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Strategies to Control Community-Associated Antimicrobial Resistance Among Enteric Bacteria and MRSA in Canada:

A Comprehensive Review

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Strategies to Control Community-Associated Antimicrobial Resistance Among Enteric Bacteria and MRSA in Canada:

A Comprehensive Review

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Executive Summary

Resistance to antimicrobial drugs is a concern that exists worldwide and has a significant impact on human and animal health. Knowledge and practice gaps exist around the control of antimicrobial resistant infections in Canada, particularly in the community setting. Although much research exists on the control of hospital-acquired resistant infections, currently, no comprehensive synthesis or review of the literature exists on the control of antimicrobial resistant organism infections within the community. In particular, there is little synthesis of information on those infections which represent a large component of community-level impact, namely resistant enteric bacteria and community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA); these infections pose a significant health burden to Canadians.

In addition to representing a significant human health impact in the Canadian community, enteric bacteria and MRSA have similar spread and control mechanisms (e.g. hygiene and hand washing, sanitation, housing density and crowding, person-to-person spread, animal exposure), thus representing areas for common policy, intervention, and other control activities.

The objective of this work was to conduct a formal, comprehensive review of control strategies and interventions available to reduce both the development of antimicrobial resistant enteric bacteria, specifically *Campylobacter spp.*, *Salmonella spp.*, verocytotoxigenic *Escherichia coli*, and *Shigella spp.*, and CA-MRSA and the spread of such infections within Canadian communities.

A comprehensive review was undertaken of the relevant peer-reviewed and gray English language literature from 1970 to present using a protocol based on systematic review methodology. A total of 1467 references were identified; of these, 563 met the abstract relevancy screening criteria and of these, 203 were reviewed in detail.



In general there was reasonable scientific evidence regarding risk groups and risk factors for CA-MRSA. This information provides some insight into potential approaches to control of these infections. Identified potential risk groups and risk factors include the following:

- Children
- Specific ethnic groups
- Athletes
- Drug use
- Men who have sex with men (MSM)
- Heterosexual high risk activities
- The military
- Veterinarians and animal handlers
- HIV infection
- Tattoo recipients
- Living with a carrier or case of CA-MRSA
- Emergency departments and hospitalized patients
- Antibiotic use

There was a paucity of information on risk groups and risk factors for the community acquired antimicrobial resistant enteric bacterial infections studied; some information exists on risk settings and risk factors for community acquired enteric bacterial infections (without reference to resistance) but the extent to which this can be extrapolated to resistant infections is unknown; much of this information takes the form of outbreak reports. Potential risk groups and risk factors for community–acquired antimicrobial resistant enteric infections include the following:

- Daycare centres
- Schools
- Households
- Nursing homes
- Immunocompromized individuals
- Specific sociodemographic factors (ie: rural residents, specific ethnic groups, income, education, access to health services)
- Population density
- Season



There is a paucity of scientifically-based information (RCT's or observational studies) on interventions for CA-MRSA or for the enteric bacterial infections studied – resistant or otherwise. A number of RCTs have shown the effectiveness of handwashing in the prevention of GI illness generally.

A limited number of intervention studies of hospital-acquired methicillin-resistant *S. aureus* (HA-MRSA) exist, however the extent to which the result of these studies can be extrapolated to CA-MRSA is unknown; such extrapolation may be misleading.

There is extensive literature concerning recommendations, guidelines and suggested approaches to the control of both CA-MRSA and, to a lesser extent, for enteric bacterial infections in community settings. Although the efficacy of these approaches is plausible, it has for the most part not been formally evaluated. Proposed approaches to control of these infections include the following:

- CA-MRSA
 - Hand and personal hygiene
 - Prudent use of antibiotics
 - Decolonisation
 - Early diagnosis and appropriate treatment
 - Education programs (hygiene; antibiotic use)
 - Regular cleaning and laundering in households and facilities
 - Equipment disinfection
 - Exclusion of those with active infection from certain high risk settings
- Community-acquired enteric bacterial infections
 - Hand, household and institutional hygiene
 - Equipment disinfection in high risk settings
 - Public and public health education
 - Early diagnosis and appropriate treatment
 - Exclusion of those with active infection from certain high risk settings

Formal evaluations of the efficacy of strategies for control of CA-MRSA and community acquired enteric infections (resistant and otherwise) are warranted and should form the basis for public health guidelines and policy. Until such time as such evaluations can be undertaken, recommendations for control of these infections must be dependent largely on historic practice, conventional wisdom, extrapolation from other contexts, consensus and conjecture.



Potential interventions that would warrant formal evaluation in various settings and groups include the following:

- Hand and personal hygiene
- Prudent use of antibiotics
- Decolonisation
- Early diagnosis and appropriate treatment
- Public education programs (hygiene; antibiotic use)
- Regular cleaning and laundering in households and facilities
- Equipment disinfection
- Exclusion of those with active infection from certain high risk settings

Ongoing collection and evaluation of information (including surveillance and epidemiologic studies) on the occurrence, settings, risk factors and risk groups for CA-MRSA and resistant enteric infections is warranted. Such information will be useful in determining disease trends, identifying risk groups, settings and risk factors and in identifying and evaluating potential interventions.

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