

# Using Standardized Patients to Introduce Bioterrorism-related material into a Medical Microbiology and Immunology Curriculum

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## ABSTRACT

The overall goal of this study was to determine how engagement in basic science courses and retention of the taught material by students could be improved. To achieve this goal we have piloted the use of Standardized Patients in various settings in the Medical Microbiology and Immunology course at the University of Louisville, School of Medicine. The availability of a high quality standardized patient program with extensive, excellent moulage (makeup) capability, allowed the Department of Microbiology and Immunology to present bioterrorism in the context of cases and patients who exhibit symptoms of the diseases studied. This type of approach is appreciated by the students as deviating from classical lecture format and also is retained far better than material which is not visually presented.

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## INTRODUCTION

Since September 11, 2001, there has been an increase in the amount of bioterrorism-relevant information included in medical school microbiology and immunology courses.<sup>1</sup> Recently, (2004) the American Association of Medical Colleges released a report indicating the need to begin teaching about such organisms and offering pedagogical recommendations and available resources,<sup>2</sup> and Coico and coauthors released the guidelines for preclerkship bioterrorism curricula.<sup>1</sup>

At the University of Louisville, School of Medicine, we wanted to implement these goals into our educational program in an innovative way. Thus, the use of Standardized Patients and an adult learning-centered framework illustrated to medical students in ways that lectures cannot match, the appearance, identification, and progression of bioterrorism-related organisms and the infections they induce. This effort is part of a larger educational initiative of the Center for the Deterrence of Biowarfare and Bioterrorism, a CDC-funded Specialty Center for Public Health Preparedness at our University. More than 7,000 healthcare professionals have been trained in the Commonwealth of Kentucky and surrounding areas. It is necessary to educate such a broad range of personnel to ensure early detection of any bioterroristic event and before the initial infection can spread. It is not probable that initially-infected

persons will have access to any specialists and will most likely be treated by a variety of frontline treatment personnel who must be equally aware of the possibilities. If they had to take time to refer such cases to a small bank of specialists, time and possibly additional lives could be lost and the location and source of the infection could go unidentified and uncontained.

This manuscript discusses two specific cases and methods as well as provides a video created in part with Health Resources and Service Administration (HRSA) support, to present bioterrorism material in the medical curriculum within the Medical Microbiology and Immunology course.

## METHODS AND MATERIALS

### Cases and sessions

The cases have been adapted from literature available on the website for the Centers for Disease Control and Prevention ([www.cdc.gov](http://www.cdc.gov)) or created at the University of Louisville and are described in Figure 1 and Figure 2. The first session describes the release of *Yersinia pestis* in a bioterrorist act in the Louisville area. This case was adapted from the material produced for the American Society of Microbiology by Snyder and Check.<sup>3</sup> The second case was developed at our school and deals with the exposure of a relief worker to smallpox in the Mid East region.

The sessions using these cases employ the Excellence in Basic Sciences (EBS) model that was published in JIAMSE.<sup>4</sup> Briefly, groups of students (from 25 to 95) were presented via email with preliminary information regarding the patient(s) in the case and then in the sessions, by questioning a physician or a 4th year medical student,<sup>5</sup> the history of present illness and results of physical examination were revealed. The students determined what laboratory tests need to be ordered and were provided with results from these tests. The students completed worksheets which asked them to list the organ systems affected, major clinical findings, listing of questions they asked the clinician or fourth year student and the laboratory tests they ordered. Finally, student groups, using PDAs, computers, text and notes and small group discussion reached a consensus on the cause of the disease in the case and handed in the worksheets and solution for course credit.

These worksheets were collected for analysis of questions asked and tests ordered and the development of differential diagnosis, as well as identification of the cause of the disease. Student mastery of bioterrorism-related knowledge related to these clinical scenarios and relevant microbiology was tested within our Block testing system.

#### **Standardized Patients and cases utilizing them**

A Standardized Patient (SP) is a person who has been coached to accurately and consistently recreate the history, personality, physical findings, and emotional structure and response pattern of an actual patient at a particular point in time. Accumulated evidence of more than thirty years and across several continents has shown that SPs make a significant contribution to medical education in the form of teaching, assessing, and providing feedback to students at all levels of their undergraduate and graduate careers.<sup>6-9</sup>

The SP Program at the University of Louisville school of Medicine is a relatively new one (created July 2000) and the program director and school faculty have eagerly sought rigorous and innovative ways to use this program throughout the medical curriculum, including the basic science courses. The SP program is currently involved in teaching and assessment activities in all four years of undergraduate medical education, as well as several residency programs. It is anticipated that the SP program will become an important component for most GME core competency assessments. Finally, there is an increased interest in using SPs for high stakes testing at both course and programmatic levels.

#### **RESULTS**

Two bioterrorism-related clinical cases have currently been adapted to our curriculum.

The first case (shown in Figure 1) describes the release of *Yersinia pestis* in a bioterroristic act in the Louisville area (adapted from Snyder and Check<sup>3</sup>). In preparation for introducing SPs into a session at the University of Louisville, School of Medicine, it was presented as a pilot program for the AMSMIC (Association of Medical School Microbiology and Immunology Chairs) Educational Conference in Myrtle Beach

(2004). It utilized a Standardized Patient with moulage for bubonic plague (a bubo and necrosis) for the whole meeting setting with a physician presenting the material as described in (Figure 1). Two medical students asked the questions of the physician and then interviewed the "patient". The "patient" also walked among the meeting participants so they could see and touch the moulage. As the illness progressed, the "patient" decompensated rapidly and then we asked the meeting participants to turn their attention to a METI human patient simulator,<sup>10</sup> which provided a physiological model for the disease. The medical students resuscitated the simulator, using skills that they had learned in their local Advanced Cardiac Life Support training course. This presentation was highly received at the AMSMIC meeting. When the same case was then presented for the first time at the University of Louisville School of Medicine to the 2<sup>nd</sup> year class (95 students) by a physician using the EBS method and a Standardized Patient circulating, the response was equally high (Figure 2) and suggests that this is indeed a viable method for presenting bioterrorism information to medical students.

The second case (Figure 3) represents smallpox, contracted by a missionary on service in a Mid Eastern country and was presented to small groups of 25 to 30 medical students, using senior students as the discussion leaders. The Standardized Patients circulated through each room and presented all three stages in the smallpox infection cycle, demonstrating high fever, lower back pain and facial lesions, as the case was being developed. For this case, the medical students filled out worksheets for course credit, as described in the Material and Methods section. A review of the student worksheets revealed that the medical class bifurcated into two distinct groups. Those students who listed more and detailed questions for the fourth year students also ordered more tests, while those with few questions ordered less and less specific laboratory tests. Those students who asked more and ordered more may excel in those areas or may have been more engaged in the exercise. Verbal feedback from the students indicated that the exercise was more enjoyable and would be remembered more vividly than a standard didactic lecture. The class of 124 (with 117 responding) rated the exercise at 4.1 on a scale of 1 to 5 with 5 being best. The microbiology questions on the Block Test on the bioterrorism agents discussed in these cases revealed that the class averaged at 82% correct answers.

To further aid in the presentation of this material, a video was constructed using Standardized Patients with moulage to demonstrate smallpox and differentiate from chickenpox. This was shown at the AMSMIC meeting and is regularly shown at the University of Louisville in the context of the course and has been distributed to other medical schools. ([Attached video clip](#)).

Both of these cases could be made more challenging for students by incorporating the use of the human patient simulator,<sup>10</sup> which is programmed to simulate late stages in both of these diseases, and which would require extensive intervention by the students to treat the patient, as we demonstrated at the AMSMIC meeting.

## DISCUSSION

This investigation has served as a pilot for integrating bioterrorism-related material in a meaningful way into the curriculum of the Medical Microbiology and Immunology course at the University of Louisville School of Medicine. We have also determined the value and any restrictions to using Standardized Patients as a teaching and learning tool in basic science courses in general. Based on our results, we believe the activities and learning situations outlined in this manuscript provided the medical students with an active learning situation that enhanced their educational experience in general and learning points about bioterrorism specifically. The use of the video on poxviruses, coupled to small group or large group sessions using SPs and the cases outlined above could constitute the start of a solid bioterrorism-related curriculum for any medical school. Also, development of other clinical cases, illustrating different, dangerous organisms will provide variety as well as additional exposure to this information.

In addition, we will continue to implement SPs into Medical Microbiology and Immunology and other basic science courses and further experience will allow us to streamline the use of this tool for the better education of our students at the University of Louisville.

## CONCLUSIONS

This manuscript introduces a relevant, potential addition to the curricula of most of our medical schools. The use of standardized patients amplifies the opportunities for presenting bioterrorism-related material to the medical students and adds a striking visual component to their experience. Coupling the use of the SPs to small group discussion, as done by the EBS methodology makes this material more memorable, interesting, and educationally relevant.

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