Premise

- Production of safe food involves intervention strategies to be implemented at all stages of production, from farm to fork
- Decision makers need information
- Scientific literature is a resource for this information
Premise

- Use of scientific literature to make informed decisions
  - Stumbling blocks
    - Lack of literature – difficult to find on a particular topic
    - Large body of literature – overwhelming quantity, conflicting conclusions

Systematic Reviews

- Method of identifying effective treatments or processes based on the available evidence from a variety of sources
  - Differ from traditional narrative or critical reviews of literature
  - Use transparent and replicable scientific methodology to collect, assess, and synthesize all available information on a subject.
  - Reproducible
**Rationale and Significance**

- **Used primarily to identify effective interventions to reduce disease burden.**
- **May also be used to**
  - identify knowledge gaps that target additional research
  - identify methodological strengths/weaknesses in the available research
  - encourage “best study practices” development for intervention research.

**Systematic reviews in health science**

- Abdominal decompression for suspected fetal compromise/pre-eclampsia
- Abdominal decompression in non-trauma patients
- Absorbable staples for uterine morcellation at cesarean section
- Absorbable synthetic versus autograft acellular dermal matrix for perineal repair
- Absorbent products for urinary incontinence and fecal incontinence in adults
- Acupuncture for preventing whiplash in children
- Acupuncture for osteoarthritic knee pain
- Acupuncture for knee pain
- Acupuncture for headache
- Acupuncture for reduction of labour
- Acupuncture for intra-articular pain
- Acupuncture for low-back pain
- Acupuncture for ending nausea
- Acupuncture for treating upper respiratory tract infections
- Addition of antihypertensive agents to thiazide diuretics for chronic arthrosis
- Add-on therapy for obstructive sleep apnea in children
- Aflibercept for fixed orthodontic brackets
- Adjunct chemotherapy for localized resectable soft tissue sarcoma in adults
- Adenosine for prevention of morbidity and mortality in preterm infants with cardiovascular compromise
- Antihypertensive drug for urinary incontinence in adults
- Advanced trauma life support training for hospital staff
- Advice on low-fat diets for obesity
- Advice to reduce daily salt for prevention of cardiovascular disease
- Advice to stay active as a single treatment for low-back pain and sciatica
- Atenolol-losartan for hypertension
- Atenolol for treatment of hypertension
- Atorvastatin for cardiovascular disease
- Atorvastatin for reduction of serum cholesterol
- Atorvastatin for treatment of hypercholesterolemia
Systematic reviews in public health

<table>
<thead>
<tr>
<th>Title</th>
<th>Year</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Meta-Analysis of Few Aspects: Implications for Effective Public Health</td>
<td>2001</td>
<td>Eng</td>
</tr>
<tr>
<td>Alcohol Education for Childbirth/Parenthood</td>
<td>2001</td>
<td>Eng</td>
</tr>
<tr>
<td>Antipathy Care Interventions for Community-Dwelling Elderly</td>
<td>2000</td>
<td>Eng</td>
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<tr>
<td>Electrometry Preparedness</td>
<td>2003</td>
<td>Eng</td>
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<tr>
<td>Child Pedestrian Safety</td>
<td>2003</td>
<td>Eng</td>
</tr>
<tr>
<td>Conclusions in Heart Health Promotion, Tobacco Use Reduction, and Injury Prevention</td>
<td>1999</td>
<td>Eng, FR</td>
</tr>
<tr>
<td>Community-Based Heart Projects</td>
<td>1999</td>
<td>Eng</td>
</tr>
<tr>
<td>Community-Based Interventions to Improve Child Mental Health: Review of Reviews</td>
<td>2002</td>
<td>Eng, FR</td>
</tr>
<tr>
<td>Community-Based Strategies to Promote Cervical Cancer Screening</td>
<td>2000</td>
<td>Eng</td>
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<tr>
<td>Effect of Exercise Training on the Wellbeing Pro. and Postmenopausal Women</td>
<td>2001</td>
<td>Eng</td>
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<tr>
<td>Effective of Patient Reminder/Interventions on Immunization Rates</td>
<td>2001</td>
<td>Eng</td>
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<tr>
<td>Effectiveness of Day Care Center Infection Control Interventions</td>
<td>1999</td>
<td>Eng, FR</td>
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<tr>
<td>Effectiveness of Dust Mite Control to Reduce Asthma Symptoms</td>
<td>2001</td>
<td>Eng</td>
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<tr>
<td>Effectiveness of Environmental Awareness Interventions</td>
<td>1999</td>
<td>Eng, FR</td>
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<tr>
<td>Effectiveness of State Supplementation for the Prevention of Neurogenic Tube Olfacts</td>
<td>2002</td>
<td>Eng, FR</td>
</tr>
<tr>
<td>Effectiveness of Food Safety Interventions</td>
<td>2001</td>
<td>Eng, FR</td>
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<tr>
<td>Effectiveness of Health Promotion Interventions in the Workplace</td>
<td>2001</td>
<td>Eng, FR</td>
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<tr>
<td>Effectiveness of Home-Based Support for Older People</td>
<td>2001</td>
<td>Eng, FR</td>
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<tr>
<td>Effectiveness of Interventions to Promote Healthy Eating in Pre-school Children Aged 1 to 5 Years</td>
<td>2001</td>
<td>Eng</td>
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<tr>
<td>Effectiveness of On-Line Health Information for Consumers</td>
<td>2002</td>
<td>Eng, FR</td>
</tr>
<tr>
<td>Effectiveness of Parenting Groups With Professional Involvement in Improving Parent and Child Outcomes</td>
<td>1999</td>
<td>Eng, FR</td>
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</tbody>
</table>

Systematic reviews in microbial food safety

Use of a systematic review to assist the development of *Campylobacter* control strategies in broilers
- Adkin et al., 2006

Very few!!
Systematic vs Traditional Review

- More focused study question
- Explicit and comprehensive search strategy
- Articles are selected according to uniformly applied and specified criteria
- Quality of articles is formally, rigorously and consistently assessed
- Quantitative summary if possible

Systematic Review Process

1. Relevance Screening
2. Literature Search
3. Quality Assessment
4. Data Extraction
5. Data Synthesis
6. Written Report
7. Study Question
Development of a Focused Study Question

- Question clearly defined *a priori*
  - Population
  - Intervention
  - Outcome
  - Specifies the system level or sector of agriculture to be reviewed

- Form a panel of content experts.
  - The subject of interest is formulated into a specific, answerable question.
Literature Search

- Generate a complete list of all primary research that is relevant to the question
  - Search terms based on
    - Population
    - Intervention
    - Outcome
    - Agricultural sector

Literature Search

- Published literature
  - Searched using exhaustive list of search terms in multiple electronic databases
  - Hand searching of journals
- “Gray” literature (completed but unpublished)
  - Scanning the internet
  - Electronic and hand searching conference proceedings
  - Contacting researchers, national and international experts in the field
Screening Abstracts for Relevance

- Determine if an article has potential to answer study question through a relevance screening tool
- *A priori* criteria for subject relevance and inclusion of material into the review
- Series of questions are answered based on information in abstract
- At least two reviewers independently access each article
Quality Assessment of the Relevant Literature

- Second, stricter level of screening using full copies of articles
- Standardized procedure for each type of study design is used to evaluate each article
- All relevant literature is reviewed by at least 2 members of the panel using the standardized protocol

Quality Assessment of the Relevant Literature

- Basis of Assessment
  - Study objectives
  - Population
  - Intervention
  - Outcome assessment
  - Withdrawals
  - Data analysis
  - Conclusions
Levels of Evidence

1. Systematic reviews
2. Randomized clinical trials
3. Cohort studies
4. Challenge studies
5. Case-control studies
6. Cross-sectional studies
7. Descriptive studies, case reports, expert committees

Data Extraction

- Data from papers deemed acceptable is extracted and used to assess the overall evidence for the efficacy of the intervention(s) under evaluation.
- Development of a data repository for the qualified articles so that the data can be summarized and/or analyzed.
Data Extraction

- Extracted information
  - Descriptive data
  - Study characteristics
  - Study results

Data Synthesis

- Summarization of results from primary studies that met quality assessment
  - Qualitative methods
  - Quantitative methods when possible
Data Synthesis

- Data is presented so that similarities and differences between the studies and the level of evidence can be visualized.
- Results are presented to show if intervention is consistent and effective.

<table>
<thead>
<tr>
<th>Article and Data Management</th>
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<tbody>
<tr>
<td>Data management challenge</td>
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<tr>
<td>Initial large volume of abstracts</td>
</tr>
<tr>
<td>Movement of literature through multiple stages of evaluation</td>
</tr>
<tr>
<td>Use of reviewers from multiple institutions</td>
</tr>
<tr>
<td>Web-based systematic review project management software is very useful (essential?)</td>
</tr>
<tr>
<td>SRS Version 3.0 Powered by TrialStat</td>
</tr>
</tbody>
</table>
Article and Data Management

- Data from literature searches loaded into a web-based program
- Program contains the standardized protocols
  - Abstract screening
  - Quality assessment
  - Data extraction
- Individual reviewers
  - Unique login
  - System provides reviewers with a list of abstracts or articles to review

As reviewers complete tasks, the system
- Automatically tracks the movement of articles through the system
- Tracks progress of individual reviews
- Identifies discrepancies in responses between reviewers
Current initiatives: Systematic reviews

- Development of a structured format for conducting systematic reviews for microbial food safety research, develop a “how to” manual (FSRRN)
- On-farm interventions for Salmonella in pork, Iowa State (FSRRN)
- Pre- and post-harvest interventions for Salmonella in broilers, Mississippi State (FSRRN)
- On-farm interventions for E. coli O157 in cattle, McMaster University (PHAC)
- Evidence for association between Johnes and Crohn’s disease, PHAC (PHAC)

Dr. Jan Sargeant
McMaster’s University

Systematic Review of Intervention Strategies in Broilers

- Objective
  - Determine which intervention strategies, management practices, or production practices throughout the production continuum will reduce or eliminate Salmonella in broilers

- Multiple study questions
  - “Does … [Intervention] … reduce or eliminate Salmonella in broilers at … [Stage of Production or Processing] … ?
Systematic Review of Intervention Strategies in Broilers

- Search terms
  - Salmonella and (broiler or layer or laying or poultry or chicken) = 13,099 citations
  - Salmonella and (broiler or layer or laying) = 3,729 citations

- Databases
  - 18 electronic databases

- “Gray” Literature
  - Specific journals, conference proceedings, symposia
Acknowledgements

- McMaster's University
  - Dr. Jan Sargeant
- Mississippi State University
  - Dr. Hart Bailey
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- Iowa State University
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  - Dr. Jim McKean
- FSRRN
  - Dr. Jay Levine
- USDA Food Safety CAP
  - Dr. Mary Torrence