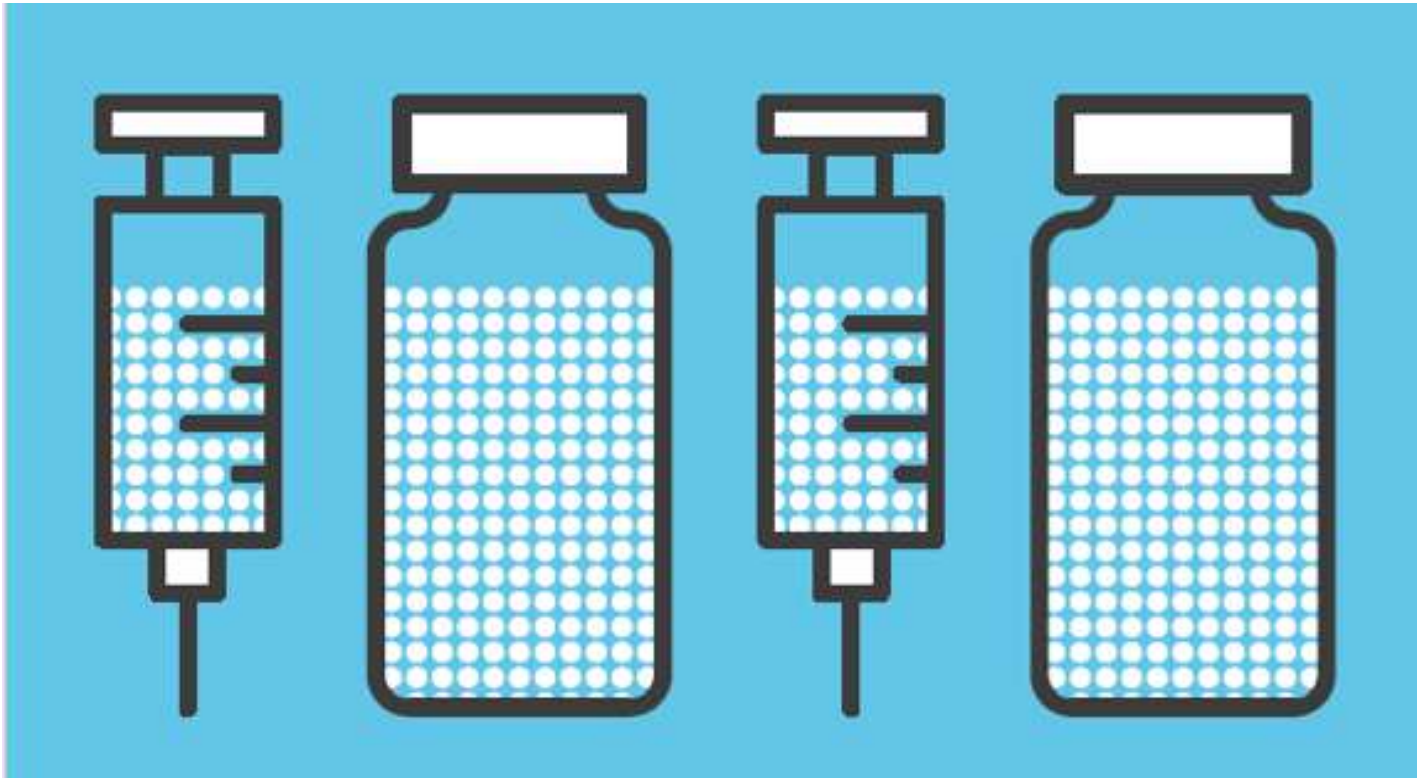
UK NEQAS

International Quality Expertise



SETTING UP AN EXTERNAL QUALITY ASSESSMENT SCHEME FOR THE MICROBIOLOGY ASPECTS OF HEART VALVE BANKING

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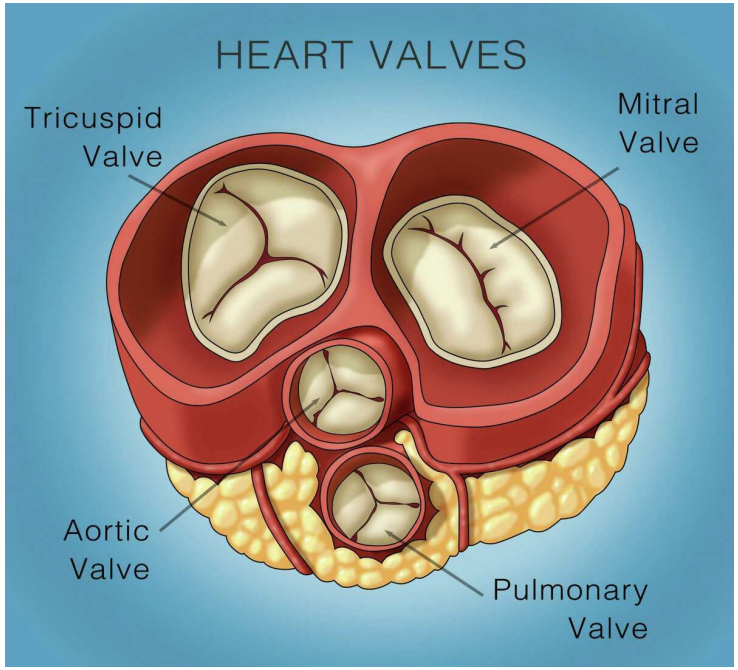
Introduction



Heart tissue products donated usually after death are banked worldwide to support reconstructive cardiac surgery, to treat both congenital and acquired cardiac defects.

Donations of substances of human origin can include a risk of transmitting infection to recipients.

One of the steps taken is to test the tissue product for the potential presence of contamination and also decontaminating the heart tissue often using an antibiotic cocktail.

90% of heart products cannot be used and are discarded.

This area of clinical practice does not have an established EQA.

Aims

To ensure the quality and safety of transplanted heart valves, it is crucial to establish an EQA scheme which involves regular testing and evaluation of tissue banks' processing methods for the detection of contamination and subsequent decontamination.

UK NEQAS for Microbiology in collaboration with the Scottish National Blood Transfusion Service (SNBTS) conducted a pilot EQA exercise in January 2024 to examine the processes employed by tissue establishments in their isolation, identification and decontamination of microorganisms present in heart valve tissue designated for transplantation.

Process

The EQA exercise used donated heart tissue (with appropriate consent) in thioglycolate broth (comply with the Human Tissue Act 2004).

The specimens was shipped to three participating tissue establishments on 8 January 2024, for testing of possible contaminants and decontamination using their usual standard operating procedure.

The participants reported their findings in a result form that was sent by email by 12 February 2024.

Report generated of the findings and published 3 May 2024.

UK NEQAS Microbiology procedure

- UKHSA site informed of the material for use in this EQA
- Contract signed between all parties involved
- Have defined procedure in place to do the work, SOP, risk assessments
- Agree a dispatch date and interested tissue banks contacted
- Heart valves received in the laboratory and logged in a laboratory management system and must be discarded after 3 months
- Process according to SOP:
  - Check for contamination
  - Check for antibiotic effect - neutralise if observed
  - Spike with known micro-organism
  - Split heart valve and store in thioglycolate broth
  - Quality control
  - Dispatch – with request form and questionnaire on method followed

Summary

- Intended result by UK NEQAS:
  - Specimen 8757 *Staphylococcus aureus*
  - Specimen 8758 No contamination (sterile)

- Tissue banks were asked to report results as per protocol and examine the heart valves at pre-decontamination and then post decontamination.

Tissue bank	Specimen 8757	Specimen 8758
1	Pre: *S. aureus* and *Streptococcus mitis/oralis* Post: No contaminants	Pre and post: no contaminants
2	Pre: *S. aureus and S. mitis/oralis* Post: *S. aureus*	Pre and post: no contaminants
3	Pre: *S. aureus and S. mitis/oralis* Post: *S. aureus and S. mitis/oralis*	Pre and post: no contaminants

- Three different results post decontamination: so which one is correct?

Summary

- Tissue bank 1 is correct

Tissue bank	Specimen 8757	Specimen 8758
1	Pre: *S. aureus* and *Streptococcus mitis/oralis* Post: No contaminants	Pre and post: no contaminants
2	Pre: *S. aureus and S. mitis/oralis* Post: *S. aureus*	Pre and post: no contaminants
3	Pre: *S. aureus and S. mitis/oralis* Post: *S. aureus and S. mitis/oralis*	Pre and post: no contaminants

- The aim is to be able to decontaminate the heart values effectively so they can be used
- Tissue banks 2 and 3 had a micro-organism post decontamination, therefore the specimen would be discarded
- Results are not aligned with what NEQAS also obtained – this is an issue
- Reason/s could be the methods used – not standardised

Summary of methods used (1 of 3)

- Pre-decontamination

Question	Tissue bank 1	Tissue bank 2	Tissue bank 3
Samples taken pre-decontamination to check for contamination	Small heart tissue pieces as well as specimens of the transport fluid	Crushed piece of the heart tissue product as well as specimens of the transport fluid	Small heart tissue pieces as well as specimens of the transport fluid
Method of culture pre-decontamination	TSB broth and Thioglycollate culture bottles	BacTALERT bottles	TSB broth, FTM broth, BacTec plus (aerobic and anaerobic) culture bottles
Temperature at which culture bottles are incubated pre-decontamination	TSB bottles at 22.5ºC Thioglycollate bottes at 32.5ºC	35-37ºC	35ºC
Duration of culture bottle incubation at pre-decontamination	14 days	14 days	14 days

- Only 2 out of 4 processes/method followed were the same

Summary of methods used (2 of 3)

- Decontamination

Question	Tissue bank 1	Tissue bank 2	Tissue bank 3
Antibiotic cocktail used for decontamination	Gentamicin 3.75g/L Imipenem 0.25g/L Polymyxin 0.2g/L Vancomycin 0.05g/L Nystatin 2.5mg/L	Lincomycin 120µg/mL Vancomycin 50µg/mL Polymyxin 124µg/mL	Amikacin 0.6mg/ml Vancomycin 0.6mg/mL Ciprofloxacin 0.15mg/mL Metronidazole 0.6mg/mL Flucytosine 1.5mg/mL
Duration of heart tissue decontamination	24 hours	48 hours	5 hours
Temperature at which antibiotic decontamination is carried out	37ºC	2ºC to 8ºC	2ºC to 8ºC
Method of removing antibiotics once decontamination is concluded	Tissue rinsed with 1L of normal saline by continuous aspiration	Tissue rinsed in normal saline, volume not specified	Tissue is transferred to 100 mL Medium 199 for a short rinse and the tissue then transferred to culture vials
Checking for possible residual antibiotics	Not done	Not done	Not done

- Only 2 out of the 5 processes/methods were the same – major difference is cocktail of antibiotics used and duration of contamination

Summary of methods used (3 of 3)

- Post decontamination

Question	Tissue bank 1	Tissue bank 2	Tissue bank 3
Samples taken post-decontamination to check for residual contamination	Sample of antibiotic post decontamination, tissue specimen post antibiotic treatment and post saline rinse stage	A crushed piece of tissue in 10mL of cryoprotectant solution (RPMI-DMSO mixture).	Two pieces of the tissue post-decontamination
Method of culture post-decontamination	TSB broth and Thioglycollate culture bottles	BacTALERT bottles	TSB and FTM culture bottles
Temperature at which culture bottles are incubated post-decontamination	TSB bottles at 22.5ºC Thioglycollate bottes at 32.5ºC	35-37ºC	35ºC
Duration of culture bottle incubation at post-decontamination	14 days	14 days	14 days

- 1 out of 4 of the processes/method followed were the same

Summary

- 13 method related questions asked
- Responses to the method/process question showed that 8/13 (62%) followed by the laboratory were different – highly non-standardised
- A major difference were the cocktail of antibiotics used - one laboratory did not include an antifungal agent
- Temperature the decontamination was done at varied between 2-8^{o}C to 37^{o}C with the duration varying between 5 hours to 48 hours (antimicrobials work better at 37^{o}C)

Conclusions

- This pilot run has demonstrated that setting up an EQA, using the logistics used by UK NEQAS to send samples all over the world is highly achievable.
- The results provide valuable insights into the processes of heart tissue banking by the participants.
- Rolling this out to all tissue banks round the world would provide greater detail and information into the processes followed thereby help to improve the safety of heart tissue over time.
- This in turn will increase the availability of safe heart tissue products by reducing the microbiology discard rate if the decontamination methods improve using evidence from tissue banks participating in the EQA over time.
- UK NEQAS and SNBTS plan to reach out to tissue banks to set up this EQA on a regular basis.
- There are no published method/guideline therefore an attempt in standardising methods used for consistency would be beneficial.

Limitations

- The pilot run was necessarily limited to a very small number of participants – increased numbers of participants over time will allow more meaningful data to be gathered.
- For UK NEQAS the lack of availability of repeat specimens for investigating EQA failures has hindered a full investigation into why the tissue banks reported two contaminants instead of the expected one – need to review process.
- Further analysis is required to understand the effectives of antibiotic combinations and concentrations.

Acknowledgements

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