	3.7

- Cotton knit treated with HeiQ Viroblock NPJ03 shows very good antimicrobial activity against *Staph. aureus* beyond 25x washes at 40°C.

ISO 20743



- Testing summary:

Sample	94% cotton (CO) / 6% elastane (EL) knit
Treatment	HeiQ Viroblock NPJ03
Handling	Pilot treatment (padding) and testing (washed 0x, 25x 40°C; ISO 6330 4G)
Test lab	Microbe Investigations AG (LS20-00620)
Test method & strains	ISO 20743; Staph. aureus (ATCC 6538P)

- Results - Staphylococcus aureus (ATCC 6538P):

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	CO/EL knit (200g/l HeiQ Viroblock NPJ03) ; 0x wash	99.9991 %	5.0
1-2	CO/EL knit (200g/l HeiQ Viroblock NPJ03) ; 25x wash	99.9544 %	3.3

- Cotton knit treated with HeiQ Viroblock NPJ03 shows very good antimicrobial activity against *Staph. aureus* beyond 25x washes at 40°C.



b) ASTM E2149

Method summary

- The ASTM E2149 method ^[1] may be used to assess the antimicrobial efficacy of absorbant (e.g. textile) and non-absorbant samples
- Apply a defined volume and concentration of the target bacteria strain to textile sample in a flask
- Allow inoculum to remain in contact with the sample for a defined time (1 hour) under dynamic contact shaking
- Remove an aliquot from the inoculum volume
- Evaluate the remaining count of recovered bacteria
- The reduction in bacteria count compared to the starting inoculum is calculated as an indicator of effectiveness

[1] ASTM E 2149-13a: Standard Test Method for Determining the Antimicrobial Activity of Immobilized Antimicrobial Agents Under Dynamic Contact Conditions”, American Society for Testing Materials (2013)

ASTM E 2149



- Testing summary:

Sample	KN95 mask, outer layer (non-woven)
Treatment	HeiQ Viroblock NPJ03 & HeiQ Barrier WDSL new
Handling	Lab treatment and testing
Test lab	Microbe Investigations AG (LS20-00597)
Test method & strains	ASTM E 2149-13a; Staphylococcus aureus (ATCC 6538P)

- Results:

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1	Untreated	89.9690 %	1.0
2	HeiQ Viroblock NPJ03 70 g/l + HeiQ Barrier WDSL new 35 g/l + HeiQ Operator Clean WFR 15 g/l	99.9974 %	4.6

- KN95 mask outer layer treated with HeiQ Viroblock NPJ03 and HeiQ Barrier WDSL new show excellent antimicrobial activity against *Staph. aureus* according to the ASTM E 2149 test.

ASTM E 2149



- Testing summary:

Sample	100% cotton (CO) woven
Treatment	HeiQ Viroblock NPJ03 & water repellency treatments
Handling	Pilot treatment and testing as received
Test lab	Microbe Investigations AG (LS20-00598)
Test method & strains	ASTM E 2149-13a; Staphylococcus aureus (ATCC 6538P)

- Results:

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1	Viroblock NPJ03 100 g/l + Barrier HM C6 60 g/l	99.8491 %	2.8
2	Viroblock NPJ03 100 g/l + DP19037 100 g/l	99.9563 %	3.4
3	Viroblock NPJ03 (Versuch 1)	99.9957 %	4.4
4	Viroblock NPJ03 (Versuch 2)	99.9284 %	3.1

- Fabric treated with combination of fluorine free water repellent DP19037 and HeiQ Viroblock NPJ03 shows very good antimicrobial activity (ASTM E2149). Fabric treated with combination of Barrier HM-C6 and HeiQ Viroblock NPJ03 shows good antimicrobial activity (ASTM E2149).

ASTM E 2149



- Testing summary:

Sample	Polyamide (PA) / Elastane (EL) mask fabric
Treatment	HeiQ Viroblock NPJ03 & HeiQ Barrier ECO DRY
Handling	Pilot treatment (exhaust) and testing (0x, 10x 30C 3G)
Test lab	Microbe Investigations AG (LS20-00611)
Test method & strains	ASTM E 2149-13a; Staphylococcus aureus (ATCC 6538P)

- Results:

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	10% Viroblock NPJ03 + 8% Barrier ECO DRY; 0x wash	95.2224 %	1.3
1-2	10% Viroblock NPJ03 + 8% Barrier ECO DRY; 10x wash	96.6719 %	1.5

- Treated mask fabric shows medium activity, initially and also after 10 x 40 °C washes.

ASTM E 2149



- Testing summary:

Sample	80% polyester (PES) / 20% elastane (EL) knits
Treatment	HeiQ Viroblock NPJ03 & HeiQ Barrier ECO DRY
Handling	Pilot treatment and testing as received
Test lab	Microbe Investigations AG (LS20-00617)
Test method & strains	ASTM E 2149-13a; Staphylococcus aureus (ATCC 6538P)

- Results:

Sample ID	Treatment	% reduction	Activity value (Log reduction)
1-1	Viroblock NPJ03 100 g/l + Barrier ECO DRY 100 g/l; Dry 130C; 0x washes	99.0523 %	2.0
1-2	Viroblock NPJ03 100 g/l + Barrier ECO DRY 100 g/l; Dry 130C; 10x washes	99.6619 %	2.5
2-1	Viroblock NPJ03 100 g/l + Barrier ECO DRY 100 g/l; Dry 130C + Cure 190C; 0x washes	99.9918 %	4.1
2-2	Viroblock NPJ03 100 g/l + Barrier ECO DRY 100 g/l; Dry 130C + Cure 190C; 10x washes	99.2828 %	2.1

- Fabrics treated with combination of HeiQ Viroblock NPJ03 and HeiQ Barrier ECO DRY show good to very good antimicrobial activity (ASTM E2149).

4. Barrier testing





a) AATCC 22 & AATCC 193

Method summary - AATCC 22: Sprat test

- The AATCC 22 method ^[1] assesses the resistance to surface wetting of textile materials
- 250ml of water is uniformly sprayed on a fabric specimen mounted at an angle of 45°.
- The Spray rating is determined by comparing fabric appearance with descriptive and photographic standards.
- A rating scale from 50 to 100 is used with 100 indicating the highest repellency level

Method summary - AATCC 193: Water/alcohol test

- The AATCC 193 method ^[2] assesses the level of repellency to water/alcohol solutions
- Drops of standard test liquids (water/alcohol solutions with varying surface tensions), are placed on the fabric surface and observed for wetting, wicking and contact angle.
- The aqueous repellency grade is the highest numbered test liquid which does not wet the fabric surface.
- A rating scale from 0 to 8 is used with 8 indicating the highest repellency level

[1] AATCC TM 22-2014, Water Repellency: Spray Test, American Association of Textile Chemists and Colorists (2014).

[2] AATCC TM 193-2012, Test Method for Aqueous Liquid Repellency: Water/Alcohol Solution Resistance, American Association of Textile Chemists and Colorists (2012).

AATCC 22 / AATCC 193



- Testing summary:

Sample	Polyamide (PA) / Elastane (EL) mask fabric
Treatment	HeiQ Viroblock NPJ03 & HeiQ Barrier ECO DRY
Handling	Pilot treatment (exhaust) and testing (0x, 10x 30C 3G)
Test lab	HeiQ Materials AG (LS20-00610)
Test method & strains	AATCC 22 (Spray test) & AATCC 193 (Water-alcohol test)

- Results:

Sample ID	Treatment	AATCC 22 (Spray /100)	AATCC 193 (water-IPA /8)
1-1	10% Viroblock NPJ03 + 8% Barrier ECO DRY; 0x wash	95	4.0
1-2	10% Viroblock NPJ03 + 8% Barrier ECO DRY; 10x wash	90	3.0

- Fabric treated with combination of HeiQ ECO DRY + Viroblock NPJ03 shows good performance at Spray and water/alcohol test.

AATCC 22 / AATCC 193



- Testing summary:

Sample	80% polyester (PES) / 20% elastane (EL) knits
Treatment	HeiQ Viroblock NPJ03 & HeiQ Barrier ECO DRY
Handling	Pilot treatment (padding) and testing (0x, 10x 30C 3G)
Test lab	HeiQ Materials AG (LS20-00616)
Test method & strains	AATCC 22 (Spray test) & AATCC 193 (Water-alcohol test)

- Results:

Sample ID	Treatment	AATCC 22 (Spray /100)	AATCC 193 (water-IPA /8)
1-1	100g/l Viroblock NPJ03 + 100g/l Barrier ECO DRY; Dry 130C; 0x wash	50	1.0
1-2	100g/l Viroblock NPJ03 + 100g/l Barrier ECO DRY; Dry 130C; 10x wash	95	2.5
2-1	100g/l Viroblock NPJ03 + 100g/l Barrier ECO DRY; Dry 130C + Cure 190C; 0x wash	70	1.0
2-2	100g/l Viroblock NPJ03 + 100g/l Barrier ECO DRY; Dry 130C + Cure 190C; 10x wash	90	2.5

- Both treated fabrics show initially poor repellency with improved performance after 10x washes.



5. HeiQ quality testing framework



Quality testing

- HeiQ follows a tiered approach to assess treated sample robustness and functionality:
 - A. Quality Assurance (QA):
 - Testing of prototype and developmental samples to assess fit to design target functionality
 - B. Quality Control (QC):
 - Testing support for ongoing production samples. Check consistency of application.

Testing purpose	Method(s)	Initial & development testing	Ongoing testing support
QC - Confirm treatment applied	Silver analysis (e.g. AAS)	HeiQ	HeiQ / 3 rd party labs
QA - Antimicrobial functionality	ISO 20743, ASTM E2149	MIS	MIS / 3 rd party labs
QA - Antiviral functionality	ISO 18184	3 rd party labs	3 rd party labs



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