Device-Related Infection Prevention Practices – DRIPP

Improvement Collaborative

Spreading best practice, reducing infections, improving outcomes for patients with urinary catheters and intravascular devices

Vascular Access Device Associated Bacteraemia Surveillance

‘How to’ Guide

Contents

Vascular Access Device (VAD) bacteraemia surveillance guidance notes

VAD bacteraemia surveillance is an evidence-based strategy in the reduction of VAD-related bacteraemias[1]. As such it is key to promoting patient safety when vascular access is necessary for treatment administraton.

This document provides a standardised approach to the identification and reporting of VAD bacteraemia data. It has been developed for flexible use depending on the resources available, with the intention of enabling patient care improvement by individual teams or departments, or by benchmarking between organisations for similar specialities. The point is to start somewhere.

Please follow the steps below to enable completion.

NB: IF ALL DATA IS NOT AVAILABLE, START USING THE DOCUMENT AND AIM TO INCREASE COMPLETION AS YOU ARE ABLE.

Step 1. – You **can collect data for any VAD** as identified in the device definitions in appendix 1. Ensure the correct device is recorded as it will be difficult to cross compare if you do not have this information.

Step 2. – **Use the bacteraemia identification tool** on page 5 to work out

a) if it is a bloodstream infection
b) to clarify if it is VAD-related.

Step 3. – **Enter the number of VAD bacteraemias into a reporting document** (see reporting template appendix 2) on a monthly or quarterly basis depending on what you are able to achieve. If you can only collect data for a specific department then start with that initially. If you need to add more tables then do so.

Step 4. (depending on local preference/ability). The simplest way in which to display improvement for staff is via the **days since the last VAD-related bacteraemia;** this is especially useful to display in clinical areas. The report template *(appendix 2)* includes this for use as needed. This will be a snapshot from the date of the report.

Step 5 (depending on local preference/ability). Bacteraemias can be identified **per 1000 bed days** which should be available from the Trust Informatics Department. This will lead to easier comparison with other organisations as you will be comparing with organisations of similar size. Remember, if you are only recording data for one department the bed days should only be referred to for that department, not for the whole Trust.

To identify the number of VAD-related bacteraemias per 1000 bed days use the following calculation:

$$\frac{\text{Number of VAD infections}}{\text{Number of inpatient days}} \times 1000 = \text{VAD-related rate per 1000 inpatient bed days}$$

Step 6 (optional). Bacteraemias can also be identified per **1000 VAD days.** This method is the gold standard for standardised reporting, and is dependent on the comprehensive recording of the date of every VAD insertion and removal. This enables calculation of the total number of indwelling VAD days.

This data can be collected via paper documents, which is labour intensive but possible, or electronic databases where available. The need for data entry on insertion and removal by a large number of staff can be difficult to achieve, and also requires the ability to extract the indwelling VAD day numbers from it. This may well require support from data analysts or IT.

To identify the number of VAD-related bacteraemias per 1000 VAD days do the following calculation:

$$\frac{\text{Number of VAD infections}}{\text{Number of VAD days}} \times 1000 = \text{VAD-related infection rate per 1000 VAD days}$$

Step 7. Reporting. You can use whatever report format you wish. The attached template, however, would enable easy cross comparison between areas/organisations. You may well need assistance from IT or a data analyst, but if this is not available you can use a simple Excel document to create your graphs. The section under each graph enables you to record any comments you may have regarding individual bacteraemias and potential causes.

Enter the data you have collected on a monthly or at a minimum quarterly basis depending on what you are able to achieve, adding more data if and when you are able. Don't be too overambitious at the start as this will prove very difficult to maintain. It is better to start small, this will enable the process to become embedded, which will facilitate expansion.

Step 8. (Optional) Comparison/benchmarking between areas/organisations. This will enable you to identify how you are performing compared with another department or similar speciality in another organisation. Having this information may help you to find out where care in your organisation can be improved, or how you can help other areas by sharing practice. This will be beneficial for patients, and healthcare staff, by improving communication and support between clinical teams, and invariably benefit the organisation and wider community.

GOOD LUCK AND DON'T GIVE UP!!!

IDENTIFYING A VAD BACTERAEMIA*– Follow steps A & B

STEP A – Has the patient met the criteria for a blood stream infection?

Criteria for case definitions for bloodstream infections in adults and paediatrics (>13yrs)

Must meet ONE of the following criteria:		
1.	Has a recognised pathogen been identified from at least one blood culture?	Y/N
	OR	
2.	Has a common skin microorganism* been identified from 2 blood cultures drawn on separate occasions and taken within a 48hr period? **AND** Does the patient have at least ONE symptom of fever >38°C, chills or hypotension?	Y/N

*Coagulase-negative staphylococci, Micrococcus sp., Propionibacterium acnes, Bacillus sp., Corynebacterium sp. etc.

STEP B – Has the bacteraemia met the criteria for a catheter-associated BSI (CABSI) or catheter-related BSI (CRBSI)? Please see Appendix 1 for a list of vascular access device definitions.

Criteria for defining CABSI – i.e. the VAD is the most probable source of bacteraemia

Must meet ALL of the following criteria:		
1.	Have one of the criteria for bloodstream infection (above) been identified?	Y/N
2.	Was there at least one VAD in situ at the time of the positive blood culture or was the VAD removed within 48 hrs before positive blood cultures?	Y/N
3.	Was the VAD the most likely source of infection (i.e. there was no other source of infection, e.g. wound / urinary / respiratory)?	Y/N

Criteria for defining CRBSI – i.e. the line is the definite source of bacteraemia

Must meet ALL of the following criteria:		
1.	Does the patient fit one of the criteria for bloodstream infection (above)?	Y/N
2.	Was there at least one VAD in situ at the time of the positive blood culture **or** was a VAD removed within 48 hrs before positive blood cultures?	Y/N
3.	Was **at least one** of the following in existence where the same culture was identified? I) quantitative VAD culture 103 CFU/ml or semi-quantitative VAD culture >15 CFU (**e.g. from a line tip**) II) quantitative blood culture ratio VAD blood sample/peripheral blood sample >5 III) differential delay of positivity of blood cultures: VAD blood sample culture positive 2 hours or more before peripheral blood culture (blood samples drawn at the same time) IV) positive culture with the same micro-organism from **pus from insertion site** V) **symptoms improve within 48hr of removal of VAD**	Y/N Y/N Y/N Y/N Y/N

Adapted from Surveillance of Blood Stream Infections in Patients Attending ICUs in England Protocol version 3.4 Infection in Critical Care Quality Improvement Programme, Public Health England, August 2018

References

1. Surveillance of Blood Stream Infections in Patients Attending ICUs in England Protocol version 3.4 Infection in Critical Care Quality Improvement Programme, Public Health England, August 2018 https://www.ficm.ac.uk/sites/default/files/protocol_v3.4_07082018.pdf

2. Schults et al (2020) International recommendations for a vascular access minimum data set: A Delphi consensus-building study. BMJ Quality & Safety. 2020;**0**:1–9. doi:10.1136/bmjqs-2020-011274

Appendix 1.

Vascular access device (VAD) definitions[2]

Peripheral intravenous cannula (PIVC): A catheter which terminates in the peripheral veins. PIVCs are often inserted in the veins of upper extremities or alternative locations.

Midline catheter (ML): A catheter intended for short to intermediate term use, inserted into a peripheral vein in the upper arm via the basilic, cephalic, or brachial vein. The catheter tip terminates in a large peripheral vein distal to the axilla, outside the thoracic cavity.

Peripherally inserted catheter (PICC): A peripherally inserted central catheter is a device (central venous catheter) that is placed in the peripheral veins and whose tip terminates in the veins of the central circulation (e.g. cavoatrial junction).

Non-tunnelled Central Venous Catheter (nt-CVC): A nt-CVC is a device (central venous catheter) that is directly inserted in the central veins whose tip terminates in the veins of the central circulation (e.g. cavoatrial junction).

Tunnelled Central Venous Catheter (t-CVC): A t-CVC is a device (central venous catheter) that is placed such that the skin entry site and the vein entry site are separated by a subcutaneous space (e.g., tunnel). The tip of the catheter terminates in the central veins of the circulation (e.g. cavoatrial junction). The catheter may or may not have a tissue ingrowth cuff.

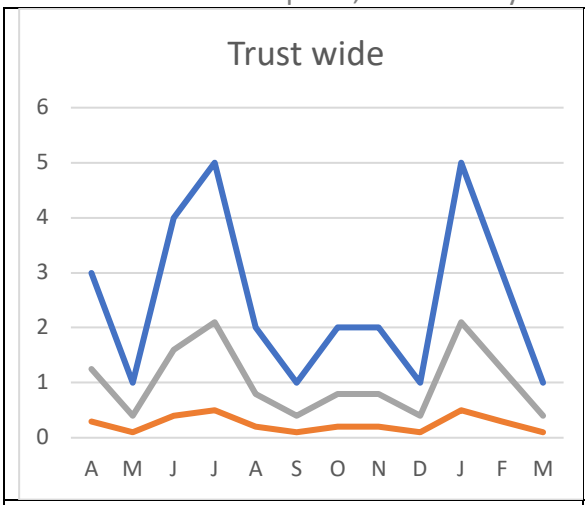
Totally implanted venous access device: A TIVAD (or Ti-CVC) is a device (central venous catheter) that has a septum/chamber/reservoir [that requires percutaneous/needle access] and is implanted in a subcutaneous tissue/pocket attached to a catheter whose tip terminates in the central veins of the circulation (e.g. cavoatrial junction), also referred to as a port, portacath or implanted port.

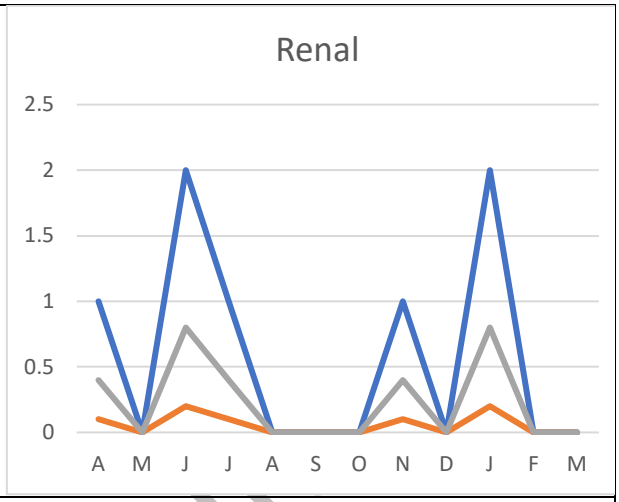
Haemodialysis catheter (HDC): A HDC is a device (central venous catheter) designed to allow high flow rates to permit hemodialysis or apheresis. The catheter tip may be staggered or have a splitter tip to prevent blood mixing at the inflow and outflow portions. The catheter may be non-tunneled or tunneled, with or without a tissue ingrowth cuff.

Appendix 2

Example of a Vascular Access Device (VAD) Bacteraemia Report - XXXXXXX Trust
Date - XX March 2021

Graph Key = -- Number of VAD line bacteraemias, -- VAD bacteremias per 1,000 line days
--- VAD bacteremias per 1,000 bed days





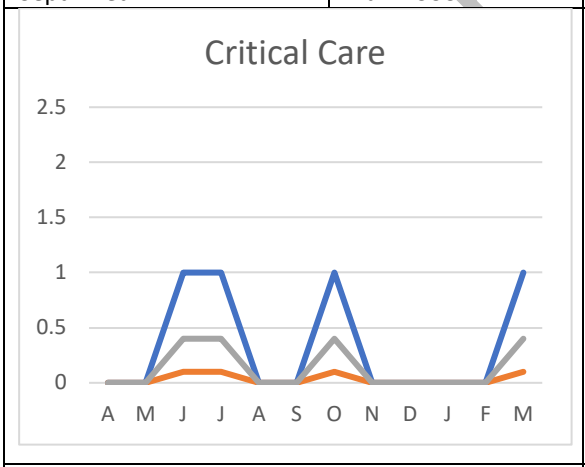
Days since last bacteraemia =

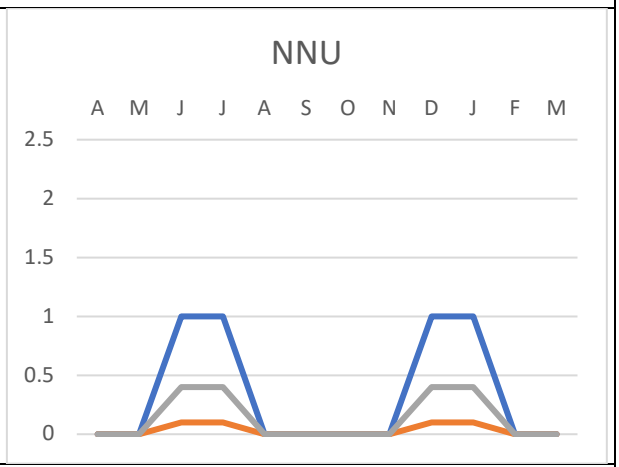
Attributions

Apr – Ren, H/Onc,Med	Oct – CCU, H/Onc
May - Surg	Nov – Ren, Med
Jun – Renx2,CCU,NNU	Dec - NNU
Jul – Ren, CCU, NNU, H/Onc, Med	Jan – Ren x 2, NNU x 1, H/Onc, Surg
Aug – Med, Surg	Feb – H/Onc, Med, Surg
Sept- Med	Mar – CCU

Days since last bacteraemia =

Comments/ learning and actions
Apr– 1 relating to……..
Jun – 2 ……..
Jul – 1……
Nov – 1 ……..
Jan – 2 ……



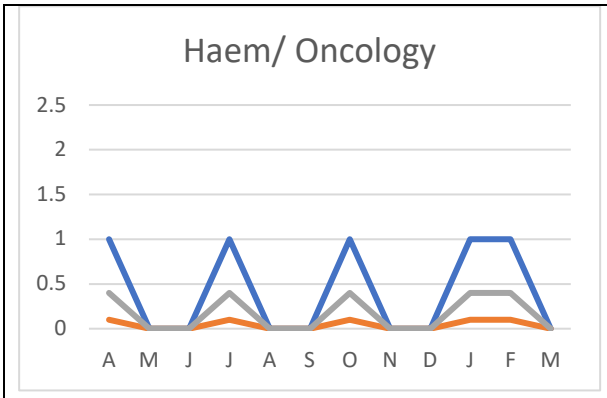


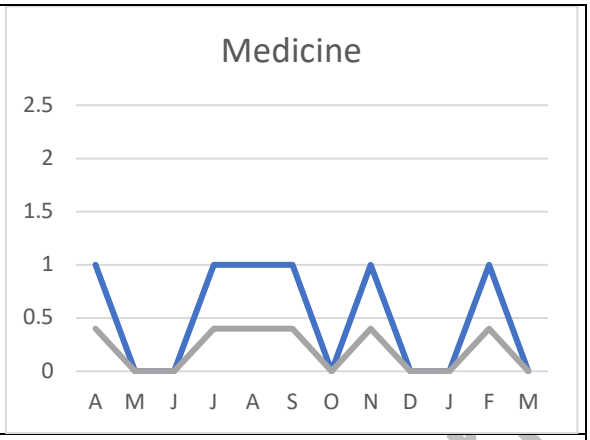
Days since last bacteraemia =

Comments/ learning and actions
Jun – 1 relating to ……
Jul – 1 ……
Oct – 1 ……
Mar – 1 ……..

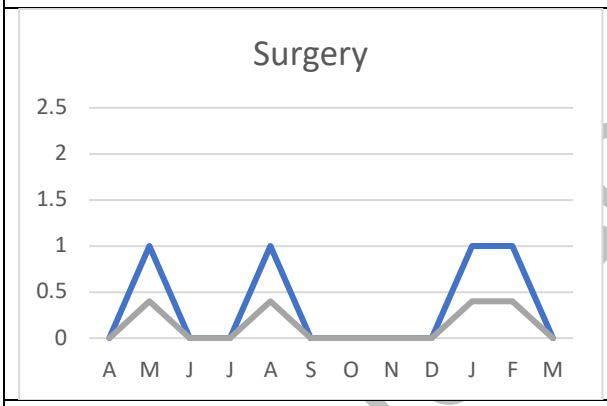
Days since last bacteraemia =

Comments/ learning and actions
Jun – 1 relating to……..
Jul – 1 ……..
Dec – 1 ……..
Jan – 1 ……





Days since last bacteraemia =	**Days since last bacteraemia =**
Comments/ learning and actions April – 1 relating to …… Jun – 1 …….. Oct – 1…… Jan – 1 …… Feb – 1 ……..	**Comments/ learning and actions** NB – currently no data per 1,000 line days Apr – 1 relating to…… July – 1 …… Aug – 1 …… Sept – 1 …….. Nov – 1 …… Feb – 1 ……



Days since last bacteraemia =	**Days since last bacteraemia =**
Comments/ learning and actions NB – currently no data per 1,000 line days May – 1 relating to Aug – 1 …….. Jan – 1 …… Feb – 1 ……..	

Adapted with permission from the Royal Devon and Exeter NHS Foundation Trust

Appendix 3.

List of Recognised Pathogen Organisms and Codes

Code	Label	Is a skin commensal ?
ACHSPP	ACHROMOBACTER SPECIES	
ACIBAU	ACINETOBACTER BAUMANNII	
ACICAL	ACINETOBACTER CALCOACETICUS	
ACIHAE	ACINETOBACTER HAEMOLYTICUS	
ACILWO	ACINETOBACTER LWOFFI	
ACINSP	ACINETOBACTER SP., NOT SPECIFIED	
ACIOTH	ACINETOBACTER SP., OTHER	
ACTSPP	ACTINOMYCES SPECIES	
1090	AEROCOCCUS SPECIES	Yes
AEMSPP	AEROMONAS SPECIES	
AGRSPP	AGROBACTERIUM SPECIES	
ALCSPP	ALCALIGENES SPECIES	
ANANSP	ANAEROBES, NOT SPECIFIED	
ANAOTH	OTHER ANAEROBES	
ASPFUM	ASPERGILLUS FUMIGATUS	
ASPNIG	ASPERGILLUS NIGER	
ASPNSP	ASPERGILLUS SP., NOT SPECIFIED	
ASPOTH	ASPERGILLUS SP., OTHER ASPERGILLUS SP., OTHER	
1142	BACILLUS ANTHRACIS	
BACSPP	BACILLUS SPECIES, OTHER	Yes
BATFRA	BACTEROIDES FRAGILIS	
BATNSP	BACTEROIDES SPECIES, NOT SPECIFIED	
BATOTH	BACTEROIDES SP., OTHER	
BCTNSP	OTHER BACTERIA, NOT SPECIFIED	
BCTOTH	OTHER BACTERIA	
BURCEP	BURKHOLDERIA CEPACIA	
2330	BURKHOLDERIA SPECIES	
CAMSPP	CAMPYLOBACTER SPECIES	
CANALB	CANDIDA ALBICANS	
CANGLA	CANDIDA GLABRATA	
CANNSP	CANDIDA SP., NOT SPECIFIED	
CANOTH	CANDIDA SP., OTHER	
CANPAR	CANDIDA PARAPSILOSIS	
CANTRO	CANDIDA TROPICALIS	
CHLSPP	CHLAMYDIA SPECIES	
CITDIV	CITROBACTER KOSERI (EX. DIVERSUS)	
CITFRE	CITROBACTER FREUNDII	
CITNSP	CITROBACTER SP., NOT SPECIFIED	
CLODIF	CLOSTRIDIUM DIFFICILE	
CLOOTH	CLOSTRIDIUM OTHER	
CORSPP	CORYNEBACTERIUM SPECIES	Yes
ENBAER	ENTEROBACTER AEROGENES	
ENBAGG	ENTEROBACTER AGGLOMERANS	
ENBCLO	ENTEROBACTER CLOACAE	
ENBGER	ENTEROBACTER GERGOVIAE	

ENBNSP	ENTEROBACTER SP., NOT SPECIFIED	
ENBOTH	ENTEROBACTER SP., OTHER	
ENBSAK	ENTEROBACTER SAKAZAKII	
ENCFAE	ENTEROCOCCUS FAECALIS	
ENCFAI	ENTEROCOCCUS FAECIUM	
ENCNSP	ENTEROCOCCUS SP., NOT SPECIFIED	
ENCOTH	ENTEROCOCCUS SP., OTHER	
ESCCOL	ESCHERICHIA COLI	
ETBNSP	ENTEROBACTERIACEAE, NOT SPECIFIED	
ETBOTH	ENTEROBACTERIACEAE, OTHER	
FILOTH	FILAMENTS OTHER	
FLASPP	FLAVOBACTERIUM SPECIES	
FUNNSP	FUNGI, NOT SPECIFIED	
FUNOTH	FUNGI OTHER	
GARSPP	GARDNERELLA SPECIES	
GNBOTH	OTHER GRAM- BACILLI, NON ENTEROBACTERIACIAEA	
GNCNSP	GRAM NEGATIVE COCCI, NOT SPECIFIED	
GNCOTH	GRAM NEGATIVE COCCI, OTHER	
GPBNSP	GRAM POSITIVE BACILLI, NOT SPECIFIED	
GPBOTH	GRAM POSITIVE BACILLI, OTHER	
GPCNSP	GRAM POSITIVE COCCI, NOT SPECIFIED	
GPCOTH	GRAM POSITIVE COCCI, OTHER	
HAEINF	HAEMOPHILUS INFLUENZAE	
HAENSP	HAEMOPHILUS SP., NOT SPECIFIED	
HAEOTH	HAEMOPHILUS SP., OTHER	
HAEPAI	HAEMOPHILUS PARAINFLUENZAE	
HAFSPP	HAFNIA SPECIES	
HELPYL	HELICOBACTER PYLORI	
KLENSP	KLEBSIELLA SP., NOT SPECIFIED	
KLEOTH	KLEBSIELLA SP., OTHER	
KLEOXY	KLEBSIELLA OXYTOCA	
KLEPNE	KLEBSIELLA PNEUMONIAE	
LACSPP	LACTOBACILLUS SPECIES	
LEGSPP	LEGIONELLA SPECIES	
LISMON	LISTERIA MONOCYTOGENES	
1960	MICROCOCCUS SPECIES	Yes
MOGSPP	MORGANELLA SPECIES	
MORCAT	MORAXELLA CATHARRALIS	
MORNSP	MORAXELLA SP., NOT SPECIFIED	
MOROTH	MORAXELLA SP., OTHER	
MYCATY	MYCOBACTERIUM, ATYPICAL	
MYCTUB	MYCOBACTERIUM TUBERCULOSIS COMPLEX	
MYPSPP	MYCOPLASMA SPECIES	
NEIMEN	NEISSERIA MENINGITIDIS	
NEINSP	NEISSERIA SP., NOT SPECIFIED	
NEIOTH	NEISSERIA SP., OTHER	
NOCSPP	NOCARDIA SPECIES	
PAROTH	OTHER PARASITES	
PASSPP	PASTEURELLA SPECIES	
PRESPP	PREVOTELLA SPECIES	
PROSPP	PROPIONIBACTERIUM SPECIES	Yes
PRTMIR	PROTEUS MIRABILIS	
PRTNSP	PROTEUS SP., NOT SPECIFIED	
PRTOTH	PROTEUS SP., OTHER	

PRTVUL	PROTEUS VULGARIS	
PRVSPP	PROVIDENCIA SPECIES	
PSEAER	PSEUDOMONAS AERUGINOSA	
PSENSP	PSEUDOMONADACEAE FAMILY, NOT SPECIFIED	
PSEOTH	PSEUDOMONADACEAE FAMILY, OTHER	
SALENT	SALMONELLA ENTERITIDIS	
SALNSP	SALMONELLA SP., NOT SPECIFIED	
SALOTH	SALMONELLA SP., OTHER	
SALTYM	SALMONELLA TYPHIMURIUM	
SALTYP	SALMONELLA TYPHI OR PARATYPHI	
SERLIQ	SERRATIA LIQUEFACIENS	
SERMAR	SERRATIA MARCESCENS	
SERNSP	SERRATIA SP., NOT SPECIFIED	
SEROTH	SERRATIA SP., OTHER	
SHISPP	SHIGELLA SPECIES	
STAAUR	STAPHYLOCOCCUS AUREUS	
STACNS	COAGULASE-NEGATIVE STAFYLOCOCCI, NOT SPECIFIED	Yes
STAEPI	STAPHYLOCOCCUS EPIDERMIDIS	Yes
STAHAE	STAPHYLOCOCCUS HAEMOLYTICUS	Yes
2440.0007	STAPHYLOCOCCUS SP., OTHER	
STAOTH	COAGULASE-NEGATIVE STAFYLOCOCCI, OTHER	Yes
STEMAL	STENOTROPHOMONAS MALTOPHILIA	
2549	STREPTOCOCCUS (VIRIDANS GROUP)	Yes
STRAGA	STREPTOCOCCUS AGALACTIAE (B)	
STRHCG	OTHER HAEMOL. STREPTOCOCCAE (C, G)	
STRNSP	STREPTOCOCCUS SP., NOT SPECIFIED	
STROTH	STREPTOCOCCUS SP., OTHER	
STRPNE	STREPTOCOCCUS PNEUMONIAE	
STRPYO	STREPTOCOCCUS PYOGENES (A)	
YEAOTH	YEASTS, OTHER	
YERSPP	YERSINIA SPECIES	