Phenotypic and Genotypic Characterization of Antibiotic Resistance Integrons in *Salmonella enterica* serovar Newport

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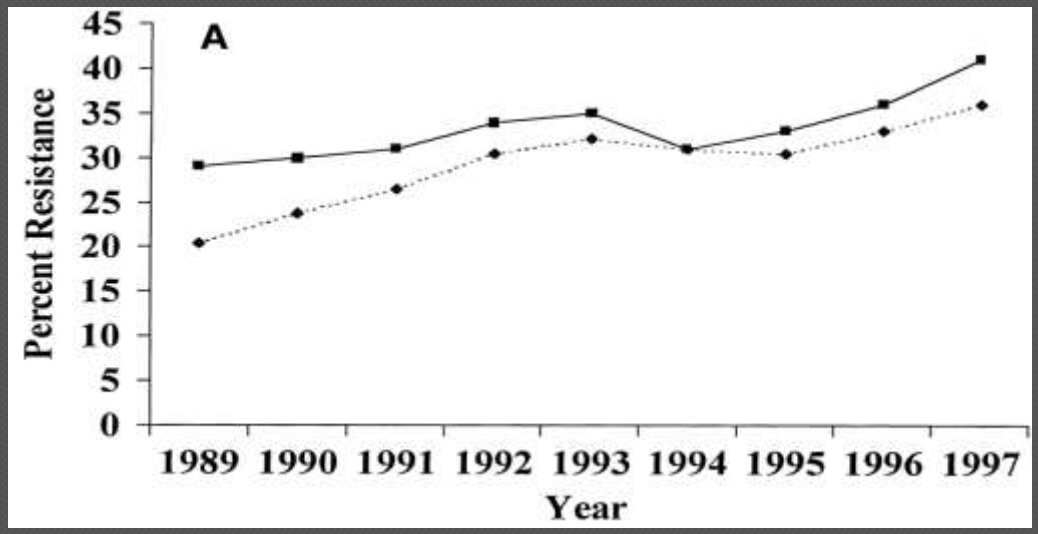
Salmonella Introduction

- *Salmonella enterica*
- Infection
  - Diarrhea
  - Fever
  - Cramps
    - Supportive Treatment
  - Sepsis
    - Antibiotic use required
  - Around 550 food-borne related deaths per year (Mead et al. 1999)

Antibiotic Resistance

- What does it mean?
- How often does it occur?
  - Resistance rates on the rise

Patients Infected with Methicillin Resistant *Staphylococcus aureus*



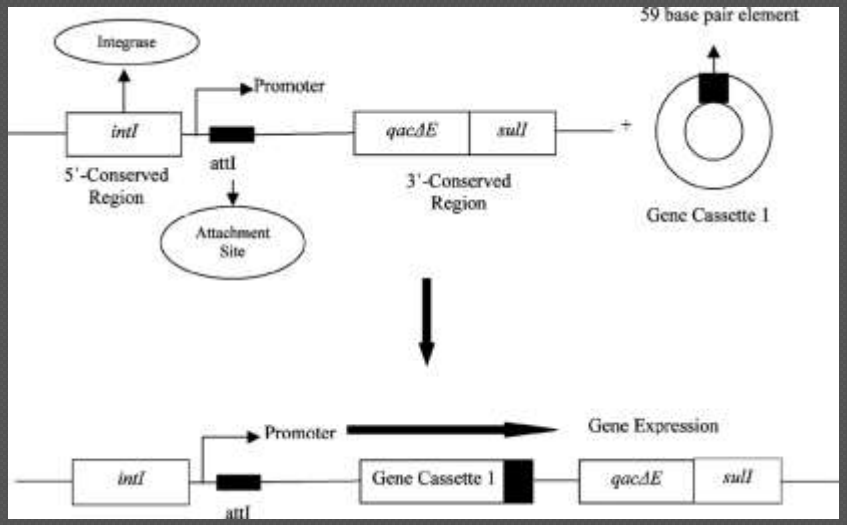
(Fridkin et al, 1999)

Antibiotic Resistance

- What causes Antibiotic Resistance?
  - Selective Pressure
    - Over prescription of antibiotics
    - Misuse of antibiotics
    - Emphasis on development of chronic medicine rather than antibiotics
  - Naturally occurring
    - Lateral gene transfer and mutations
      - Plasmids
      - Integrons

Integrons

- What is an Integron?
  - Mobile DNA
    - Random genome insertion
  - Conserved Sequences (CS)
  - Genes Cassettes Inserted Between CS



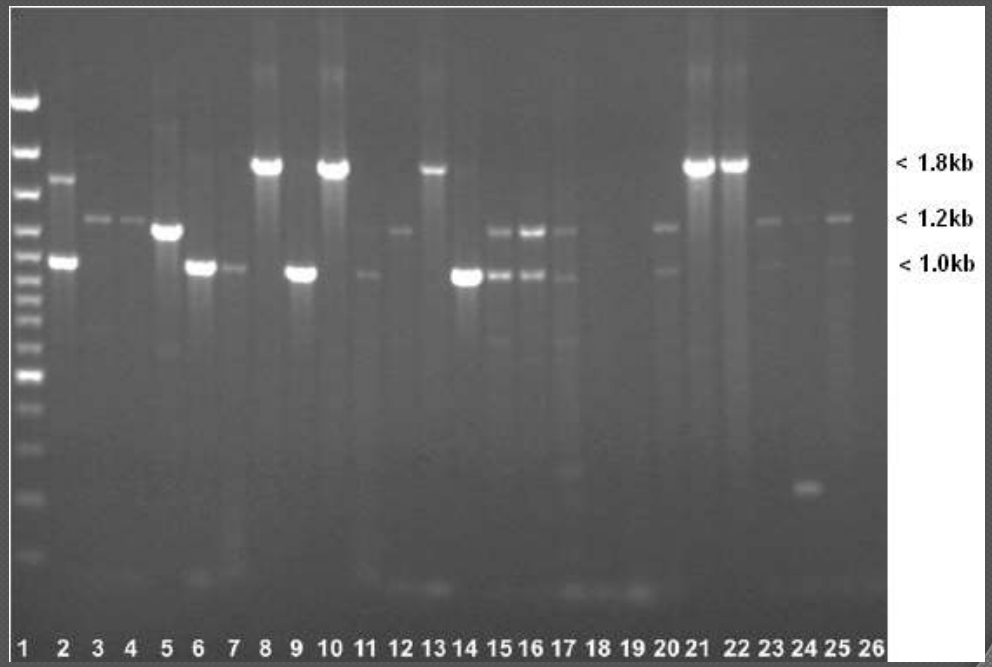
(Harbottle et al. 2006)

Previous Study

	SN1	SN2	SN3	SN4	SN5	SN6	SN7	SN8	SN9	SN10	SN11	SN12	SN13	SN14	SN15	SN16	SN17
Cephazolin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Penicillin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Polymyxin B	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Cephalothin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Ampicillin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Amikacin	S	S	S	S	R	S	S	S	S	S	S	S	S	S	S	S	S
Sulfamethazole W/ Trimeth	R	S	S	R	I	S	R	S	R	S	S	R	S	S	S	S	S
Tetracycline	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Streptomycin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Naladixic Acid	S	S	S	S	R	S	S	S	S	S	S	S	S	S	S	S	S
Gentamicin	S	S	S	R	R	S	S	R	R	S	S	S	R	S	S	S	S
Erythromicin	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Neomicine	R	S	S	R	S	I	S	R	R	I	I	S	I	R	S	R	S

Previous Study

- *Salmonella enterica* serovar Newport
- Uncharacterized Integrons
  - 1.0, 1.2, and 1.8 kb

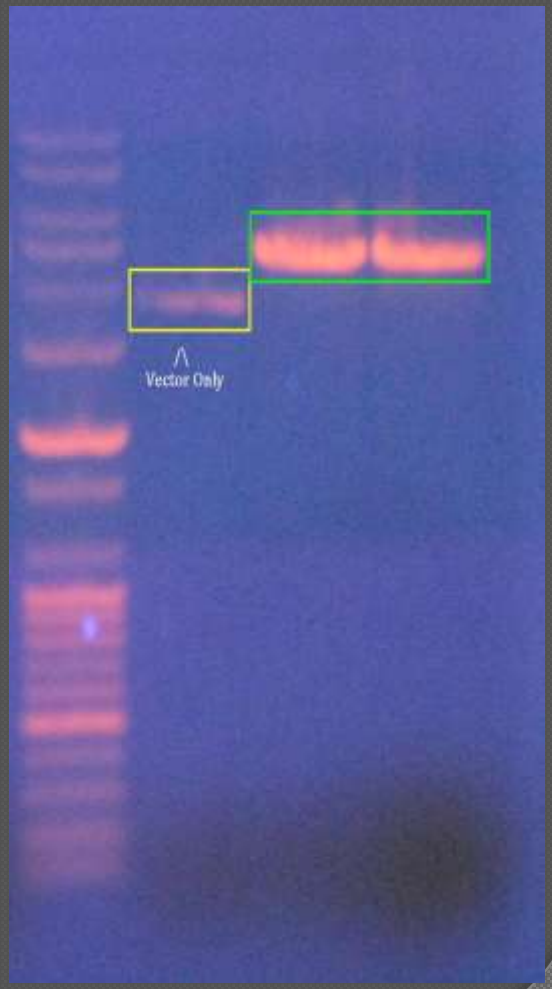


(Willford et al. 2007)

Previous Study

- 1.2 kb integron was sequenced and coded for Dihydrofolate Reductase conferring Trimethoprim resistance (Laroche, Pawlak , Berthe, Skurnik , and Petit 118-130)
- Conferred antibiotic resistance was confirmed with antibiotic testing

	EC	pET24	pE12S4-29
Trimethoprim plate (TSA with 5µg/ml of Trimethoprim)	NG	NG	G



Research Objectives

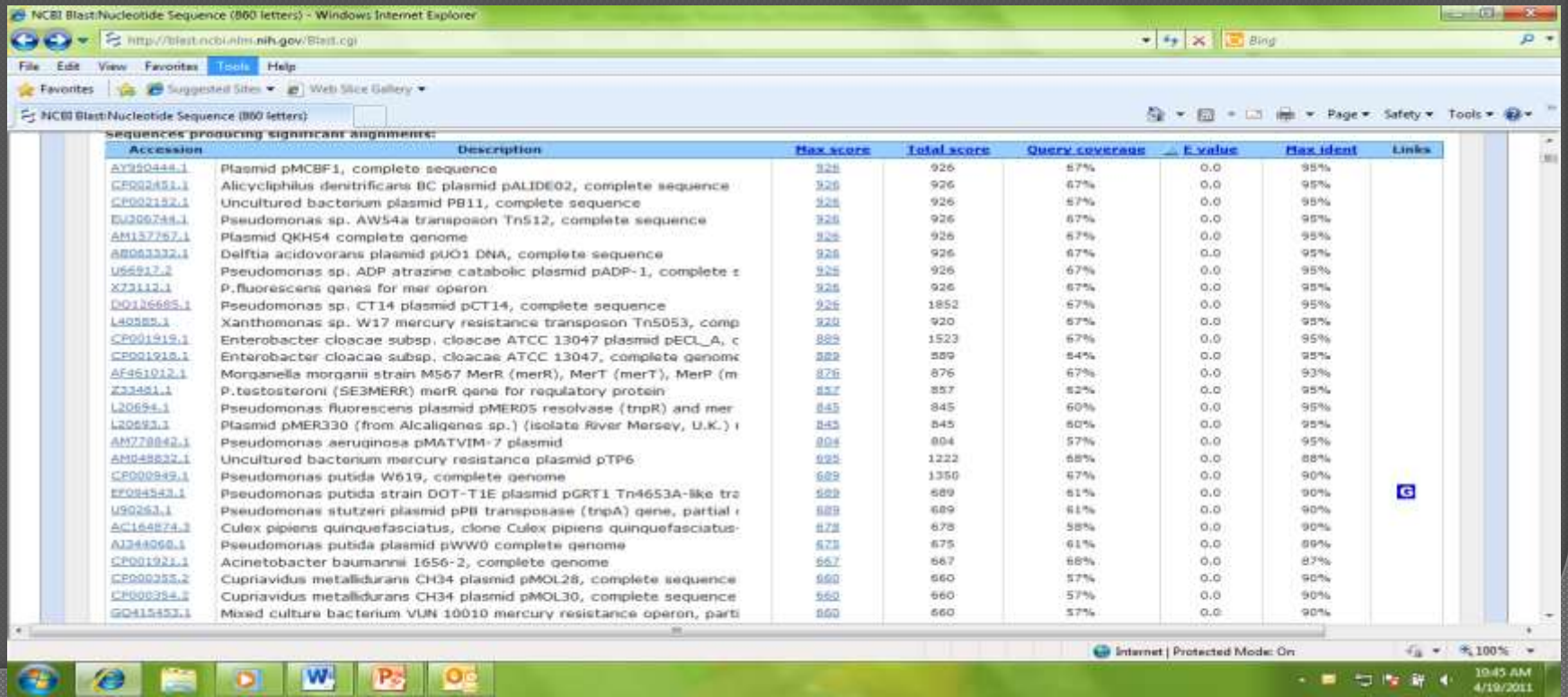
- Determine if trimethoprim resistance (1.2 kb) can be transferred between *Salmonella* strains, SN4 to PT30
- Characterize transferred genes for antibiotic resistance phenotypically and genotypically

Procedure

- SN4 (1.2 kb) and PT30 were grown individually
- Samples from each culture were then grown together in mixture, dilutions of the mixture were cultured on LB plates containing Naladixic Acid and Trimethoprim to select for PT30 containing the 1.2kb integron
- Transferred genes were sequenced

Results

- The 1.2 kb integron was not transferred from SN4 to PT30. A mercury resistance plasmid was transferred and sequenced.



Conclusions

- No proven transference of the 1.2kb integron gene cassette
- Identification of a mercury resistance gene cassette
  - Potential explanation for multiple resistance observed in SN strains

Future Work

- Characterize mercury resistance gene contribution to antibiotic resistance

- Cloning and sequencing of 1.8 kb integron
- Transformation of all three integrons in combination, i.e. 1.0 and 1.2, all three etc.
  - Establishment on antibiotic resistance profiles for combined transformants

- Movement of integrons between *Salmonella* species

References

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Questions

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