Transferring of 100,000 Samples of RG 3 Biological Agents in Singapore – A Lesson Learnt

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BACKGROUND:
For over 30 years, prior to May 2013, the clinical microbiology laboratories of Singapore General Hospital were located in different areas of the Hospital Campus. These laboratories handled diagnostic analysis for biological agent from risk group 1 – 4. To house all these different laboratories under one roof, a new laboratory including a new state of the art BSL3 was built. In May 2013, all Risk Group (RG) 3 biological agents (over 100,000 samples) from the old laboratories had to be relocated to the new BSL3. These samples were kept in different sizes of receptacles and at different storage conditions. Transfer routes to the new Laboratory which meant using public road with heavy traffic had to be carefully planned and executed. It was a huge challenge to the relocation team technically, logistically and operationally. As the original diagnostic laboratories servicing the 1600-bed hospital had to continue throughout the process, shutting down was not an option. An improvised method to transfer these samples was devised. The samples were packed according to the intent of International Air Transport Association (IATA) standards. This paper shares the journey of how the Hospital managed the relocation of these Agents safely, efficiently and without affecting the day to day diagnostic operations.

METHOD;
The relocation of high risk pathogens was a Risk Assessment based approach. A dedicated Team was set up to focus on this particular part of the move. The Team consisted of members from respective Pathology Laboratories, Division of Ambulatory & Clinical Support Services, Biosafety practitioner, members of the main relocation team and the specialist courier company. The main objectives were identified:

- Safely relocate the 100,000 plus samples to the new biosafety level (BSL)3 within the given time (3 weekends)
- Meeting the local legal requirements for the safe transport of biological agents
- Minimum disruption to the normal diagnostic services

The whole process could be broken down into the following phases:

1. Stock taking and risk analysis
2. Local legislative requirements for transportation of RG3 domestically
3. Preparation, training and communication
4. Biosafety, biosecurity and emergency plan
5. Dry run and actual move

1. Stock Take and Risk Analysis
As part of the initial planning, each individual laboratory was given a task to conduct a stock take and housekeeping exercise. This was to consolidate and reduce the number of items and inherent risk during the Move. Laboratories were requested to produced a summary of all of their RG3 and 4 agents and their acceptable shipping requirement (for a few hours). Once the data was submitted, the Team consolidated them and divided them into group (A – I) with the estimated quantity (table 1).

TYPE OF SAMPLES AND THEIR SHIPPING REQUIREMENTS									
	Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H	Group I
Unit of measurement (storage requirement)	Cryovial (solid state at -80°C)	Bottles (liquid media at ambient temperature)	Tubes (liquid media at ambient temperature)	Tubes (solid media at ambient temperature)	Tubes (solid state at -30°C)	Agar plates (ambient temperature)	Tubes (solid state at -80°C)	Tubes (liquid at 2 - 8°C)	Blood product solid state at -80°C)
Estimated Quantity	80,000	600	50,000	8,000	1,000	40	10	50	10

Table 1: Consolidated Groups of Shipping Requirements and the Estimated Quantity

2. Legislative Requirements:

a. The Team reviewed the local requirements and made reference to the IATA Dangerous Goods Regulation (DGR) for the shipping of Infectious Substance (Div. 6.2)
b. According to the DGR, shipping of infectious materials (Cat A) by air must meet the IATA Packaging Instruction (PI) 620. it also stated that the maximum quantity (for passenger aircraft) is limited to 50mL or 50g per package.
c. Under the Singapore Biological Agents and Toxins (Transportation) Regulation, Section 4 shipping of biological agents on public road (e.g. domestic transfer) requires the following:
   i. Biological agent be contained in a primary receptacle which is individual wrapped or separated from other primary receptacles so as to prevent contact between primary receptacles
   ii. The primary receptacle be packed in a secondary receptacle containing sufficient absorbent material within.
   iii. The secondary receptacle must be watertight and packed in a rigid outer container.
   iv. The requirement is similar to that of DGR except:
      - Packaging material does not need to bear the UN certification mark
      - The law does not state the maximum quantity per package
d. Although there is no specific requirement for the packaging material locally, the Team agreed that the packing material must comply with the requirement of PI620 of the DGR.

3. Preparation, Training and Communication:

a. Partnering with a professional courier company, the Team began to develop the method of packing. It was impractical to pack according to DGR requirement. After conducting risk assessment, it was decided that the samples be packed in the original shipping packaging as the primary receptacle. It would then placed into a (PI620) compliance secondary receptacle containing absorbent materials. The receptacle would be sealed and only opened in biological safety cabinet (BSC) after the arrived at the BSL3.
b. Packing over 100,000 samples is a daunting task. It was decide to select a number of senior staff from each laboratory to be trained and qualified as competent person for the packing of Div 6.2. Over 30 staff were trained and qualified.
c. As the Move involved large quantity of high risk samples, the respective government agencies , hospital senior management and relevant internal departments were part of our communication network. This was to ensure there would be no surprise for all (especially the agencies).



Photos 1 – 2 (left to right): demonstration and hands-on practice of proper packing procedures,
Photo 3 - security seal used for the Move

4. Biosafety, biosecurity and emergency planning
In order to ensure safety of all handlers, the primary receptacles were checked and capped while the secondary receptacles were sealed inside the containment laboratories. Prior to sending out of the laboratories, staff carried out surface wipe down with disinfectant and allowed adequate contact time. Another set of staff were tasked to receive the decontaminated package and placed them into the outer packaging.
Upon arrival at the new BSL3, the entire packaging was transferred to the equipment decontamination area where the outer package was removed and both primary and secondary receptacles were opened inside one of the BSCs in the BSL3.
Once inside the BSL3, staff would examine the packages to ensure there was no signs of leakage or damage before retrieving the primary container for storage. Any signs of leakage or damage the package would be treated and handled separately by the emergency response team.

As the materials being transferred were high risk pathogens, extensive security protocols were devised and implemented.

a. Inventory record - list of items and their quantity were generated and pasted on the outside of the outer package
b. “Chain of custody” – throughout the entire journey when the packages left the old laboratories to the new storage location. Designated staff (both laboratory and courier company) had to check and sign the record form.
c. A designated laboratory personnel accompanied each “consignment” until handing over to the staff stationed at the new BSL3.
d. For biosecurity reason, security seals (with running serial numbers) were pasted on the outer package to ensure that integrity of the contents.
e. In order to prevent any possible road traffic accidents and serve as extra security measure, auxiliary (campus) police provided escort for the convoy.

In the event of emergency, possible scenarios (e.g. road traffic accident, leakage en-route to the new laboratories) were carefully thought through and response plans were drawn up. A dedicated Emergency Response Team was on standby through out the relocation. Relocation team and biosafety personnel were also on duty to provide assurance.

Photo 4:
Packages were loaded into the outer package (after surface was decontaminated)

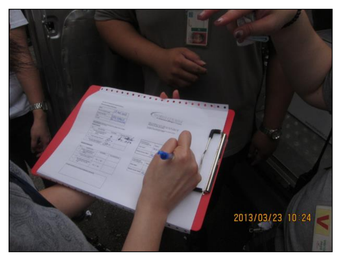

Photo 5:
Signing of inventory record when handing over to another team

Photo 6:
Outer packages were checked and opened in equipment room before transferred into BSL3.

Photo 7:
Auxiliary Police provide escort to ensure an uninterrupted journey.

Photo 8 & 9 :
Simulation of a biological incident en-route and practice of emergency plan. Scenarios include spill and vehicle break down.

5. Dry Run and Actual Move
As the relocation involved a number of departments as well as external service providers, any miscommunication or operational gaps could result in a catastrophic incident. Therefore, prior to the actual moving date, a “full-dress rehearsal” was organised. This allowed all personnel involved to practice their roles and close any gaps found. In order to better prepare all the personnel for any incident, a simulated spill incident was also injected into the “rehearsal”. At the end of the “rehearsal” only a few minor adjustments were made to enhance the safety and security of the move.

During the actual move, teams were assembled at the designated locations to carry out their pre-assigned tasks. Thanks to the training and dry run, the plan was executed smoothly and uneventful. Not only the 3 main objectives were achieved but also the move was completed ahead of schedule.

Conclusions:
Relocation of large quantity of high risk pathogens can present a daunting challenge to both laboratory and biosafety personnel. However, when we recognize that it requires multiple departments (and disciplines) to make a safe move and begin to involve all relevant parties, things begin to take shape. Lessons learnt include:

- The need for a designated small team to oversee the entire move.
- Involvement of the departments, government agencies and external service providers as early as possible
- Regular communications to avoid surprises (especially with government agencies)
- Recognition and rehearsal to mitigate adverse situations as part of planning
- Training of as many key personnel as possible
- Rehearsal of the Plan

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