

### **Project Title**

Improvement in TAT for Carbapenem-resistant Enterobacterales (CRE) testing by Designing a Customised Streaking Pattern on the BD Kiestra™ Inoqula™

### **Project Lead and Members**

Project lead: Carmen Cheng

Project members: Ong Chiou Horng, Douglas Chan

### **Organisation(s) Involved**

Ng Teng Fong General Hospital

### **Healthcare Family Group Involved in this Project**

Allied Health

### **Applicable Specialty or Discipline**

Medical & Laboratory Technology

### **Project Period**

Start date: December 2018

Completed date: July 2019

### **Aims**

To improve the turnaround time (TAT) of Carbapenem-resistant Enterobacterales (CRE) active surveillance testing (AST) and outbreak investigation requests by developing a new streaking pattern which to improve colony isolation in mixed cultures.

### **Background**

See poster appended / below

### **Methods**

See poster appended / below

## **Results**

See poster appended / below

## **Lessons Learnt**

The use of equipment to automate laboratory processes can be useful in improving work efficiency. It is also equally important to ensure that these equipment are effectively used by looking into whether any of their processes can be improved. It is crucial that CRE results are reported timely as it lets healthcare providers to initiate appropriate infection control interventions efficiently and mitigate the spread of multidrug-resistant organisms

## **Conclusion**

See poster appended / below

## **Project Category**

Technology, Medtech, Product Development, Care & Process Redesign, Value Based Care, Productivity

## **Keywords**

Microbiology, Carbapenem-Resistant Enterobacterales Testing, Customised Streaking Pattern, BD Kiestra Inoqula

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# IMPROVEMENT IN TAT FOR CRE TESTING BY DESIGNING A CUSTOMISED STREAKING PATTERN ON THE BD Kiestra™ INOQUILA™

- ✓ SAFETY
- PRODUCTIVITY
- ✓ PATIENT EXPERIENCE
- ✓ QUALITY
- ✓ VALUE

MEMBERS: CARMEN CHENG, ONG CHIOU HORNG, DOUGLAS CHAN

## Define Problem/Set Aim

Our hospital is the pioneer in Singapore for the automation of specimen processing and plate streaking using the BD Kiestra Inoquila. In the Microbiology laboratory, the primary method used to screen for Carbapenem-resistant Enterobacterales (CRE) is by bacterial culture of rectal swabs onto agar plates. However, the presence of other commensal bacteria in such cultures can hinder identification and testing due to the lack of isolated colonies of interest. As these potential CRE colonies have to be subcultured first, it can delay the reporting of positive results and subsequent implementation of infection control measures by at least a day.

The aim of this project is to improve the turnaround time (TAT) of CRE active surveillance testing (AST) and outbreak investigation requests by developing a new streaking pattern which to improve colony isolation in mixed cultures.

## Establish Measures

### Original streaking pattern – 20 July to 19 December 2018

Of all the CRE AST and outbreak investigation requests received in this period, 211 cases had colonies of interest that required further workup to rule out CRE.

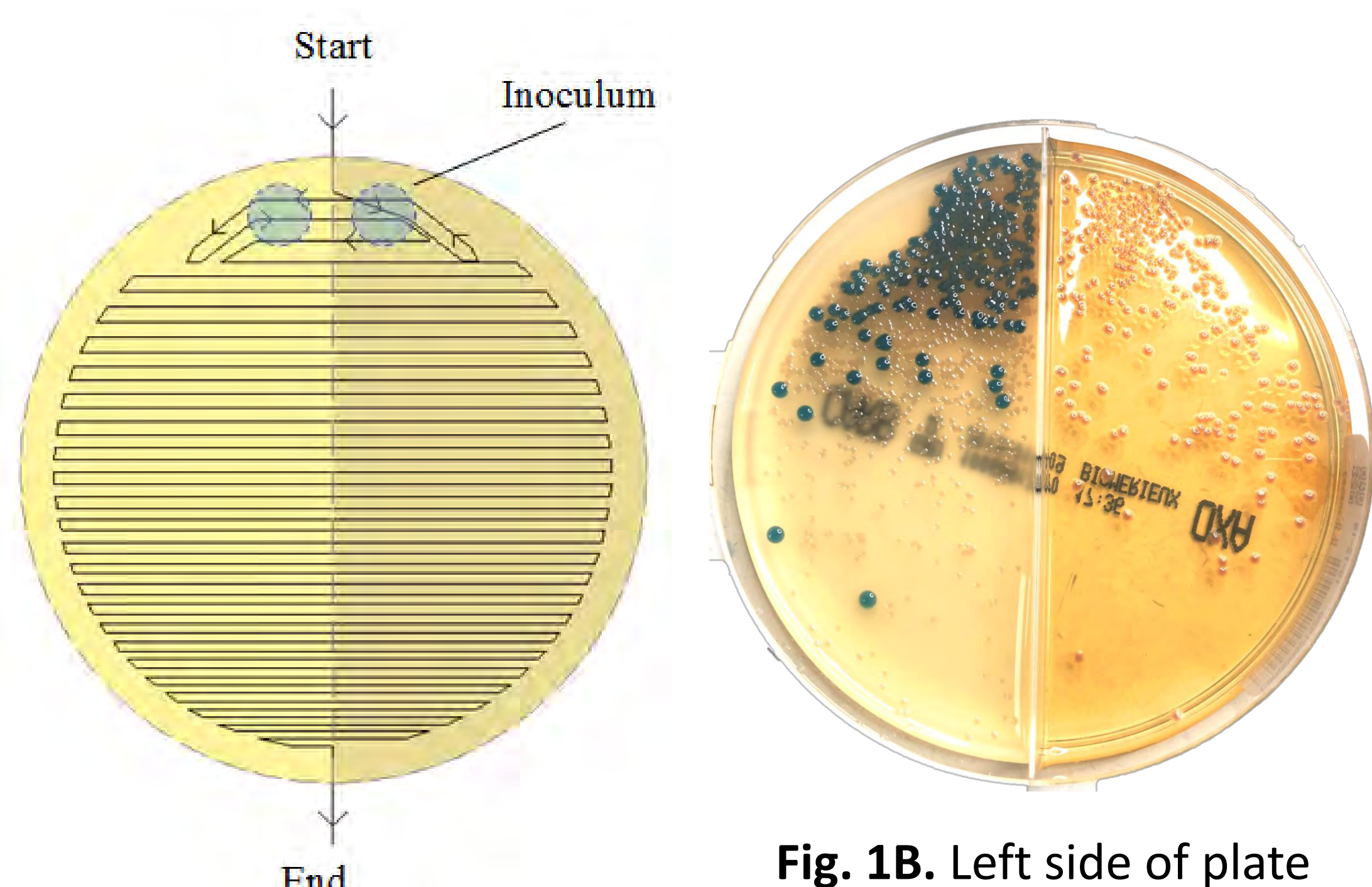
**16 (7.6%) of these cases** required an additional subculture step before workup could proceed due to the lack of isolated colonies of interest.

The average time taken from plate inoculation to obtaining isolated colonies for workup was **1 day 1 hour (h) and 43 minutes (min)**.

## Analyse Problem

In the original CRE pattern, the streaking magnet starts at the area of inoculation and moves down the plate in a zigzag manner such that the bead on each side spreads the inoculum across half the width of the plate (Fig. 1A).

The problem was that for cases with incomplete suppression of commensal flora, there would be insufficient isolated colonies of interest for workup as all colonies tend to cluster together on the top half of the plate (Fig. 1B).



**Fig. 1A** Streaking path of magnet in the original CRE pattern

**Fig. 1B.** Left side of plate showing mixed growth where majority of blue colonies of interest are clustered on agar plate with original CRE pattern

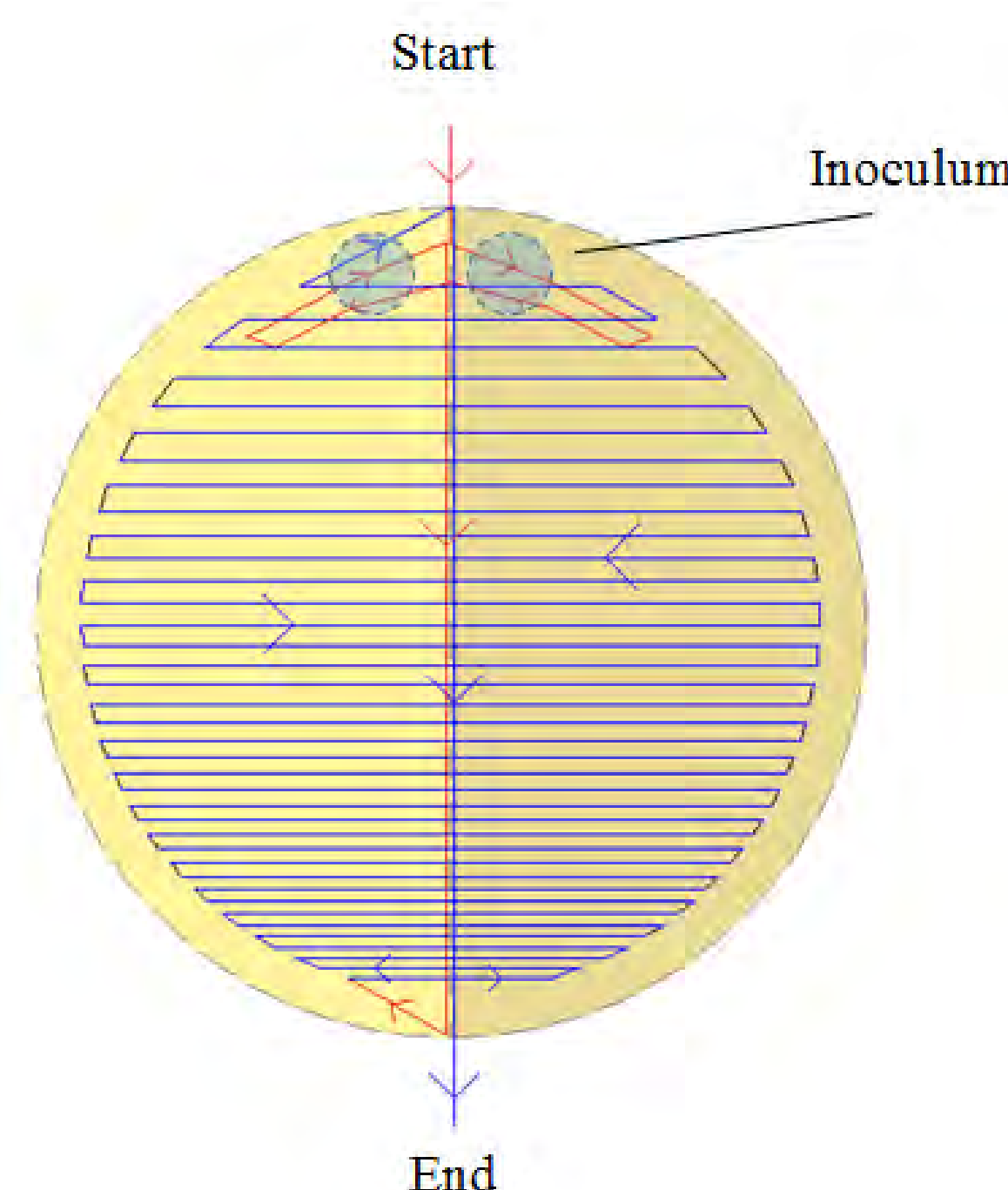
## Select Changes

As the original pattern was already the most ideal out of the manufacturer's available pattern templates, we requested to design our own pattern to overcome this problem.

The initial design proposal was to streak vertically up and down the full length of the plate as better colony isolation can be achieved by spreading bacterial colonies over a longer straight distance compared to half the plate width with the current streaking pattern.

However due to limitations with the single magnet streaking system, accommodations had to be made before achieving the final design (Fig. 2A). Test plates were streaked with the new pattern to confirm visually that colony distribution has improved (Fig. 3B) before it was put into routine for a pilot to see if data shows actual improvement in time taken from inoculation to workup.

**Fig. 2A** Streaking path of the magnet in the new pattern. A vertical primary streak down the length plate (red) is made before streaking horizontally in a zigzag manner (blue)



**Fig. 2B** New pattern showing better colony distribution on the plate as well as more isolated colonies of interest available for workup

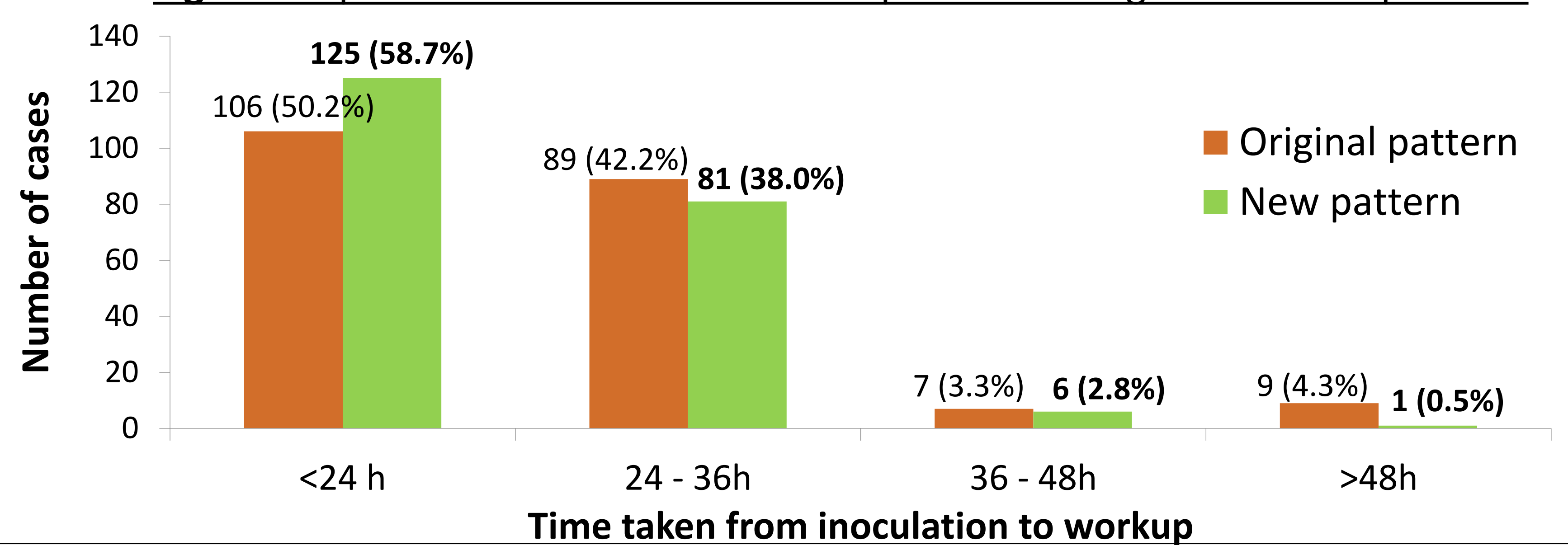
## Test & Implement Changes

### Pilot run of new streaking pattern - 20 December 2018 to 10 July 2019

Of all the CRE AST and outbreak investigation requests received in this period, 213 cases had colonies of interest that required further workup to rule out CRE.

Of these cases, the number requiring an additional subculture step before workup reduced to **2 (0.9%)**. This reduction in delays is reflected by the increase in the percentage of cases which can now be worked up in under 24 h, and reduction of cases requiring more than 36 h (Fig. 3). The average time taken from plate inoculation to obtaining isolated colonies for workup also reduced by 1 h 57 min per case to **23 h 46 min**.

**Fig. 3** Comparison of time taken to workup between original and new patterns



## Spread Change/Learning Points

The use of equipment to automate laboratory processes can be useful in improving work efficiency and can also save on manpower time and cost. However it is equally important to ensure that these equipment are being used effectively by looking into whether any of their processes can be improved.

As the new pattern has demonstrated a reduction in time to workup which in turn translates to reduced TAT, it has been implemented for routine use. The timely reporting of CRE results is crucial as it allows healthcare providers to initiate appropriate infection control interventions efficiently and to control the spread of these multidrug-resistant organisms.

