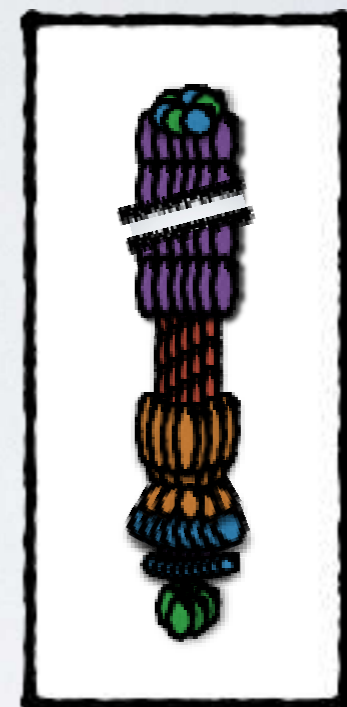
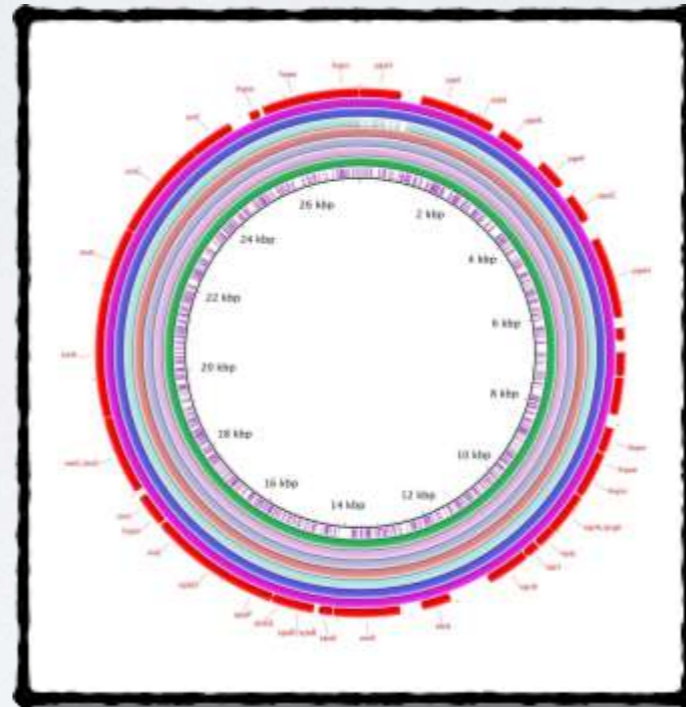
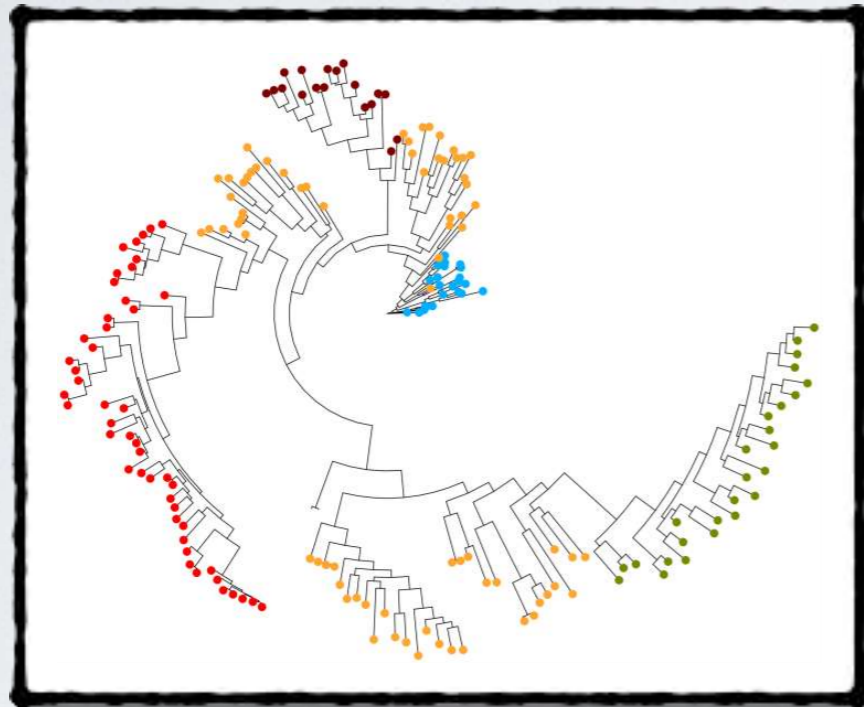


**A highly conserved complete accessory Type-III  
E. coli secretion system 2 (ETT2) is present in  
bloodstream isolates of the ST69 lineage**



**Stephen Fox**

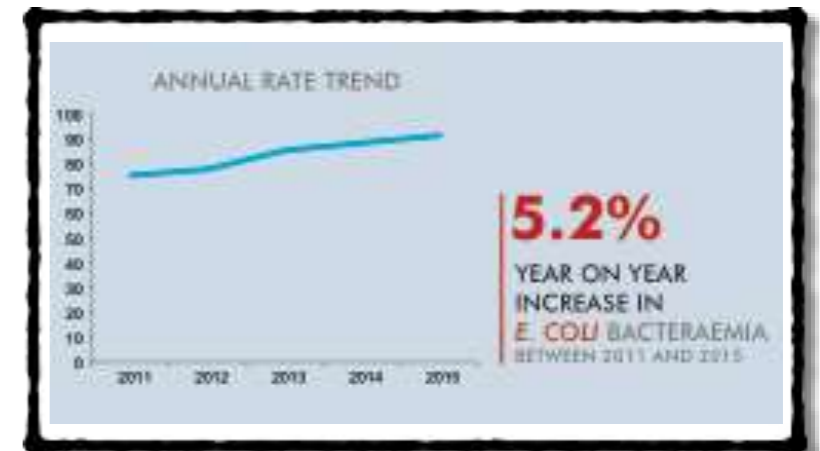


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of Glasgow



# E. COLI BACTERAEMIA

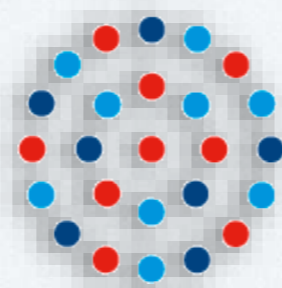
- The presence of bacteria in the blood, a blood stream infection (BSI)
- Estimated 300,000 E. coli bacteraemia cases in EU in 2016
- About 20,000 extra deaths and a million extra hospital bed days (EU)
- 2016 EU Estimated Incidence Rate is 56 per 100,000 population
- 2015 Scotland Incidence Rate is 86 per 100,000
- Rates are increasing 5.2% yearly in Scotland
- Worst case estimate for EU: 4-fold increase in coming years





# AIM

**Whole Genome Sequencing (WGS) with enhanced clinical data to investigate Host/Bacteria factors that contribute to bacteraemia in Scotland**



Health  
Protection  
Scotland



# WGS OF E. COLI STRAINS IN SCOTLAND

- 162 BSI isolates for Greater Glasgow & Clyde and Dumfries & Galloway Health Boards

- Hospital associated 59%

- Community associated 41%

- Catheter associated 16%

- Deceased 36%

- Strain Types:

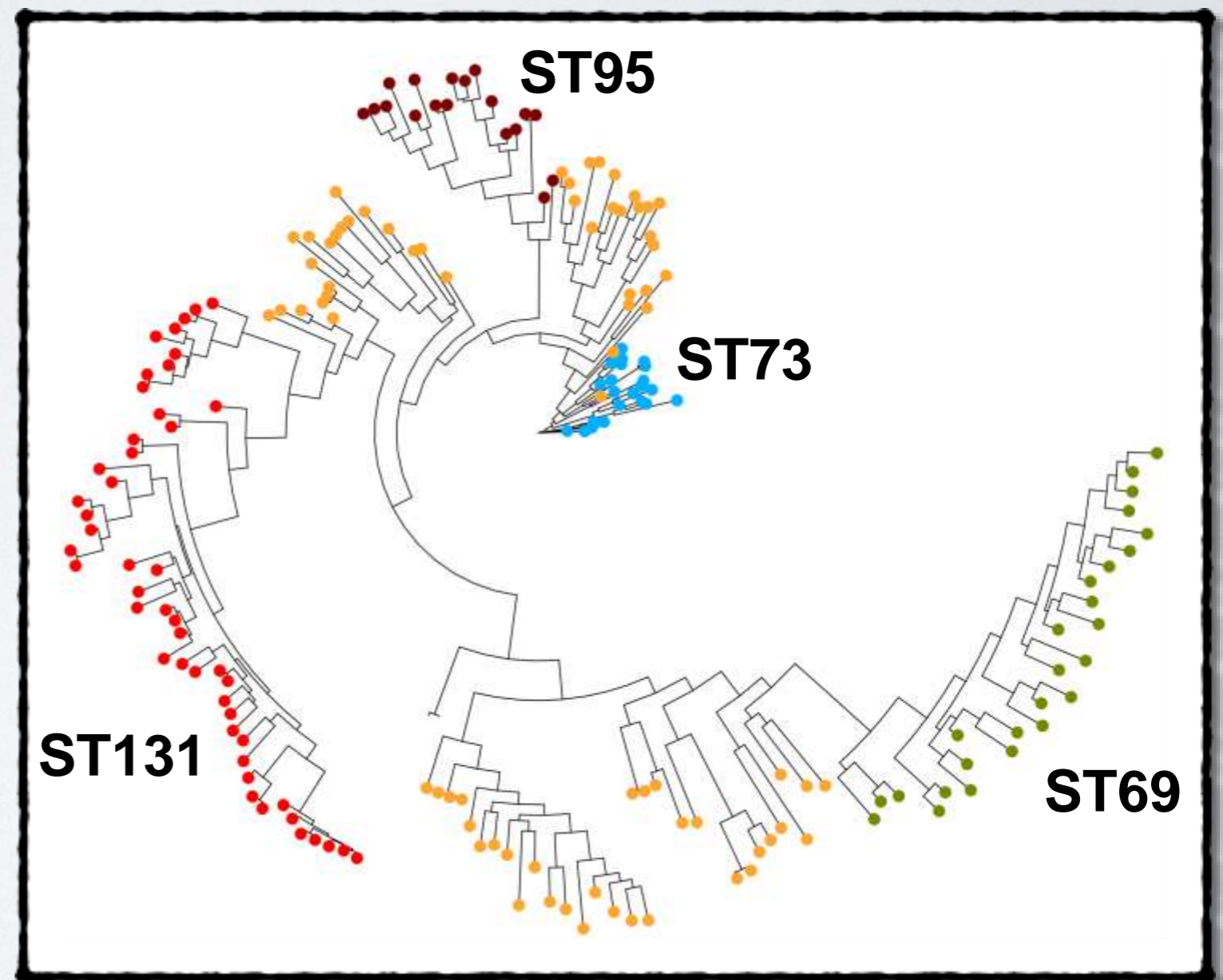
● ST131 24%

● ST69 16%

● ST73 13%

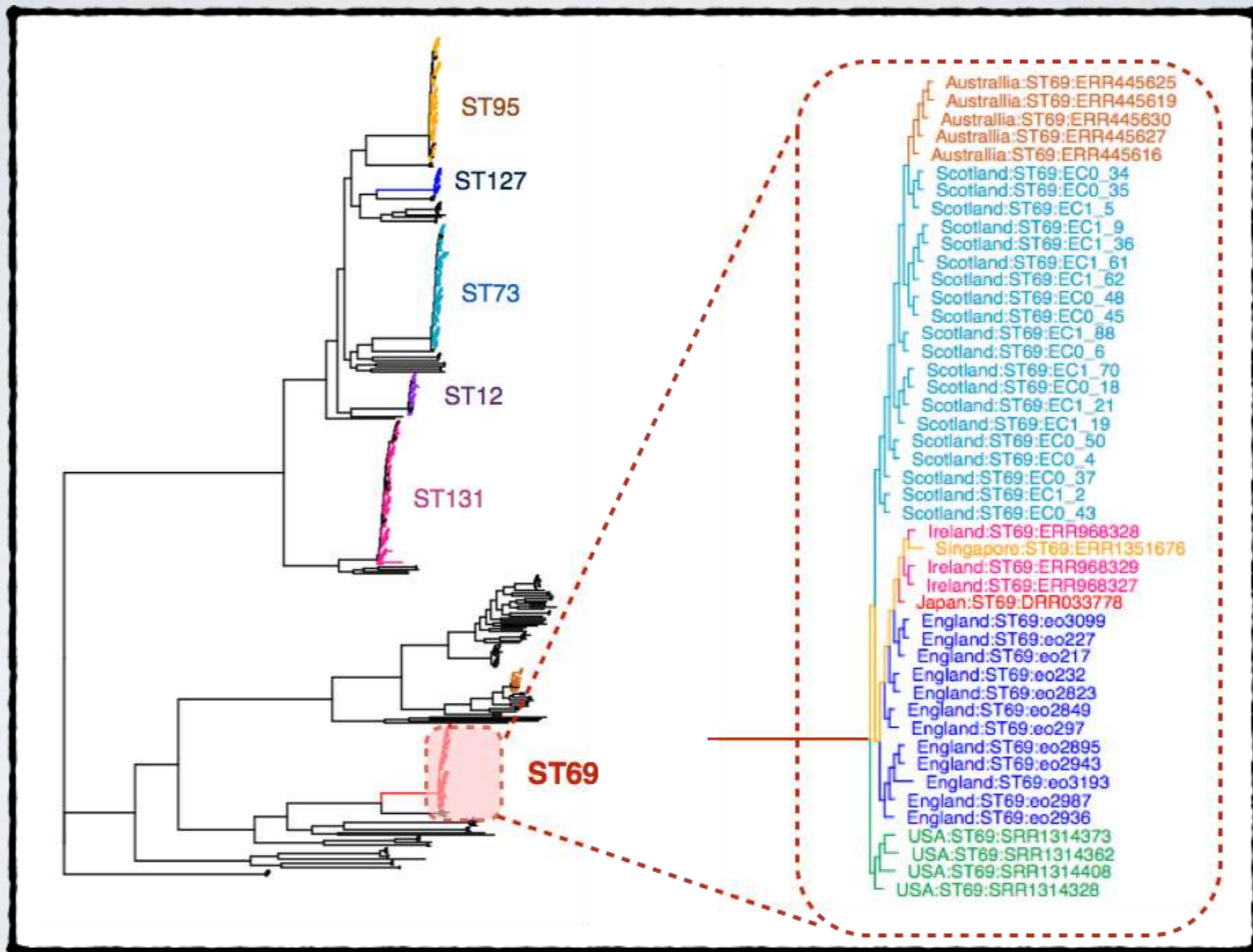
● ST95 9%

● Others 38%



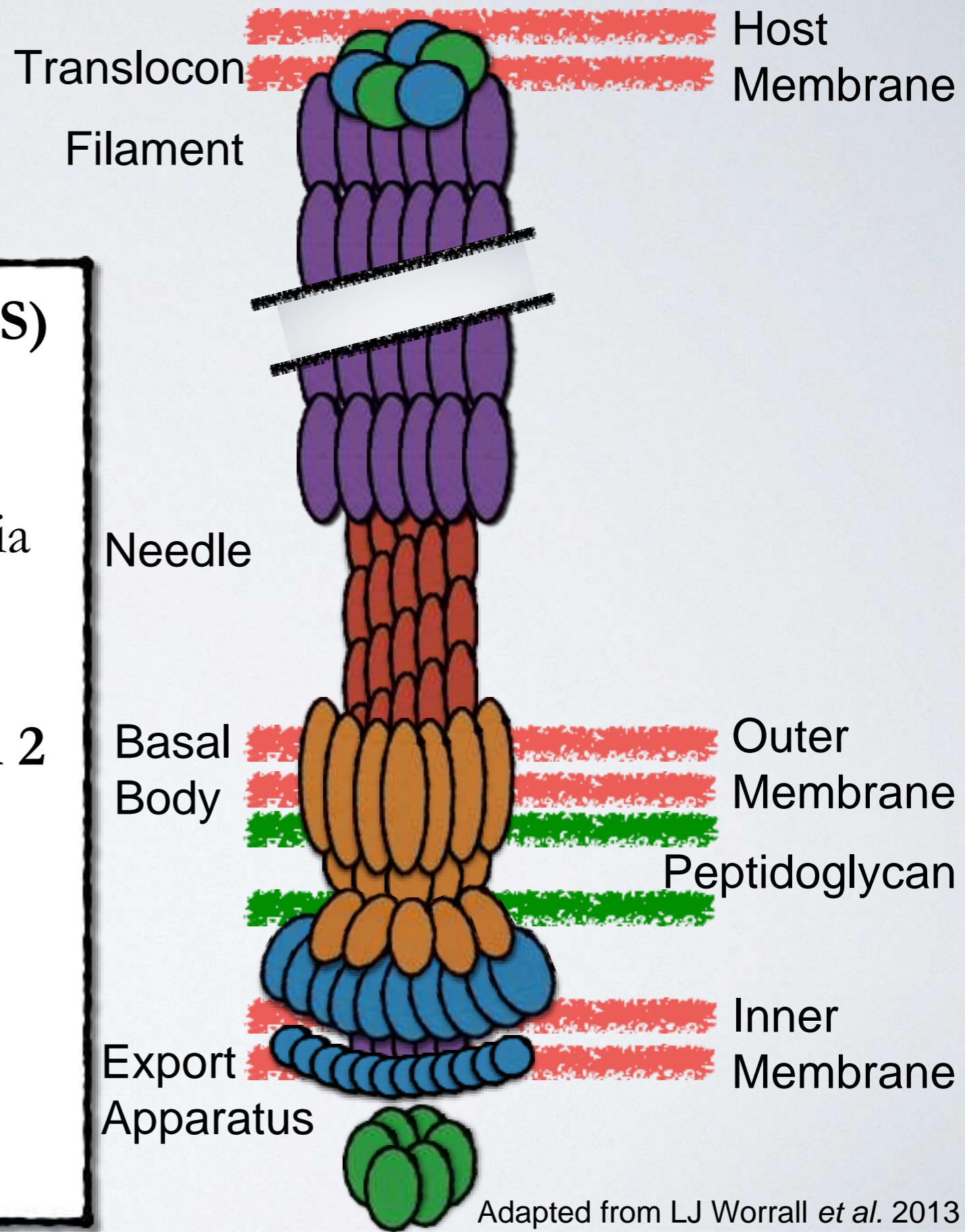


# CLONAL ST69 STRAIN



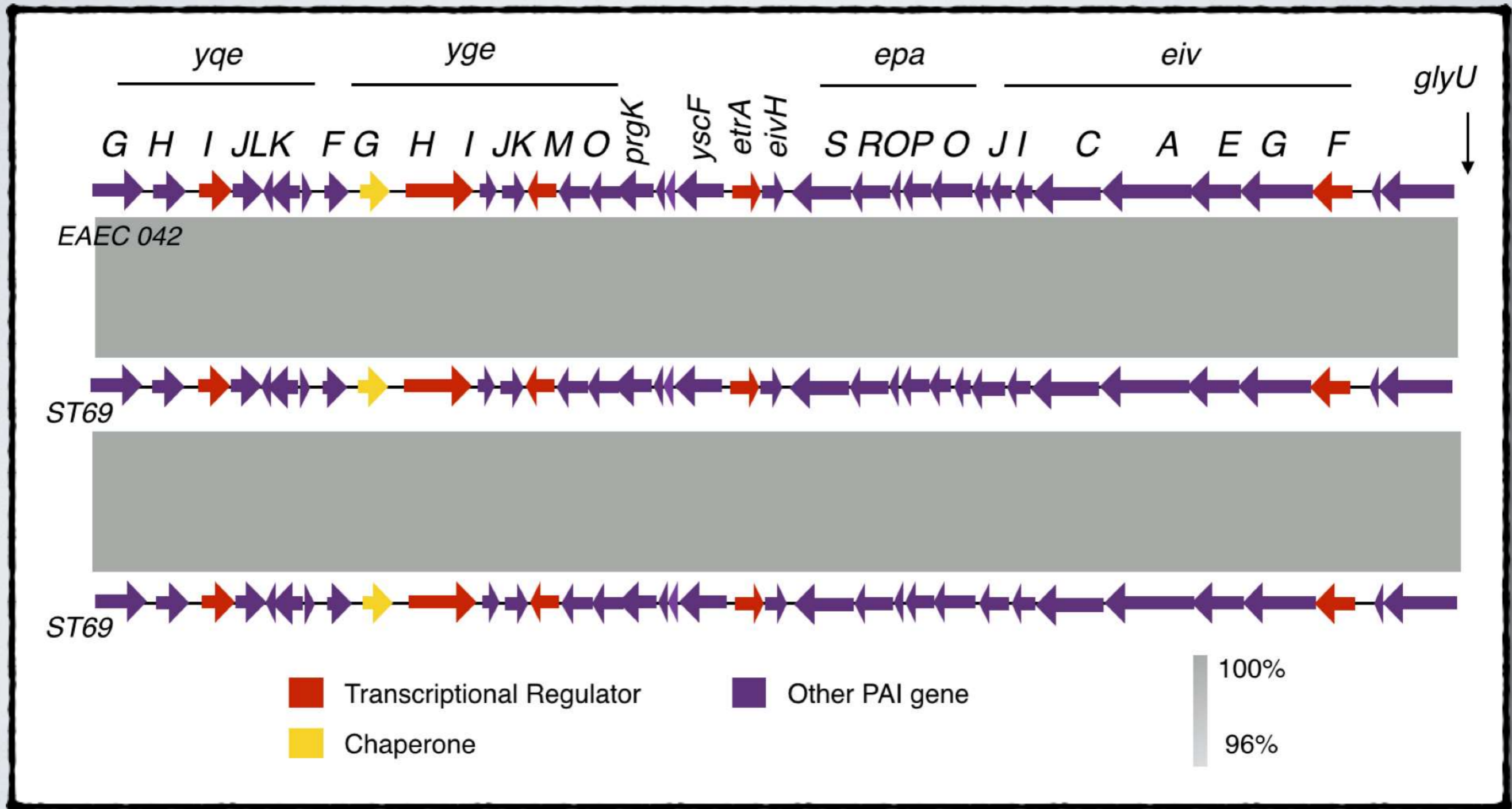
# WHAT IS ETT2?

- **Type-III Secretion System (T3SS)**
  - Gram -ve system for delivering effector proteins into host cell via Injectisome
- **E. coli type III secretion system 2**
  - Two Systems ETT1 and ETT2
  - ETT1 (LEE) → Injectisome
  - ETT2 function is unknown

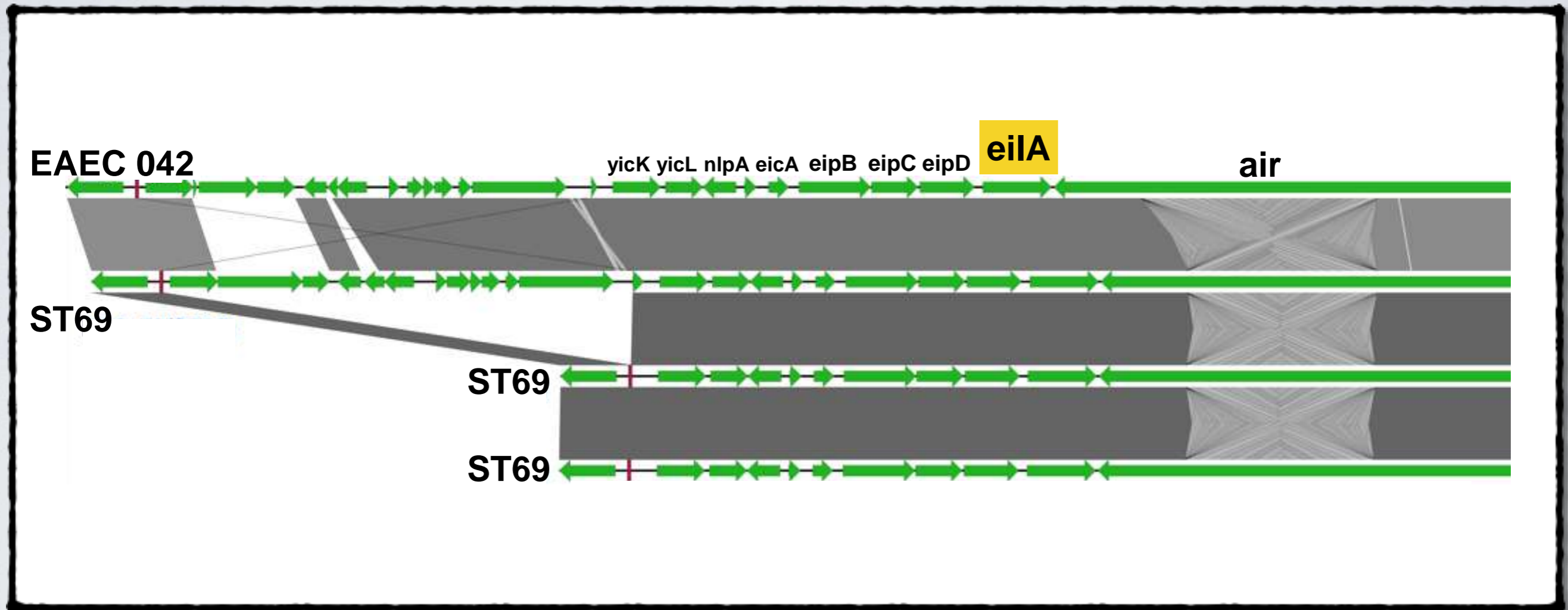




# ST69 STRAINS POSSESS INTACT ETT2 OPERON



# ST69 STRAINS ALSO POSSESS EIP OPERON

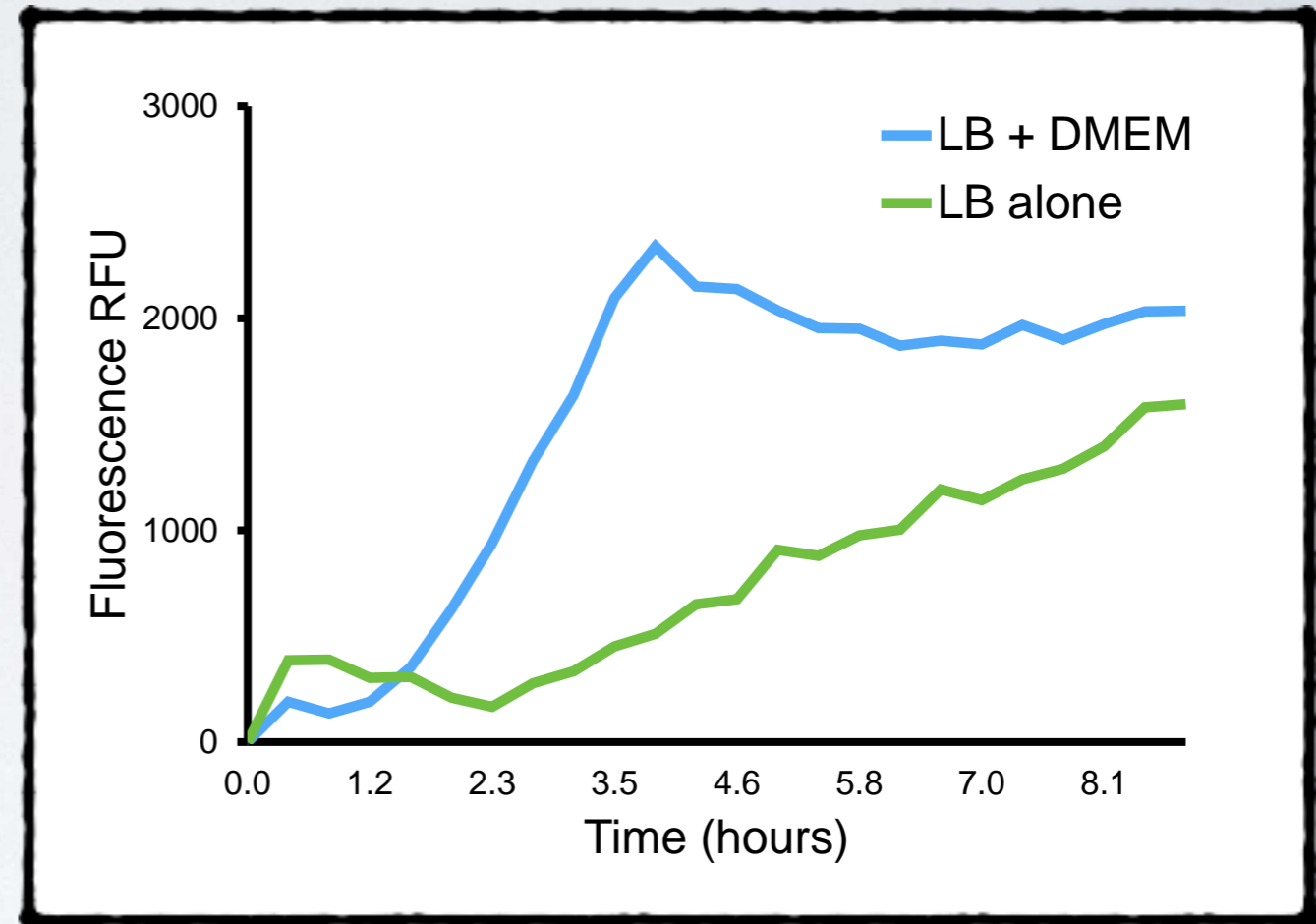


*eilA* “Master Regulator” of ETT2 System (Sheikh et al., 2006)



# IS THE ETT2 ACTIVE IN ST69?

- **eilA Reporter plasmid:**
  - **pAJR70 GFP Reporter plasmid (Roe et al., 2003)**
  - **~500bp region upstream of eilA promoter**
- **50/50 LB/DMEM activates ETT2 (Sheikh et al., 2006)**
- **LB/DMEM mix increases eilA activity in ST69 strains**
- **ETT2 is an active secretion system?**



# SUMMARY

- E. coli **Bacteraemias** are a serious and growing threat
- **ST69** present in 16% of Scottish isolates
- All contained intact **ETT2** system (**ETT2 & eip**)
- **Role of the ST69 ETT2?**
  - **Secretion system**
  - **Adherence**
  - **Regulates virulence**
- **Effect of ETT2 on E. coli bacteraemia?**



# THANKS TO...

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