COMMUNITY-ACQUIRED METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS

E. Rubinstein1, M.R. Mulvey1,2, G.R. Golding1,2, T. Stewart2,
1Department of Medical Microbiology and Infectious Diseases, Faculty of Medicine, University of Manitoba, Winnipeg, Canada, 2National Microbiology Laboratory, Public Health Agency Canada, Winnipeg, Canada

INTRODUCTION

Community-acquired methicillin-resistant Staphylococcus aureus (CA-MRSA) is an increasingly frequent cause of skin infections that are resistant to commonly prescribed antibiotics. CA-MRSA refers to an MRSA infection with onset in the community of an individual without any established MRSA risk factor such as recent hospitalization, surgery, residence in a long-term facility, or presence of invasive medical devices. In Canada - CA-MRSA was first reported among an Aboriginal community in Alberta in the 1980’s: the prevalence of CA-MRSA in the general population is unknown but it is considered low; the rates of hospitalizations of MRSA infected patients have increased from 1/1000 admissions in 1999 to 3/1000 in 2006 and the rate of MRSA isolation from 4 to 8/10000 admissions (CNISP). In Northern Saskatchewan, the rates have increased from 8/10 000 in 2001 to 144/10 000 in 2006 (Golding). CA-MRSA 7 (USA 400) is the most common strain.

In a specific Nunavut community, between August 1, 2006 to December 31, 2007, there were 132 lab-confirmed cases of CA-MRSA within the community, representing 6.5% (132/2060) of the community’s population. Laboratory confirmed cases of CA-MRSA are just the tip of the skin and soft tissue infection (STI) iceberg. Some infected individuals did not seek medical assessment. It is believed that syndromic STIs may be up to 7 times more frequent than lab-confirmed CA-MRSA cases. In many individuals, recurrent infectious episodes have occurred. Some patients have been medically evacuated to tertiary centres for treatment. CA-MRSA infections also have resulted in death.

In Nunavut, an increase in the number of laboratory-confirmed cases of MRSA has been observed since December 2006 in a specific community (CCDR). Since then, the number of cases in this community in Nunavut has further increased (~300 in February 2009). Most CA-MRSA cases occur in specific households.

Epidemic curve of laboratory-confirmed CA-MRSA cases in a community in Nunavut by week of specimen collection date, (n = 43) (A Dallo, J Sobel, C Palacios et al. CCDR 2008; 24:05)

NASAL MICROFLORA/NATURAL HISTORY

Rationale: Nasal carriage of S. aureus has been identified as a significant risk factor for infection by S. aureus, with 20-30% of healthy adults being colonized at any given time. It is currently not known 1) to what extent the indigenous microbiota of the anterior nares plays in preventing CA-MRSA colonization, 2) how the nasal microbiota is altered following CA-MRSA colonization, 3) the effects of antimicrobial treatment, both topical and systemic, on CA-MRSA and indigenous microbiota, 4) length of CA-MRSA carriage, and 5) are there other body sites that play a carriage role.

Details: Microbes obtained from screening nasal swabs will be studied using state-of-the-art genetic techniques to determine what changes occur to the microbial community when CA-MRSA is present or when antibiotics are administered. In better understanding of these processes, it is hoped that we can learn how to prevent CA-MRSA nasal colonization thereby limiting further transmission of this organism within the community.

OBJECTIVE

A two tired cross-over multi-prong intervention in a community of ~2000 inhabitants in Nunavut with the objective: to examine if treating all members of an afflicted household, both patients and non-patient carriers, can decrease the number of infections caused by CA-MRSA as well as the number of nasal carriers of CA-MRSA.

METHODS

Identification of stakeholders:
- Community (nurses, health committee, community members, chief and band)
- Nunavut Department of Health and Social Services
- Nunavut Department of Education
- Public Health Agency of Canada (PHAC) • National Microbiology Lab (NML)
- Community Acquired Infections Division (CAID), Centre for Communicable Diseases and Infection Control • University of Manitoba (Infectious Diseases Section, Department of Pediatrics, Northern Medical Unit)
- First Nations & Inuit Health Branch, Health Canada
- Northern Secretariat, Health Canada

PRE INTERVENTION STEPS

1. Obtaining approval for the study from the various Ethics Boards (University, Nunavut Public Health, FNHBC, Chief and Council etc.)
2. Approval of the Community
3. Securing funds
4. Recruitment of local health-workers
5. Pre-intervention epidemiological CA-MRSA data update
6. Control and intervention arms will receive general education in hygiene through a. “Germs Away”: a program aimed at educating grades 4-6 on proper hand hygiene and cough etiquette developed at the NML with funding from CIHR.
   b. “Do Bugs Need Drugs”: a program developed in Alberta aimed at educating kindergarten aged children about infections with antibiotics are administered. In better understanding of these processes, it is hoped that we can learn how to prevent CA-MRSA nasal colonization thereby limiting further transmission of this organism within the community.

INTERVENTION STEPS

1. Dividing the community randomly according to afflicted house holds to an intervention arm and a control arm.
2. Careful monitoring and recording SSI morbidity in the nursing station
3. Monthly nasal swabs for CA-MRSA and other bacterial
4. Administering a questionnaire for monthly response
5. Intervention group will receive an intense monthly educational program on:
   a. Important messaging on how to recognize SSTI and to prevent transmission
   b. Implementation of activities within the schools such as hand washing and cleaning of environmental surfaces should also be simultaneously implemented
   c. Programs developed in the particular community with participation of community members
6. Intervention arm will receive:
   a. Individual pocket bottles hand cleanser containing alcohol/chlorhexdin solution with directions on how to use
   b. Weekly soap and paper towel supply and monitoring of house water supply
   c. Instruction of sheet change, individual use of bed, mattress and blankets
   d. Individual bath towel
   e. Cleaning of bath and shower between users
7. If nasal cultures are positive after 4 months of the intervention and CA-MRSA associated SSTI still appear in the intervention household (>1), antibiotic decontamination of the household will be started with Mupirocin nasal ointment and administration of Septra and rifampin for 10 days each of the subsequent months to reduce casual carriage of MRSA and nasal swabs continued.
8. Nine months following start of the control arm will start receiving the intervention, and both arms followed for nine months.

Schematic time course of intervention and control arms