

Bacterial contamination in the evacuated blood collection tube: a short report

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Abstract:

Bacterial contamination in the evacuated blood collection tube: a short report

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The evacuated blood collection system is a method of venipuncture used worldwide nowadays. Since all medical equipment should be tested for effectiveness and safety, the test for contamination in vacuum blood collection is necessary. Here, we report the results from a study of contamination in the vacuum tube. A short evaluation of bacterial contamination in 100 vacuum tubes was performed, with null prevalence of bacterial contamination observed. This could mean that the used vacuum tubes were sterile, or contaminated but not detected due to small sample in this study.

Key words: bacterial contamination, vacuum tubes

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บทคัดย่อ:

การเก็บตัวอย่างเลือดด้วยระบบสุญญากาศเป็นวิธีการเจาะเลือดที่ใช้อย่างกว้างขวางในปัจจุบัน และการตรวจสอบเกี่ยวกับประสิทธิภาพและความปลอดภัยของอุปกรณ์การแพทย์ทุกชนิดเป็นสิ่งจำเป็น ดังนั้นผู้พิมพ์จึงได้ศึกษาการปนเปื้อนเชื้อแบคทีเรียในหลอดสุญญากาศ โดยทำการศึกษาจากหลอดสุญญากาศจำนวน 100 หลอด ไม่พบว่ามีการเจริญของเชื้อแบคทีเรียแต่อย่างใด จากผลการศึกษาเบื้องต้นนี้อาจจะบ่งบอกว่าหลอดสุญญากาศที่ใช้ในปัจจุบันมีความปราศจากเชื้อปนเปื้อนหรืออาจจะมีการปนเปื้อนแต่ตรวจไม่พบเชื้อเนื่องจากตัวอย่างที่ทำการศึกษามีจำนวนไม่มากพอ

คำสำคัญ: การปนเปื้อนเชื้อแบคทีเรีย, หลอดสุญญากาศ

Introduction

Evacuated blood collection system is a method of venipuncture used worldwide nowadays. Evacuated tubes, needles and holders are used together as a system for the collection of venous blood. Based on the basic principles of Fluid Mechanics, venipuncture can be easily done following the recommendations and universal precautions.¹ The three parts required for the procedure are a vacuum tube, holder and specific needle.

The vacuum tube is a specially designed tube without air inside. The main role of this tube is to provide vacuum pressure to start the blood flow thorough the needle during venipuncture. Since all medical equipment should be tested for effectiveness and safety, the test for the contamination in vacuum blood collection is necessary.² Although the bacterial contamination in evacuated blood collection tubes could cause few problems in laboratory analyzing process since the purpose of many tubes are mainly for clinical chemistry and hematological work, the problems in case of microbiological usage and side effect to the patients contacting with contaminants should be concerned. Here, we report the results from a study of contamination in vacuum tubes.

Materials and methods

Study design

This study was designed as a descriptive study. The objective of this study was to study the prevalence of contamination in vacuum tube. One hundred commercially available vacuum tubes with several additives were used; plain tube

20, EDTA 20, heparin 20, fluoride 20 and citrate 20. The total number of tubes used was based on previous reports of contamination rate in the West.³⁻⁵ All tubes were randomly selected and sent for further analysis.

Laboratory analysis

Each tube was checked for the expiry date and integrity (without leakage or breakage). Then it was sent for microbiology study applying the standard hemoculture techniques. Identification test was performed in each culture-positive tube.

Statistical analysis

The rate of contamination of vacuum tubes was calculated as percentage. Comparison between groups of vacuum tubes was performed using F test (since there are five groups). P-value equal or less than 0.05 was accepted as statistically significant.

Table 1 Contamination of blood collection tubes classified by type of additive

Tube	Number of culture positive	Contamination rate (%)
Plain (n = 20)	0	0
EDTA (n = 20)	0	0
Heparin (n = 20)	0	0
Fluoride (n = 20)	0	0
Citrate (n = 20)	0	0

Results

The contamination rate classified by each type of vacuum tube is shown in Table 1. The overall contamination rate was 0%.

Discussion

The evacuated blood collection system is a worldwide blood collection technique based on the principle of fluid mechanics. The equipment consists of an evacuated blood collection tube, holder and needle. Safety considerations of the system should concern both patients as the recipient and medical personnel as the practitioner. To ensure safety for the patients, the safest equipment should be selected. Therefore, checking for contamination of the vacuum tube and needle is necessary. Due to the fact that venipuncture is a basic medical procedure that all physicians perform, knowledge concerning safety of the system is necessary.²

The problem of contamination of vacuum tubes has been discussed for a long time. Several problems can result from contaminated tubes. Firstly, the effect of microbiology test is placed in question in case that the tubes are used although it is rare to happen in the present day. False-positive results stemming from the use of nonsterile tubes can be eliminated by inoculating blood culture bottles before other specimen tubes. According to the study of Hoffman,³ 35% of pediatric size vacuum EDTA tube contained bacterial contamination. Similar results were reported from Emmanuel et al.⁵ However, those reports were published a long time ago at a time when the manufacturing of evacuated blood collection tubes may not have reached the standard. Secondly, dangerous effects to the patients from contaminated vacuum tubes can occur, such as backflow from poor venipuncture technique.⁶ This point can be a big problem although it does not occur often.

Here, we performed this study in order to review the possible bacterial contamination of the vacuum tubes. Although there are some previous studies on this topic³⁻⁵ they are quite dated, and there is no previous study from Thailand. Our study found no contamination in our setting. In this study, the

author used the commercially available tubes, which already passed the quality control of the manufacturer, therefore, the low or very low prevalence of contamination can be expected. This could mean that the vacuum tube might be sterile in the present day due to principles of good manufacturing practice (GMP), or there might still be bacterial contamination but we did not detect it because of the main limitation of this study, the small sample size.

Continuous monitoring for the safety of medical equipment is necessary in the present day due to the concept of laboratory quality. Not only bacterial contamination of the vacuum tubes, but also other types of contamination such as trace element contamination should be studied.⁷

Conclusion

A small study of bacterial contamination rate of 100 vacuum tubes was performed, with null prevalence of bacterial contamination observed. This might imply that the presently used vacuum tubes are sterile, or they might still be contaminated but this contamination was not detected due to the small sample size in this study.

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