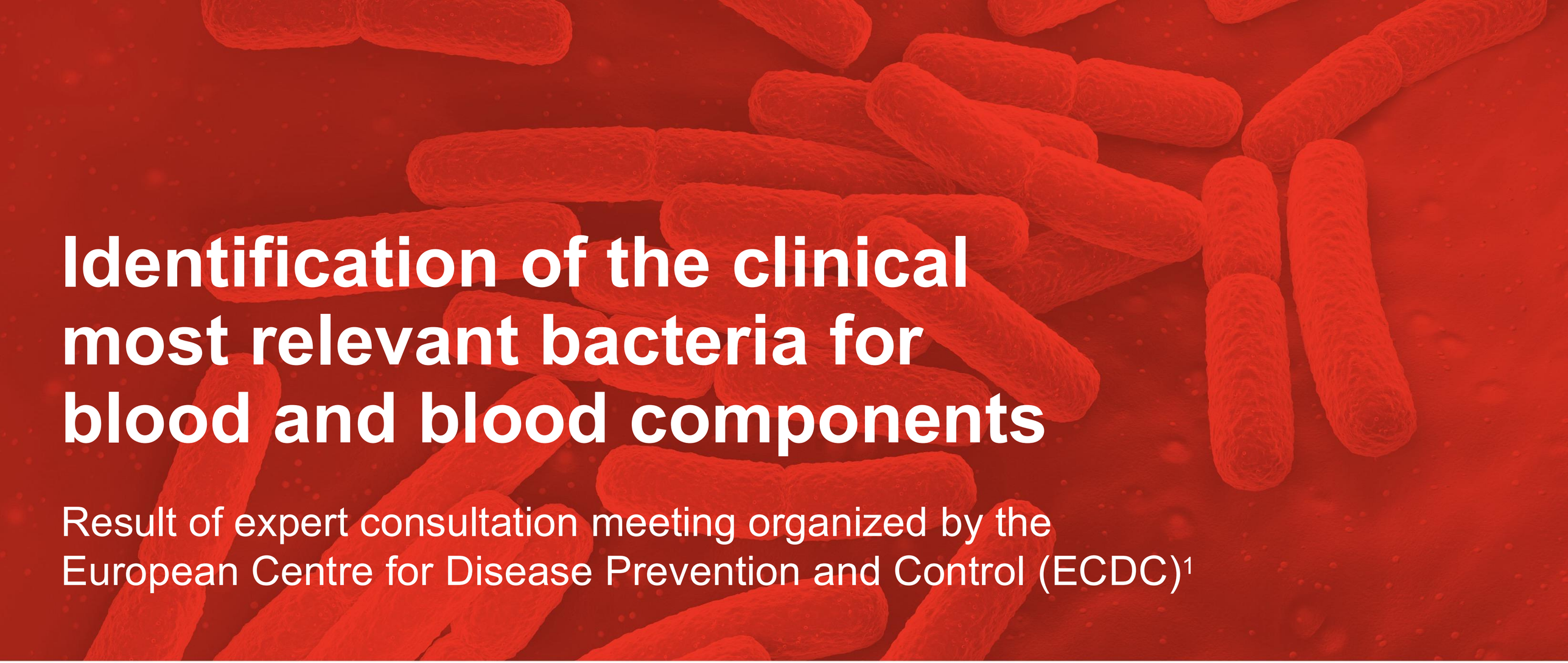


Identification of the clinical most relevant bacteria for blood and blood components

Result of expert consultation meeting organized by the European Centre for Disease Prevention and Control (ECDC)[1]

cerus

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

MKT-EN 000431, v2.0

Literature review[1]

Step 1

List of confirmed and probable transmissions of bacterial infections from published reviews and original research in the English language

40 bacteria

Responsible for:

213
transmissions

46
fatalities

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Expert review[1]

Step 2

Selecting most frequently transmitted bacteria for ranking exercise

40 bacteria

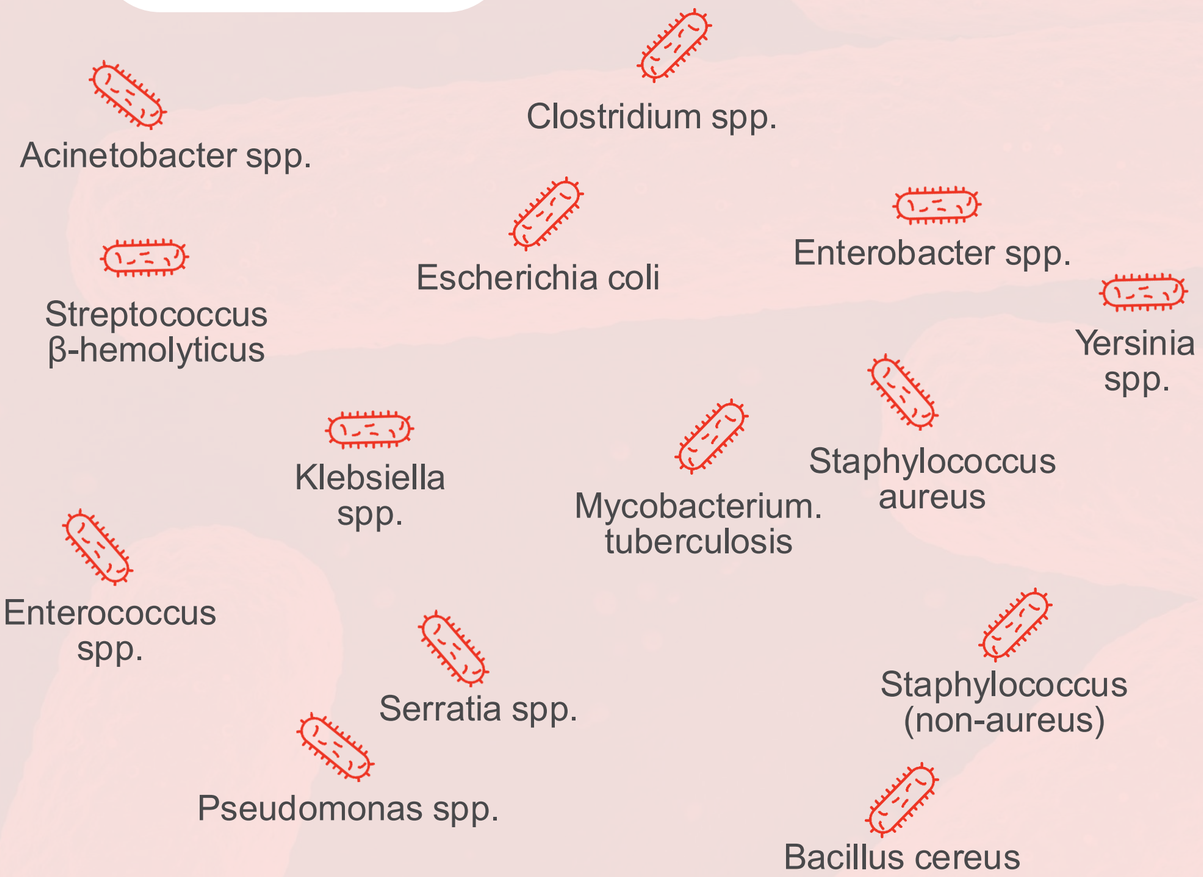
1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Expert review[1]

Step 2

Selecting most frequently transmitted bacteria for ranking exercise

14 bacteria



Responsible for:

84% transmissions

93% fatalities

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Expert review[1]

Step 3 Prioritization of clinically most relevant bacteria

RISK OF TRANSMISSION: reflects an overall prevalence of bacterial transmissions through substances of human origin (SoHO) in the EU adjusted for a given bacteria by a frequency of reported cases of transmission or contamination and survival during processing and storage.

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Expert review[1]

Step 3 Prioritization of clinically most relevant bacteria

RISK OF TRANSMISSION: reflects an overall prevalence of bacterial transmissions through substances of human origin (SoHO) in the EU adjusted for a given bacteria by a frequency of reported cases of transmission or contamination and survival during processing and storage.

SEVERITY OF DISEASE: reflects virulence, toxins production by multiplying during a storage, and survival of a given bacteria after transmission. Health consequences, expressed in disability-adjusted life-year (DALYs) per case, are assessed according to the loss of life, permanent disability, and seriousness of illness.

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Expert review[1]

Step 3 Prioritization of clinically most relevant bacteria

RISK OF TRANSMISSION: reflects an overall prevalence of bacterial transmissions through substances of human origin (SoHO) in the EU adjusted for a given bacteria by a frequency of reported cases of transmission or contamination and survival during processing and storage.

SEVERITY OF DISEASE: reflects virulence, toxins production by multiplying during a storage, and survival of a given bacteria after transmission. Health consequences, expressed in disability-adjusted life-year (DALYs) per case, are assessed according to the loss of life, permanent disability, and seriousness of illness.

ANTIMICROBIAL RESISTANCE: reflects a probability that a given bacteria is resistant to antimicrobials that is assessed from reported prevalence in the EU, resistance to single or multiple antimicrobials, and trend in the past 4 years developing resistance.

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Expert review[1]

Step 3 Prioritization of clinically most relevant bacteria

Scoring Criteria

RISK OF TRANSMISSION: reflects an overall prevalence of bacterial transmissions through substances of human origin (SoHO) in the EU adjusted for a given bacteria by a frequency of reported cases of transmission or contamination and survival during processing and storage.

- >0,1 %
- 0,01 %-0,001 %
- 0,1 %-0,01 %
- <0,001 %

SEVERITY OF DISEASE: reflects virulence, toxins production by multiplying during a storage, and survival of a given bacteria after transmission. Health consequences, expressed in disability-adjusted life-year (DALYs) per case, are assessed according to the loss of life, permanent disability, and seriousness of illness.

- >10 DALY
- 0,1 - 1 DALY
- 1 - 10 DALY
- <0,1 DALY

ANTIMICROBIAL RESISTANCE: reflects a probability that a given bacteria is resistant to antimicrobials that is assessed from reported prevalence in the EU, resistance to single or multiple antimicrobials, and trend in the past 4 years developing resistance.

- > 99 %
- 1 - 10 %
- 10 - 99 %
- < 1 %

THREAT EVOLUTION: reflects a probability expressed in the percentage that the magnitude of the threat posed by a given pathogen doubles in the next 5 years.

- > 99 %
- 1 - 10 %
- 10 - 99 %
- < 1 %

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Very high | Moderately high | Moderately low | Very low

Expert review[1]

Step 3 Prioritization of clinically most relevant bacteria

Scoring Criteria

RISK OF TRANSMISSION: reflects an overall prevalence of bacterial transmissions through substances of human origin (SoHO) in the EU adjusted for a given bacteria by a frequency of reported cases of transmission or contamination and survival during processing and storage.

- >0,1 %
- 0,01 %-0,001 %
- 0,1 %-0,01 %
- <0,001 %

Weight score **90%**

SEVERITY OF DISEASE: reflects virulence, toxins production by multiplying during a storage, and survival of a given bacteria after transmission. Health consequences, expressed in disability-adjusted life-year (DALYs) per case, are assessed according to the loss of life, permanent disability, and seriousness of illness.

- >10 DALY
- 0,1 - 1 DALY
- 1 - 10 DALY
- <0,1 DALY

ANTIMICROBIAL RESISTANCE: reflects a probability that a given bacteria is resistant to antimicrobials that is assessed from reported prevalence in the EU, resistance to single or multiple antimicrobials, and trend in the past 4 years developing resistance.

- > 99 %
- 1 - 10 %
- 10 - 99 %
- < 1 %

Weight score **10%**

THREAT EVOLUTION: reflects a probability expressed in the percentage that the magnitude of the threat posed by a given pathogen doubles in the next 5 years.

- > 99 %
- 1 - 10 %
- 10 - 99 %
- < 1 %

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Very high | Moderately high | Moderately low | Very low

Final result[1]

Step 4 Final result ranking exercise

Priority	Ranking	Pathogen	Probability of transmission	Severity of disease	Antimicrobial resistance	Threat evolution

Very high Moderately high Moderately low Very low

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Final result[1]

Step 4 Final result ranking exercise

Priority	Ranking	Pathogen	Probability of transmission	Severity of disease	Antimicrobial resistance	Threat evolution
Tier 1	1	*Staphylococcus aureus*	Moderately high	Very high	Moderately high	Moderately high
	2	*Streptococcus b-hemolyticus*	Moderately high	Very high	Very low	Very low

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Very high · Moderately high · Moderately low · Very low

Final result[1]

Step 4 Final result ranking exercise

Priority	Ranking	Pathogen	Probability of transmission	Severity of disease	Antimicrobial resistance	Threat evolution
Tier 1	1	*Staphylococcus aureus*	Moderately high	Very high	Moderately high	Moderately high
	2	*Streptococcus b-hemolyticus*	Moderately high	Very high	Very low	Very low
Tier 2	3	*Klebsiella spp.*	Moderately high	Moderately high	Moderately high	Very high
	4	*Escherichia coli*	Moderately high	Moderately high	Moderately high	Moderately high
	5	*Pseudomonas spp.*	Moderately high	Moderately high	Moderately high	Moderately high
	6	*Enterobacter spp.*	Moderately high	Moderately high	Moderately low	Moderately low
	7	*Yersinia enterocolitica*	Moderately high	Moderately high	Very low	Very low

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Very high · Moderately high · Moderately low · Very low

Final result[1]

Step 4 Final result ranking exercise

Priority	Ranking	Pathogen	Probability of transmission	Severity of disease	Antimicrobial resistance	Threat evolution
Tier 1	1	*Staphylococcus aureus*	Moderately high	Very high	Moderately high	Moderately high
	2	*Streptococcus b-hemolyticus*	Moderately high	Very high	Very low	Very low
Tier 2	3	*Klebsiella spp.*	Moderately high	Moderately high	Moderately high	Very high
	4	*Escherichia coli*	Moderately high	Moderately high	Moderately high	Moderately high
	5	*Pseudomonas spp.*	Moderately high	Moderately high	Moderately high	Moderately high
	6	*Enterobacter spp.*	Moderately high	Moderately high	Moderately low	Moderately low
	7	*Yersinia enterocolitica*	Moderately high	Moderately high	Very low	Very low
Tier 3	8	*Acinetobacter spp.*	Moderately low	Moderately high	Moderately high	Moderately high
	9	*Staphylococcus (non-aureus)*	Moderately high	Moderately low	Moderately high	Moderately high
	10	*Serratia spp.*	Moderately low	Moderately high	Moderately low	Moderately low
	11	*Clostridium spp.*	Moderately low	Moderately high	Very low	Very low

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Very high · Moderately high · Moderately low · Very low

Final result[1]

Step 4 Final result ranking exercise

Priority	Ranking	Pathogen	Probability of transmission	Severity of disease	Antimicrobial resistance	Threat evolution
Tier 1	1	*Staphylococcus aureus*	Moderately high	Very high	Moderately high	Moderately high
	2	*Streptococcus b-hemolyticus*	Moderately high	Very high	Very low	Very low
Tier 2	3	*Klebsiella spp.*	Moderately high	Moderately high	Moderately high	Very high
	4	*Escherichia coli*	Moderately high	Moderately high	Moderately high	Moderately high
	5	*Pseudomonas spp.*	Moderately high	Moderately high	Moderately high	Moderately high
	6	*Enterobacter spp.*	Moderately high	Moderately high	Moderately low	Moderately low
	7	*Yersinia enterocolitica*	Moderately high	Moderately high	Very low	Very low
Tier 3	8	*Acinetobacter spp.*	Moderately low	Moderately high	Moderately high	Moderately high
	9	*Staphylococcus (non-aureus)*	Moderately high	Moderately low	Moderately high	Moderately high
	10	*Serratia spp.*	Moderately low	Moderately high	Moderately low	Moderately low
	11	*Clostridium spp.*	Moderately low	Moderately high	Very low	Very low
Tier 4	12	*Enterococcus spp.*	Moderately low	Moderately low	Moderately high	Moderately high
	13	*M. tuberculosis*	Very low	Moderately high	Moderately low	Moderately high
	14	*Bacillus spp.*	Moderately high	Very low	Very low	Very low

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

Very high · Moderately high · Moderately low · Very low

Final result[1]

Step 4 Final result ranking exercise

Priority	Ranking	Pathogen	Probability of transmission	Severity of disease	Antimicrobial resistance	Threat evolution
Tier 1	1	*Staphylococcus aureus*	Moderately high	Very high	Moderately high	Moderately high
	2	*Streptococcus b-hemolyticus*	Moderately high	Very high	Very low	Very low
Tier 2	3	*Klebsiella spp.*	Moderately high	Moderately high	Moderately high	Very high
	4	*Escherichia coli*	Moderately high	Moderately high	Moderately high	Moderately high
	5	*Pseudomonas spp.*	Moderately high	Moderately high	Moderately high	Moderately high
	6	*Enterobacter spp.*	Moderately high	Moderately high	Moderately low	Moderately low
	7	*Yersinia enterocolitica*	Moderately high	Moderately high	Very low	Very low
Tier 3	8	*Acinetobacter spp.*	Moderately low	Moderately high	Moderately high	Moderately high
	9	*Staphylococcus (non-aureus)*	Moderately high	Moderately low	Moderately high	Moderately high
	10	*Serratia spp.*	Moderately low	Moderately high	Moderately low	Moderately low
	11	*Clostridium spp.*	Moderately low	Moderately high	Very low	Very low
Tier 4	12	*Enterococcus spp.*	Moderately low	Moderately low	Moderately high	Moderately high
	13	*M. tuberculosis*	Very low	Moderately high	Moderately low	Moderately high
	14	*Bacillus spp.*	Moderately high	Very low	Very low	Very low

ecdc

“Bacteria ranked in tiers 1 and 2 represent a substantial threat to the safety of blood and blood components.”[1]

Very high · Moderately high · Moderately low · Very low

1. Prioritizing of bacterial infections transmitted through substances of human origin in Europe, D. Domanovic et all, TRANSFUSION 2017;57;1311–1317

INTERCEPT™ Blood System provides robust pathogen inactivation for the clinically most relevant bacteria

ECDC

Published pathogen inactivation data[2]

Priority	Ranking	Organism	System	PI Data	N° studies[3]	Extend of inactivation (log reduction)									
						1	2	3	4	5	6	7	8	9	10
Tier 1	1	*Staphylococcus aureus*													
	2	*Streptococcus pyogenes*													
Tier 2	3	*Klebsiella pneumoniae*													
	4	*Escherichia Coli*													
	5	*Pseudomonas aeruginosa*													
	6	*Enterobacter cloacae*													
	7	*Yersinia enterocolitica*													
Total number of peer reviewed publications									**> 4 log**						

1. Mirasol® Pathogen Reduction Technology (PRT) System
2. Peer reviewed publications only, no abstracts
3. References peer reviewed publication, see slide 22

INTERCEPT™ Blood System provides robust pathogen inactivation for the clinically most relevant bacteria

ECDC

Published pathogen inactivation data[2]

Priority	Ranking	Organism	System	PI Data	N° studies[3]	Extend of inactivation (log reduction)
Tier 1	1	*Staphylococcus aureus*	INTERCEPT	✓	4	>5 6,1 6,6 >10
	2	*Streptococcus pyogenes*	INTERCEPT	✓	2	>5 >6,8
Tier 2	3	*Klebsiella pneumoniae*	INTERCEPT	✓	2	>5,6 >6
	4	*Escherichia Coli*	INTERCEPT	✓	3	>6,2 >6,4 >9
	5	*Pseudomonas aeruginosa*	INTERCEPT	✓	1	4,5
	6	*Enterobacter cloacae*	INTERCEPT	✓	1	5,9
	7	*Yersinia enterocolitica*	INTERCEPT	✓	2	>5 >5,9
Total number of peer reviewed publications			INTERCEPT		15	**> 4 log**

1 2 3 4 5 6 7 8 9 10

1. Mirasol® Pathogen Reduction Technology (PRT) System
2. Peer reviewed publications only, no abstracts
3. References peer reviewed publication, see slide 22

INTERCEPT™ Blood System provides robust pathogen inactivation for the clinically most relevant bacteria

ECDC

Published pathogen inactivation data[2]

Priority	Ranking	Organism	System	PI Data	N° studies[3]	Extend of inactivation (log reduction)
Tier 1	1	*Staphylococcus aureus*	INTERCEPT	✓	4	>5 6,1 6,6 >10
	2	*Streptococcus pyogenes*	INTERCEPT	✓	2	>5 >6,8
Tier 2	3	*Klebsiella pneumoniae*	INTERCEPT	✓	2	>5,6 >6
	4	*Escherichia Coli*	INTERCEPT	✓	3	>6,2 >6,4 >9
	5	*Pseudomonas aeruginosa*	INTERCEPT	✓	1	4,5
	6	*Enterobacter cloacae*	INTERCEPT	✓	1	5,9
			MIRASOL[1]	x	0	No peer reviewed data published
	7	*Yersinia enterocolitica*	INTERCEPT	✓	2	>5 >5,9
Total number of peer reviewed publications			INTERCEPT		15	**> 4 log**

1 2 3 4 5 6 7 8 9 10

1. Mirasol® Pathogen Reduction Technology (PRT) System
2. Peer reviewed publications only, no abstracts
3. References peer reviewed publication, see slide 22

INTERCEPT™ Blood System provides robust pathogen inactivation for the clinically most relevant bacteria

ECDC

Published pathogen inactivation data[2]

Priority	Ranking	Organism	System	PI Data	N° studies[3]	Extend of inactivation (log reduction)
Tier 1	1	*Staphylococcus aureus*	INTERCEPT	✓	4	>5 6,1 6,6 >10
	2	*Streptococcus pyogenes*	INTERCEPT	✓	2	>5 >6,8
Tier 2	3	*Klebsiella pneumoniae*	INTERCEPT	✓	2	>5,6 >6
			MIRASOL[1]	✓	2	2,7 2,8
	4	*Escherichia Coli*	INTERCEPT	✓	3	>6,2 >6,4 >9
	5	*Pseudomonas aeruginosa*	INTERCEPT	✓	1	4,5
	6	*Enterobacter cloacae*	INTERCEPT	✓	1	5,9
			MIRASOL[1]	x	0	No peer reviewed data published
	7	*Yersinia enterocolitica*	INTERCEPT	✓	2	>5 >5,9
			MIRASOL[1]	✓	1	3,3
Total number of peer reviewed publications			INTERCEPT		15	**> 4 log**

1 2 3 4 5 6 7 8 9 10

1. Mirasol® Pathogen Reduction Technology (PRT) System
2. Peer reviewed publications only, no abstracts
3. References peer reviewed publication, see slide 22

INTERCEPT™ Blood System provides robust pathogen inactivation for the clinically most relevant bacteria

ECDC

Published pathogen inactivation data[2]

Priority	Ranking	Organism	System	PI Data	N° studies[3]	Extend of inactivation (log reduction)
Tier 1	1	*Staphylococcus aureus*	INTERCEPT	✓	4	>5 6,1 6,6 >10
			MIRASOL[1]	✓	2	4,26 4,8
	2	*Streptococcus pyogenes*	INTERCEPT	✓	2	>5 >6,8
			MIRASOL[1]	✓	2	2,6 >6
Tier 2	3	*Klebsiella pneumoniae*	INTERCEPT	✓	2	>5,6 >6
			MIRASOL[1]	✓	2	2,7 2,8
	4	*Escherichia Coli*	INTERCEPT	✓	3	>6,2 >6,4 >9
			MIRASOL[1]	✓	4	>4,4 5,4 >5,45 >6
	5	*Pseudomonas aeruginosa*	INTERCEPT	✓	1	4,5
			MIRASOL[1]	✓	1	4,7
	6	*Enterobacter cloacae*	INTERCEPT	✓	1	5,9
			MIRASOL[1]	x	0	No peer reviewed data published
	7	*Yersinia enterocolitica*	INTERCEPT	✓	2	>5 >5,9
			MIRASOL[1]	✓	1	3,3
Total number of peer reviewed publications			INTERCEPT		15	
			MIRASOL[1]		12	

1 2 3 4 5 6 7 8 9 10

> 4 log

1. Mirasol® Pathogen Reduction Technology (PRT) System
2. Peer reviewed publications only, no abstracts
3. References peer reviewed publication, see slide 22

INTERCEPT™ Blood System provides robust pathogen inactivation for the clinically most relevant bacteria

ECDC

Published pathogen inactivation data[2]

Priority	Ranking	Organism	System	PI Data	N° studies[3]	Extend of inactivation (log reduction)
Tier 1	1	*Staphylococcus aureus*	INTERCEPT	✓	4	>5 6,1 6,6 >10
			MIRASOL[1]	✓	2	4,26 4,8
	2	*Streptococcus pyogenes*	INTERCEPT	✓	2	>5 >6,8
			MIRASOL[1]	✓	2	2,6 >6
Tier 2	3	*Klebsiella pneumoniae*	INTERCEPT	✓	2	>5,6 >6
			MIRASOL[1]	✓	2	2,7 2,8
	4	*Escherichia Coli*	INTERCEPT	✓	3	>6,2 >6,4 >9
			MIRASOL[1]	✓	4	>4,4 5,4 >5,45 >6
	5	*Pseudomonas aeruginosa*	INTERCEPT	✓	1	4,5
			MIRASOL[1]	✓	1	4,7
	6	*Enterobacter cloacae*	INTERCEPT	✓	1	5,9
			MIRASOL[1]	x	0	No peer reviewed data published
	7	*Yersinia enterocolitica*	INTERCEPT	✓	2	>5 >5,9
			MIRASOL[1]	✓	1	3,3
Total number of peer reviewed publications			INTERCEPT		15	
			MIRASOL[1]		12	

1 2 3 4 5 6 7 8 9 10

> 4 log

1. Mirasol® Pathogen Reduction Technology (PRT) System
2. Peer reviewed publications only, no abstracts
3. References peer reviewed publication, see slide 22

Mirasol: For ~43 % of the clinically most relevant bacteria the extent of inactivation is “< 4 log” or “no peer reviewed data” have been published


Would you like to know more?
Ask access to the
INACTIVATION APP
contact@cerus.com

Pathogen inactivation data - References peer reviewed publication

Priority	Ranking	Organism	INTERCEPT		Mirasol[1]	
			Reference	Extent of inactivation (log reduction)	Reference	Extent of inactivation (log reduction)
Tier 1	1	*Staphylococcus aureus*	Schmidt M et al., Transfusion, 2015	>5	Kwon SY et al., Vox Sanguinis, 2014	4,26
			Nath Makroo et al., Asian Journal of Transfusion Science, 2018	>6,1	Keil SD et al., J. Vis. Exp., 2015	4,8
			Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	6,6		
			Kwon SY et al., Vox Sanguinis, 2014	>10		
	2	*Streptococcus pyogenes*	Schmidt M et al., Transfusion, 2015	>5	Keil SD et al., J. Vis. Exp., 2015	2,6
			Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	>6,8	Bello-López et al., Transfusion Clinique et Biologique, 2018	>6
Tier 2	3	*Klebsiella pneumoniae*	Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	>5,6	Bello-López et al., Transfusion Clinique et Biologique, 2018	2,7
			Schmidt M et al., Transfusion, 2015	>6	Keil SD et al., J. Vis. Exp., 2015	2,8
	4	*Escherichia Coli*	Nath Makroo et al., Asian Journal of Transfusion Science, 2018	>6,2	Ruane HP et al., Transfusion, 2004	>4,4
			Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	>6,4	Keil SD et al., J. Vis. Exp., 2015	>5,4
			Kwon SY et al., Vox Sanguinis, 2014	>9	Kwon SY et al., Vox Sanguinis, 2014	5,45
					Bello-López et al., Transfusion Clinique et Biologique, 2018	>6
	5	*Pseudomonas aeruginosa*	Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	4,5	Keil SD et al., J. Vis. Exp., 2015	4,7
	6	*Enterobacter cloacae*	Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	5,9	**No peer reviewed data published**	
	7	*Yersinia enterocilityca*	Schmidt M et al., Transfusion, 2015	>5	Keil SD et al., J. Vis. Exp., 2015	3,3
			Irsch J et al., Transfusion Medicine and Hemotherapy, 2011	>5,9		

1. Mirasol® Pathogen Reduction Technology (PRT) System


cerus