MISSOURI DEPARTMENT OF
HEALTH &
SENIOR SERVICES

Salmonella enterica Outbreak in a NICU

Brooklyn White, MPH, CIC
HAI/AR Program Coordinator

Background

- Nontyphoidal Salmonella is a leading cause of foodborne illness with approximately 1.35 million infections a year
- Symptoms include fever, diarrhea, vomiting, nausea, abdominal pain
- Time between exposure to symptom onset typically ranges from 6-72 hours but can be as long as 16 days

It is estimated only 1 in 30 Salmonella cases get reported

Salmonella

- *Salmonella enterica* has over 2,500 serotypes including:
  - Enteritidis
  - Branderup
  - Newport
  - Cotham
  - Oranienburg
  - Javiana
  - Typhimurium



- Salmonellosis is individually reportable
- Outbreaks are also reportable

Facility Background

- Acute Care Hospital with a level III NICU
- Average daily census of 13
- NICU Unit has both rooms and bays, each area has a separate nurse's station

Initial Case Notification
Tuesday

- 3 patients in the Neonatal Intensive Care Unit tested positive for Salmonella

- Medical Records were requested as well as isolates to be submitted to the Missouri Public Health Laboratory
  - Medical record review indicated that the first patient onset was nearly 4 weeks prior

- Initial recommendations included increased cleaning across the unit as well as continued surveillance

Initial Questions

- Have any staff or visitors been ill with GI symptoms?
- Are the infants receiving formula, breastmilk, fortifier?
- How is milk/formula prepared?

The Next Day
Wednesday

- Notified 2 NICU staff had been ill with GI symptoms since the first infant onset
  - Reported diarrhea or vomiting that lasted 3-5 days both were excluded from work while ill and symptoms had resolved

- 2 additional infants tested positive for Salmonella

The Following Day
Thursday

- 2 additional infants tested positive for Salmonella, one asymptomatic
  - Tested all remaining patients admitted to NICU

- Notified that one of the case's family had 40 bearded dragons at home

Updated Information & Questions

- No clear links based on Formula, Breastmilk, or fortifier
  - 3 different formulas had been used across the cases
- Considering possible environmental contamination
  - Food preparations
  - Medical Equipment
- Was there overlapping staff with the ill patients?
- Where had the patients been in the unit?

The Next Week

- Onsite Infection Control Assessment and Response Conducted
- Another positive patient, this patient had been discharged from NICU days prior and represented with symptoms
- Initial Whole Genome Sequencing revealed initial specimens were serotype enteritidis
- Facility Conducted Environmental Samples

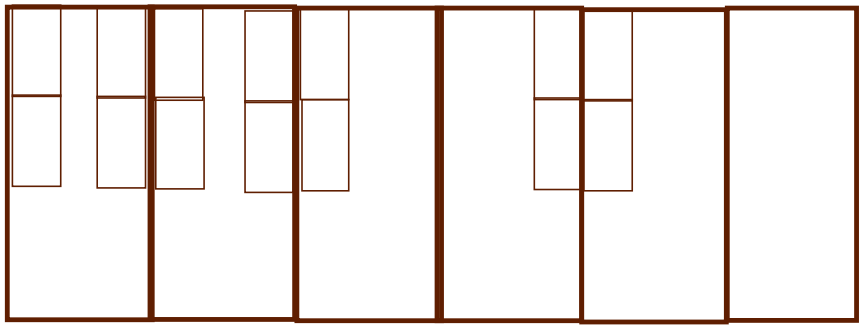
Epidemiology

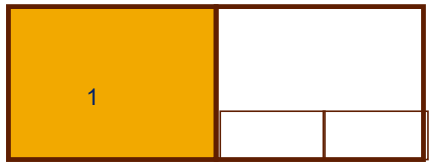
- Age at onset ranged from 6 days to 47 days (age adjusted PMA 34w4d to 26 days)
- Symptoms included fever (8/8), diarrhea (3/8), blood in stool (3/8), vomiting (1/8)

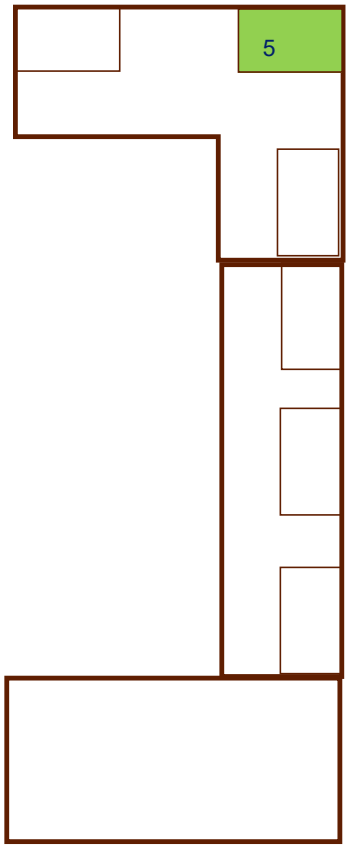
NICU Bed Trace

# Patient not Ill	Patient not Ill in room/bed previously (2 days)
# Patient Symptomatic	Patient Symptomatic in room/bed previously (2 days)
# Patient Tested Positive	Patient Tested Positive in room/bed previously (2 days)

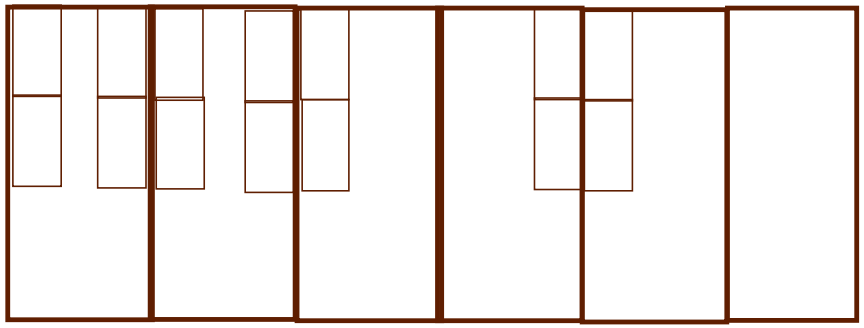
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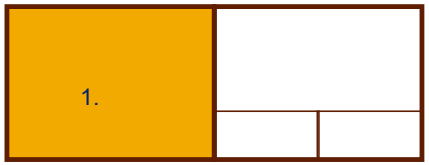


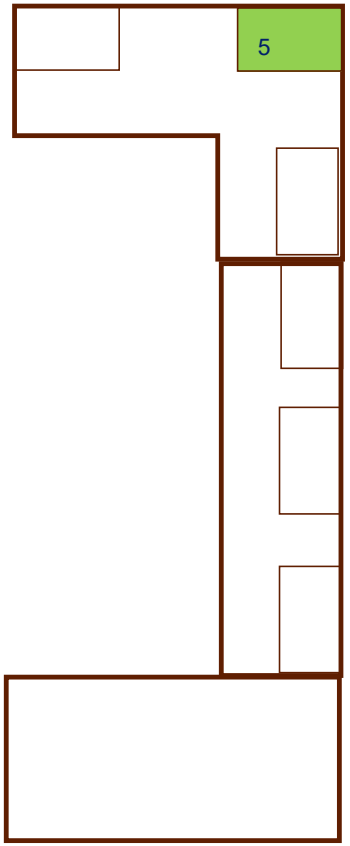




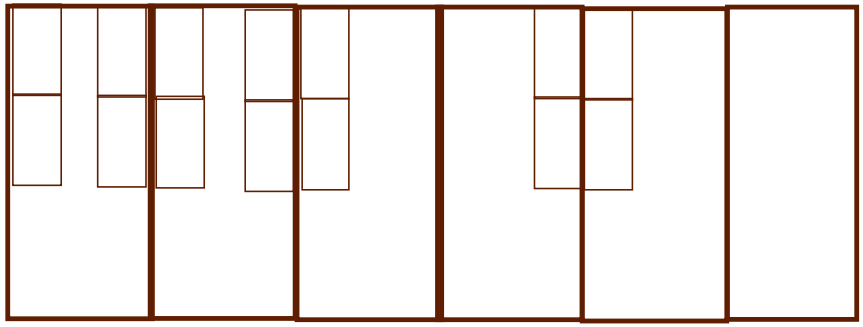
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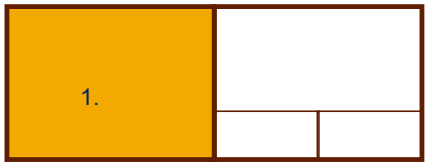


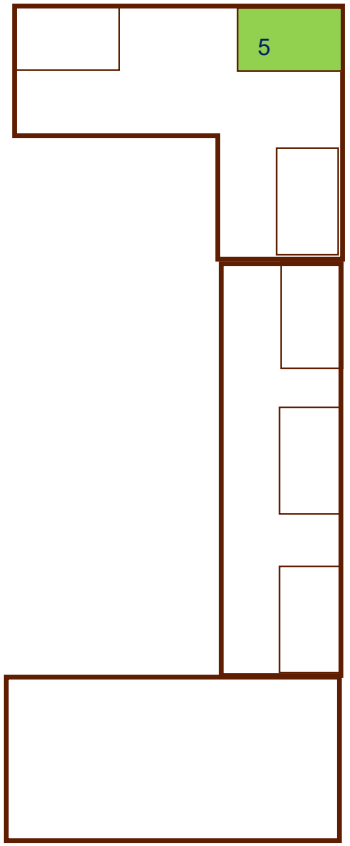




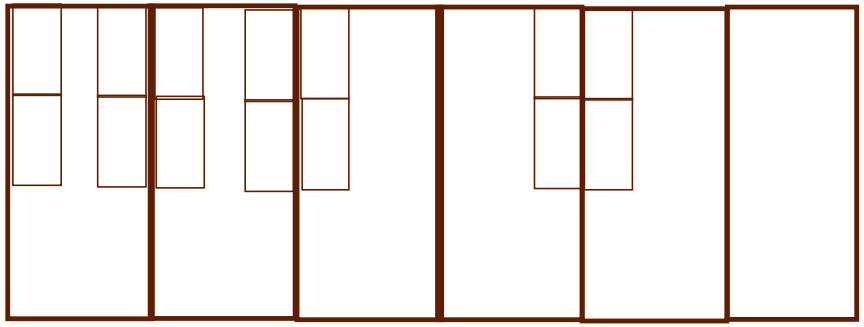
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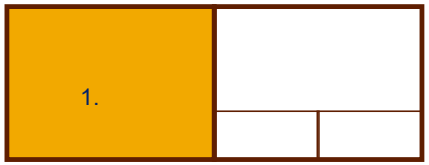


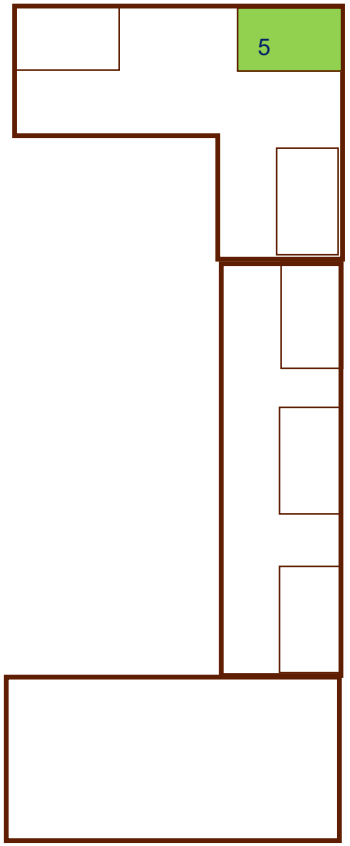




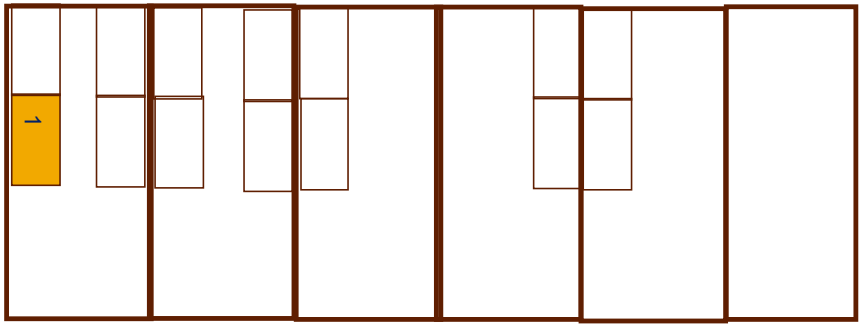
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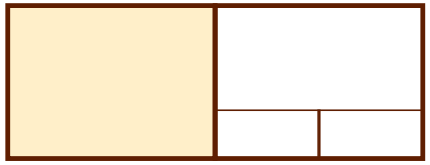


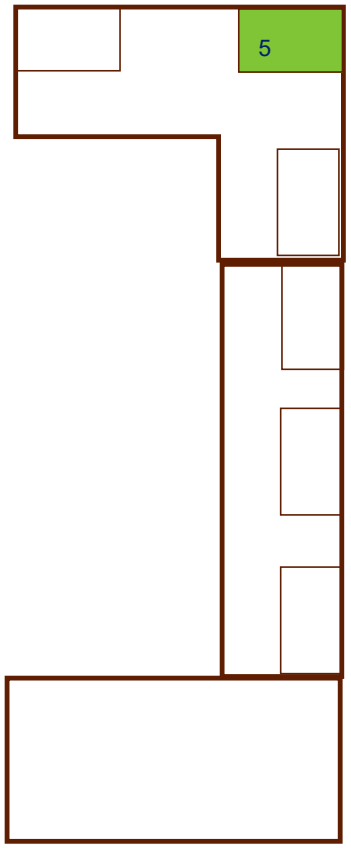




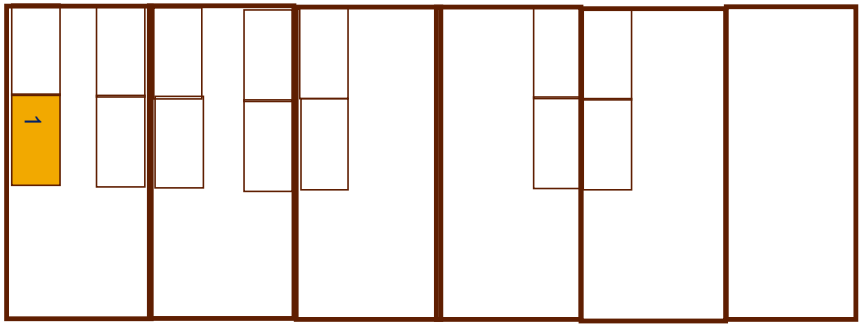
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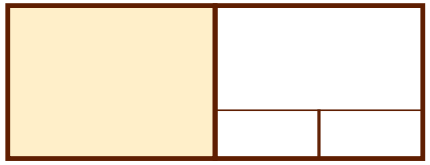


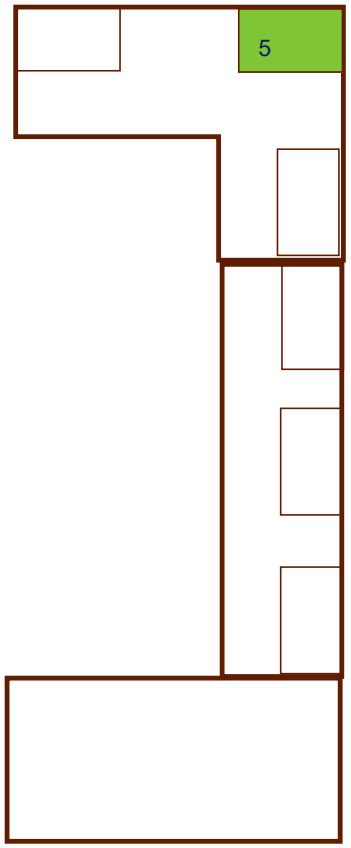




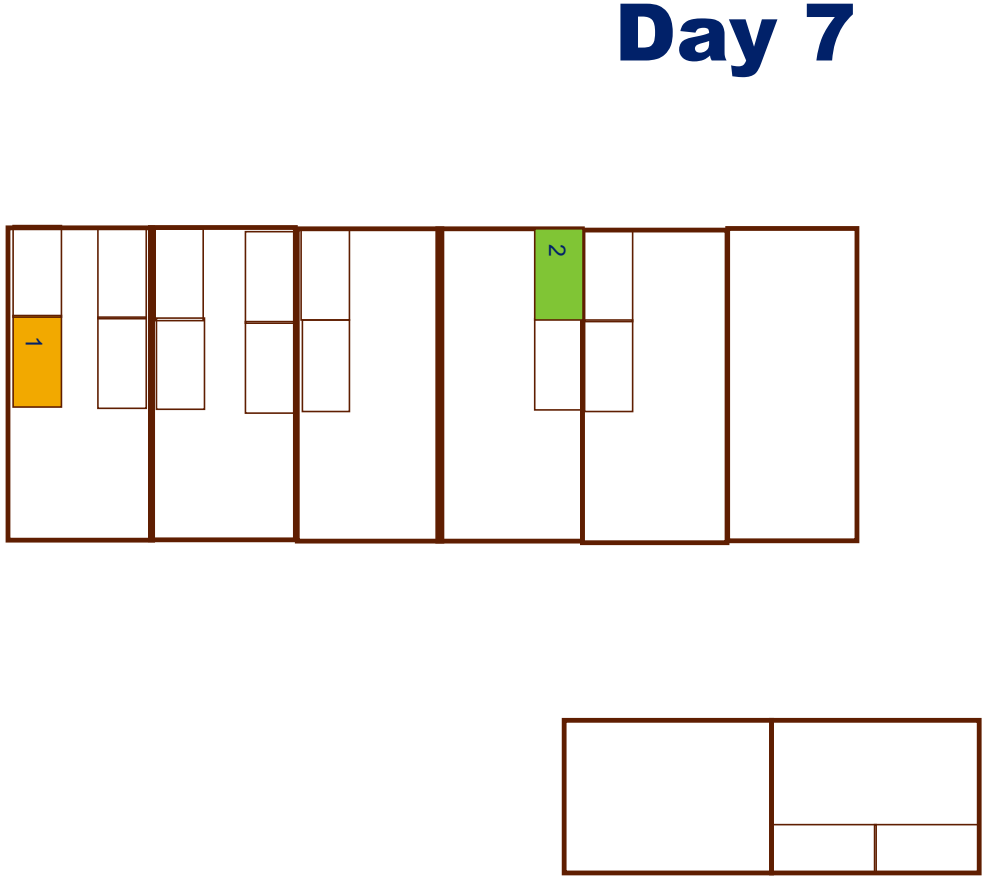
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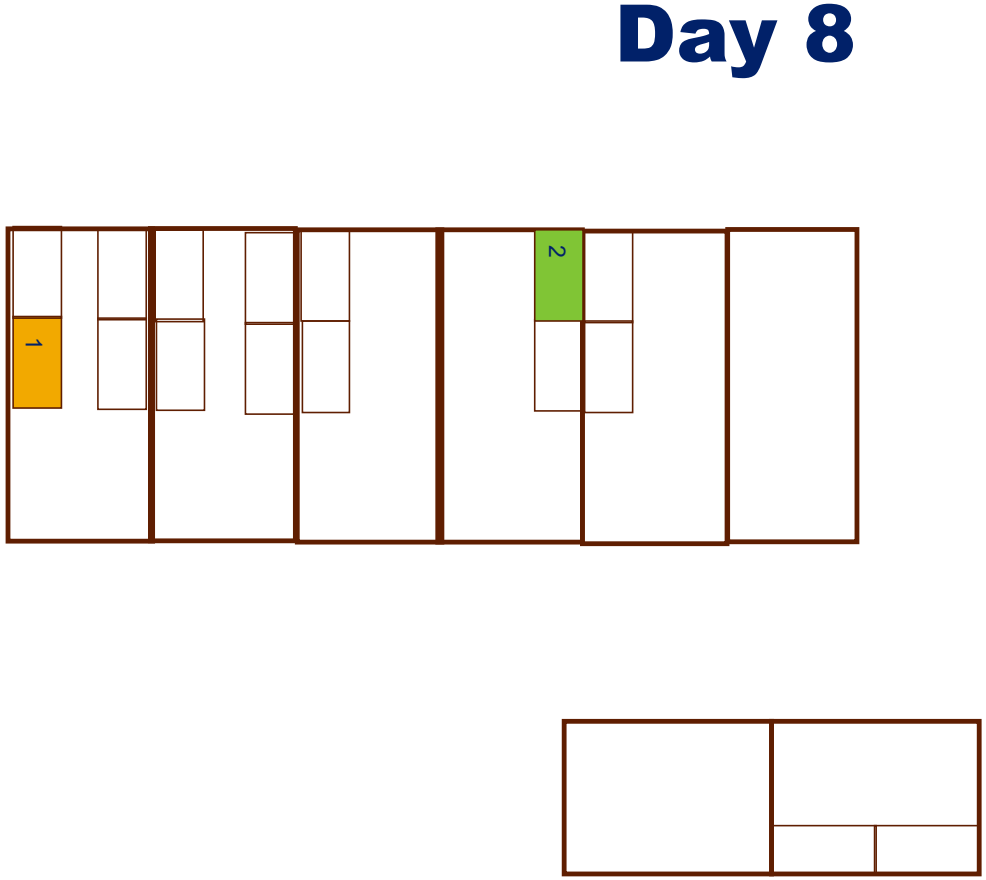




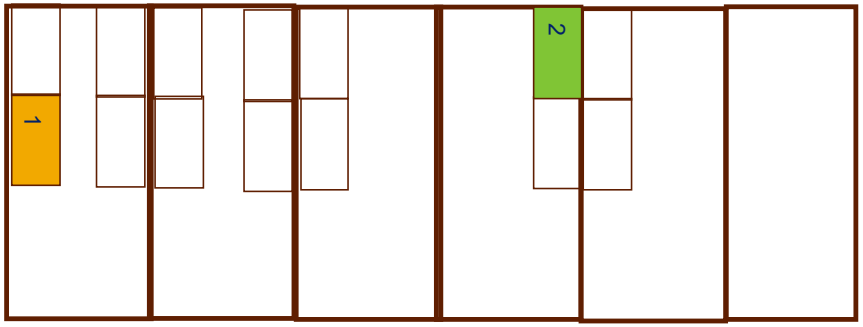
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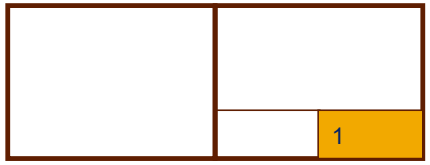


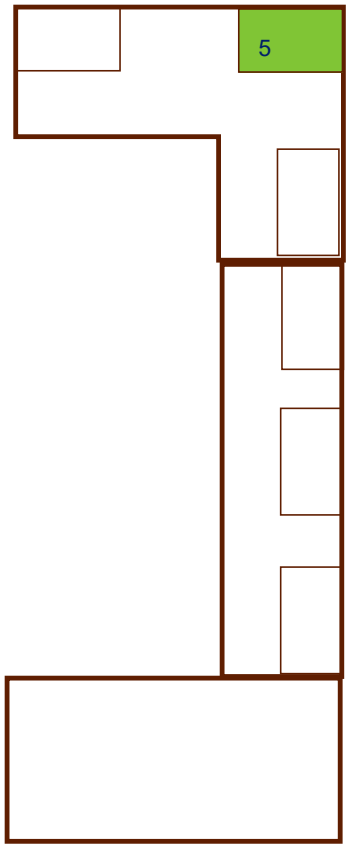
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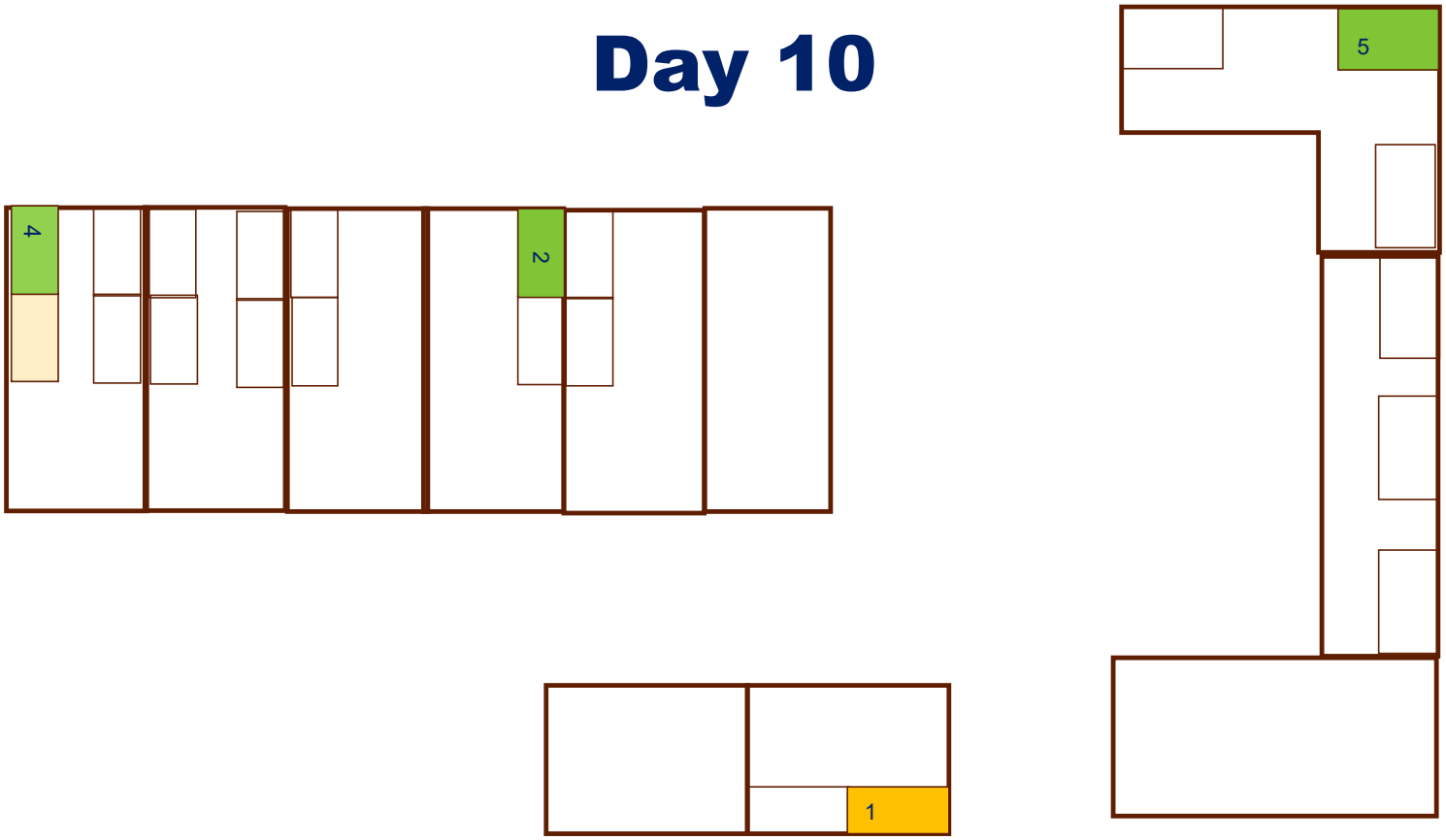
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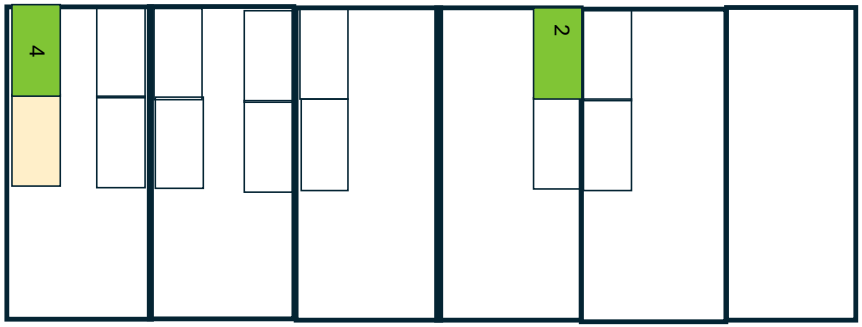


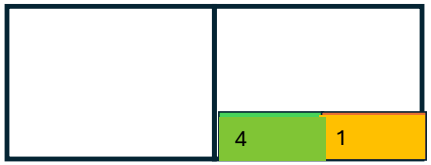


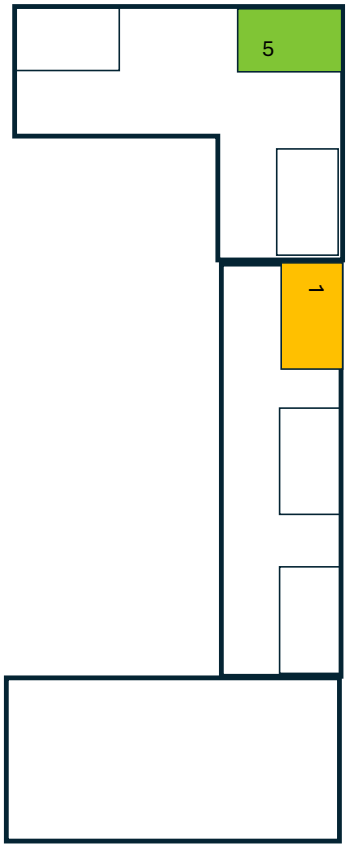
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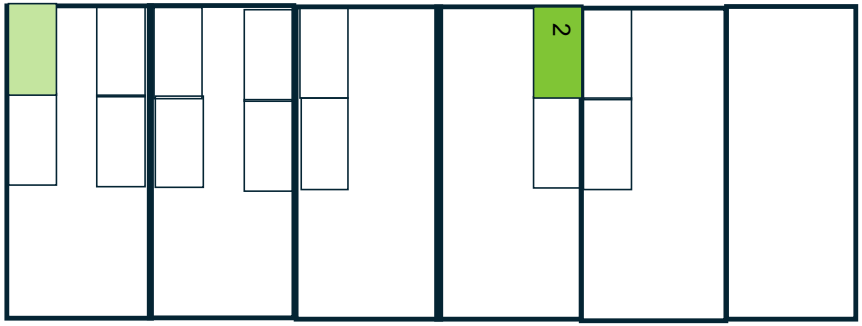
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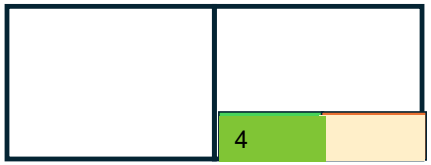


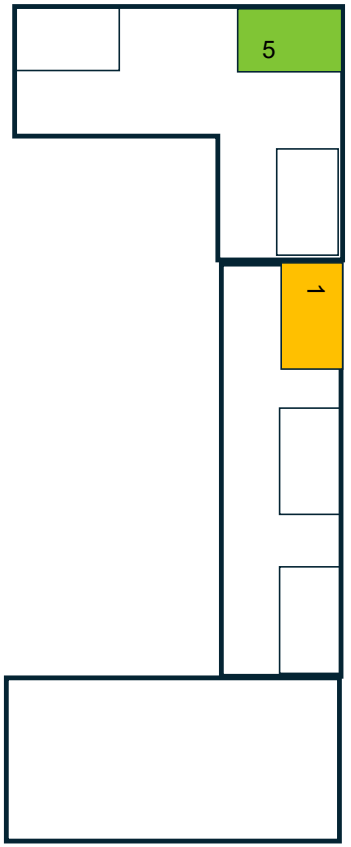




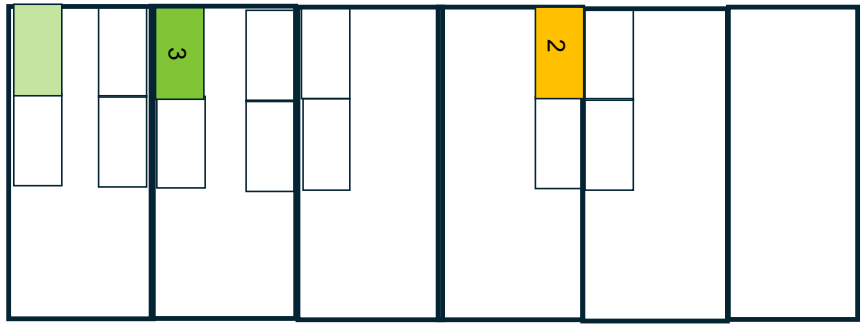
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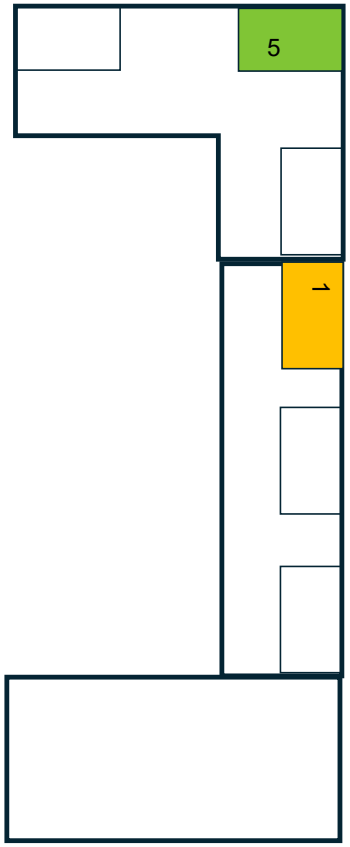




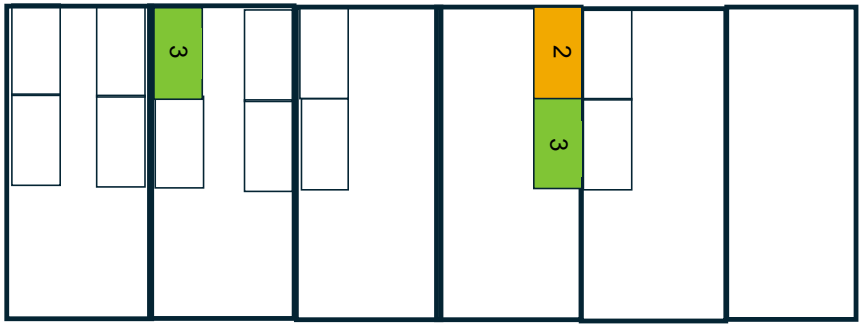
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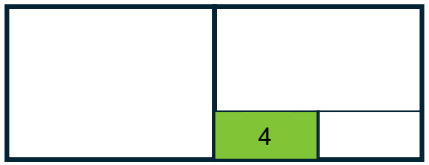


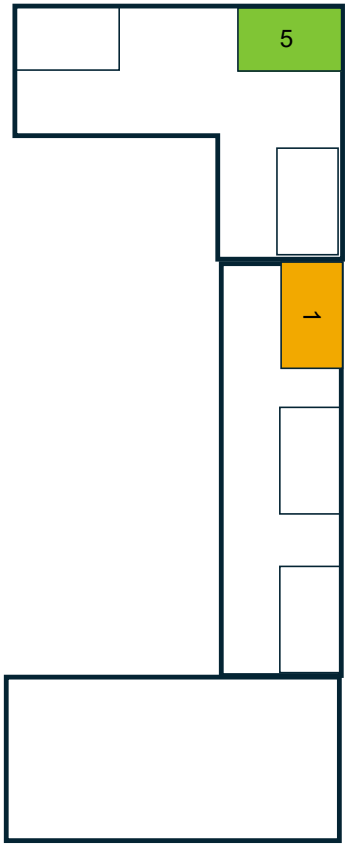




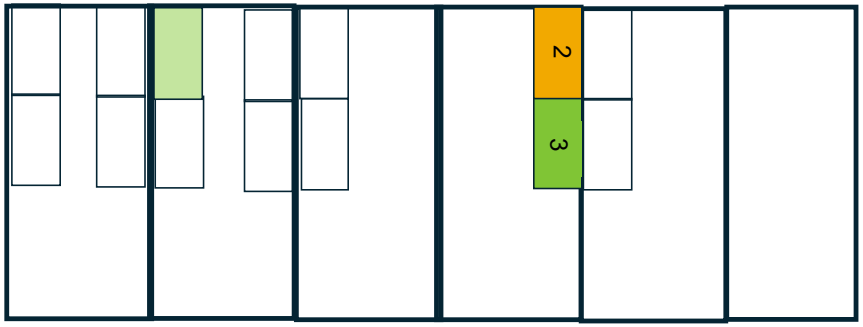
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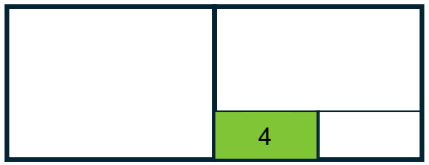


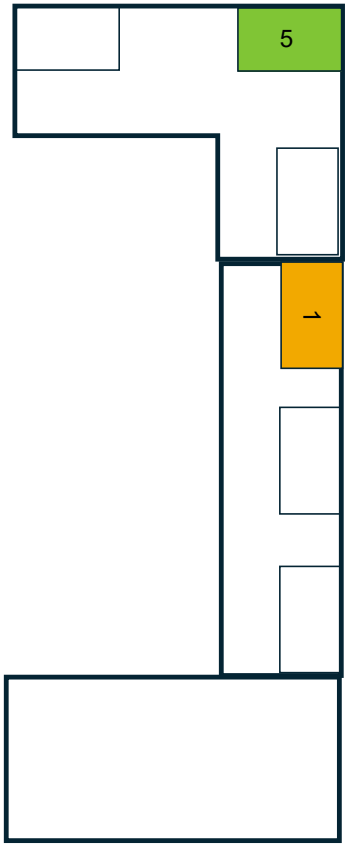




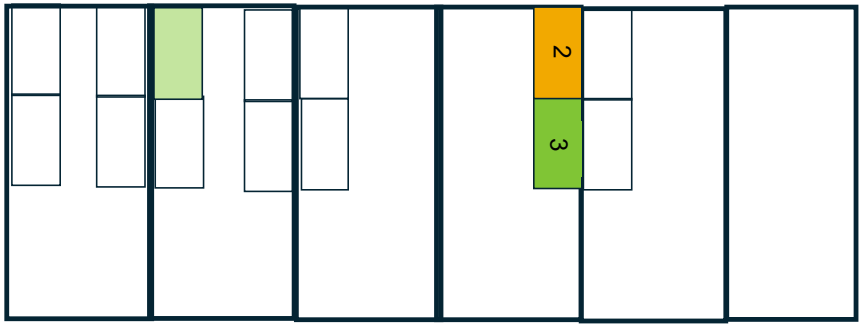
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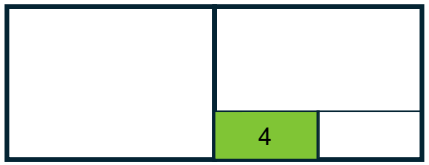


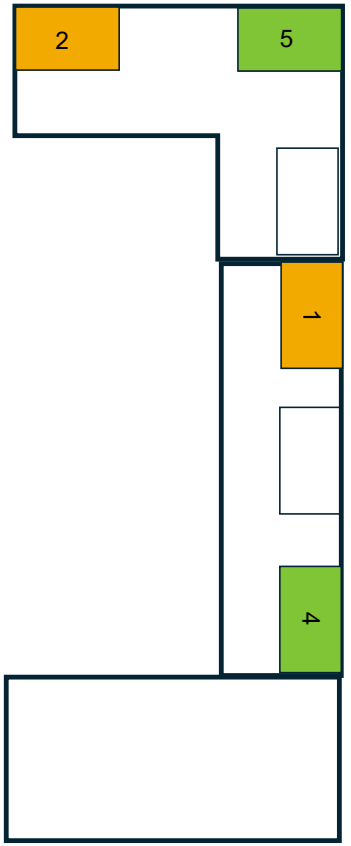




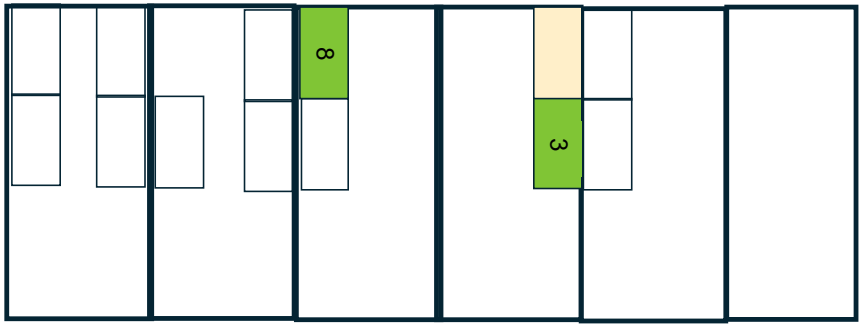
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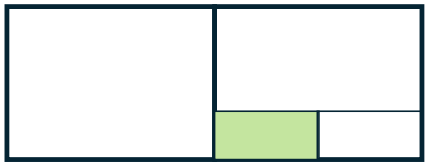


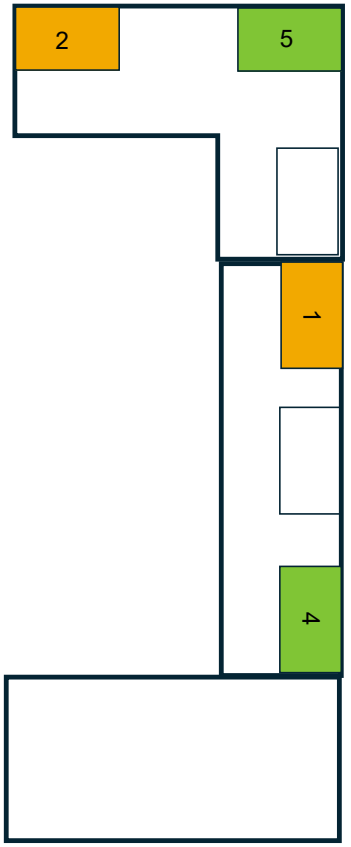




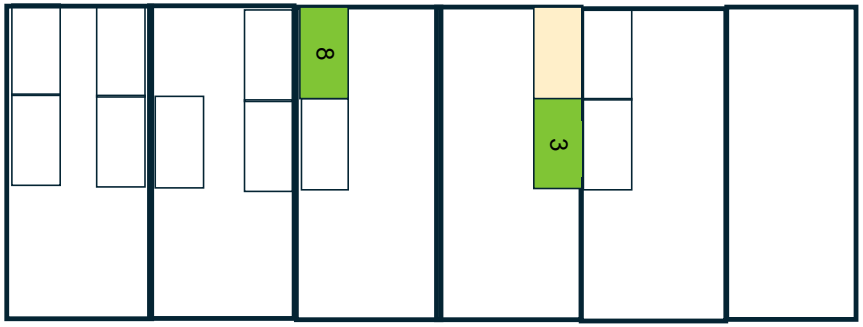
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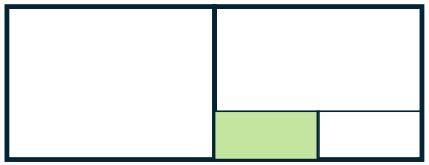


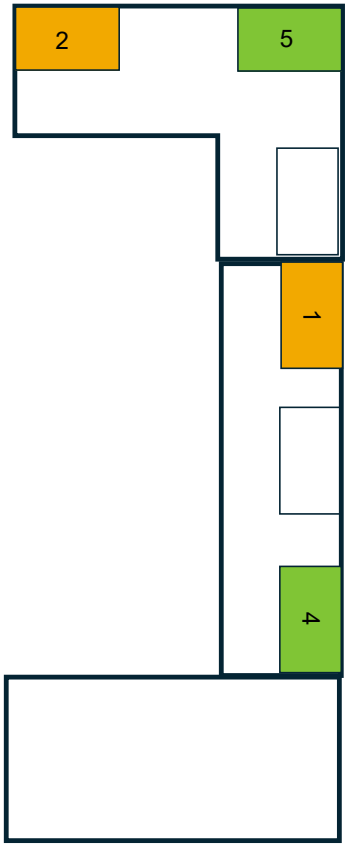




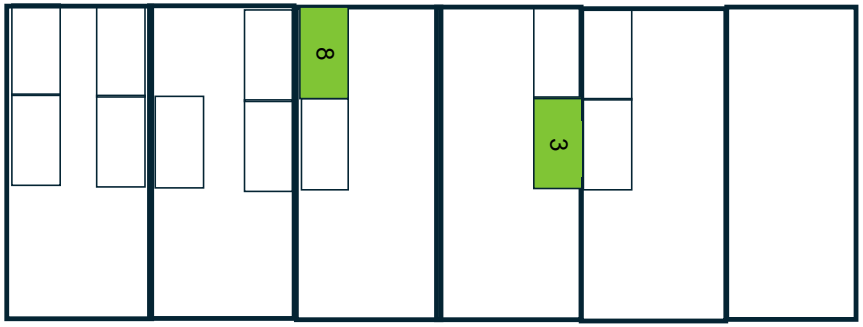
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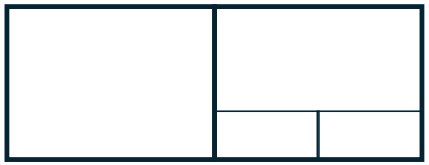


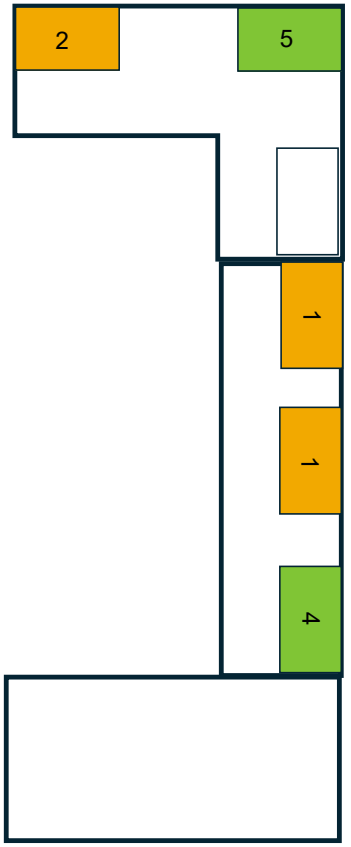




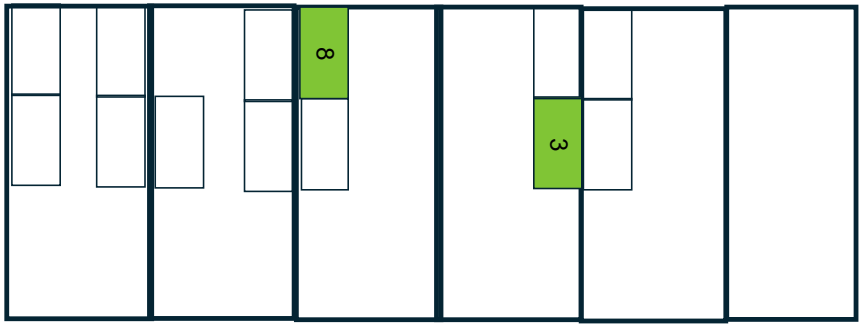
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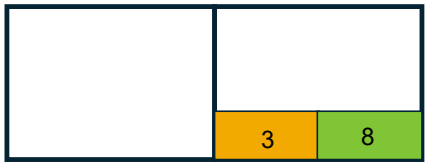


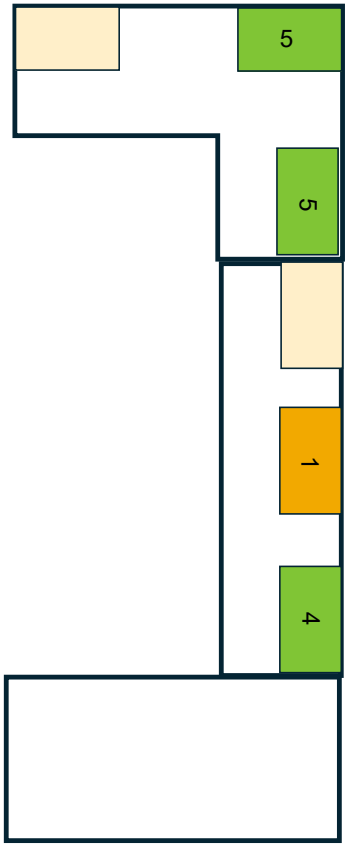




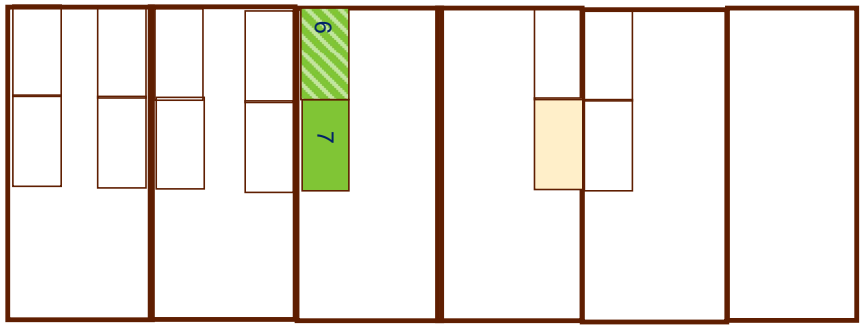
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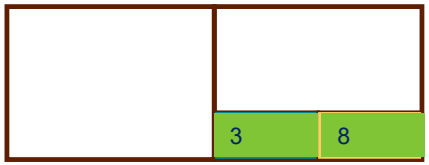


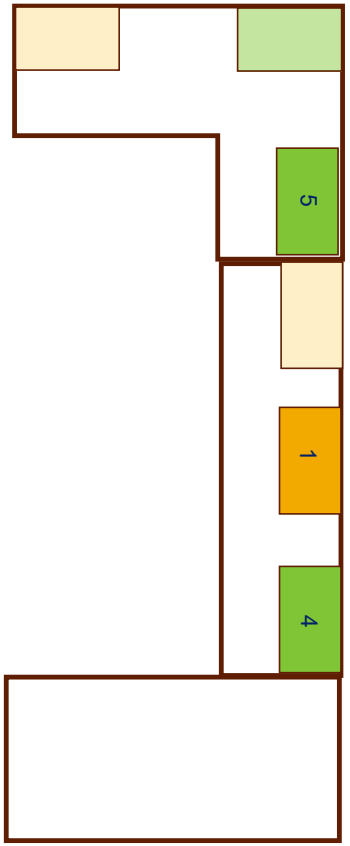




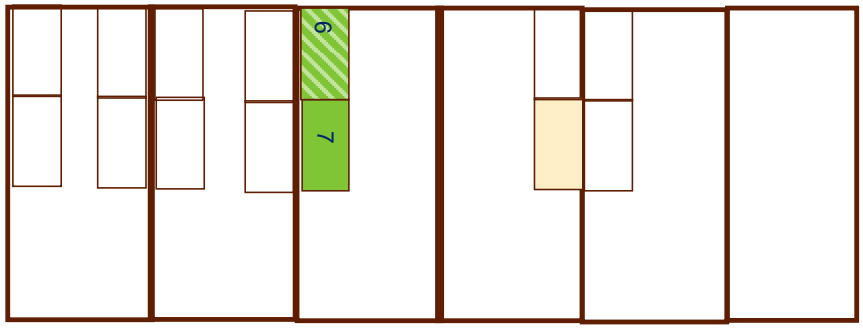
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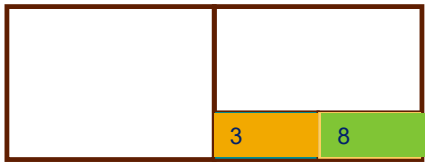


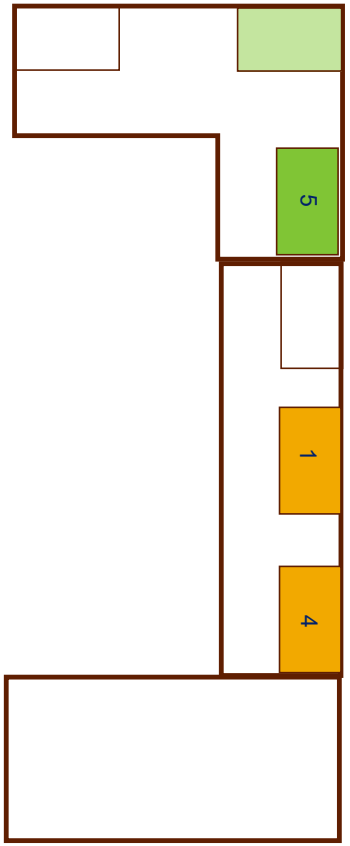




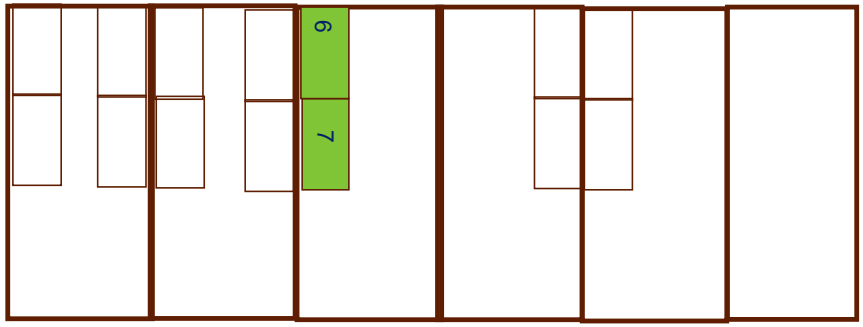
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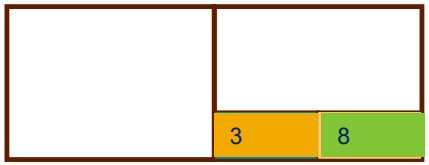


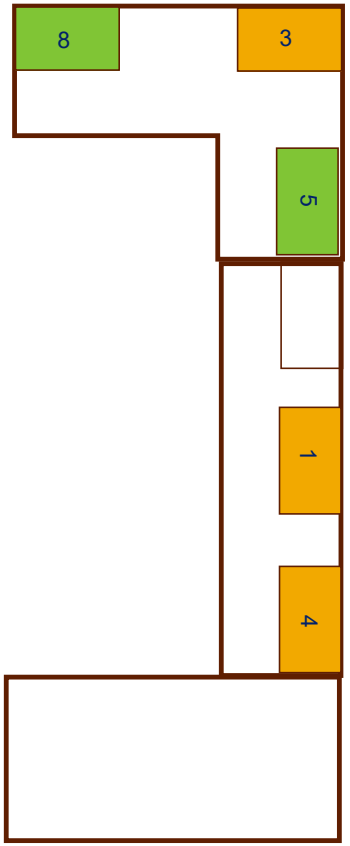




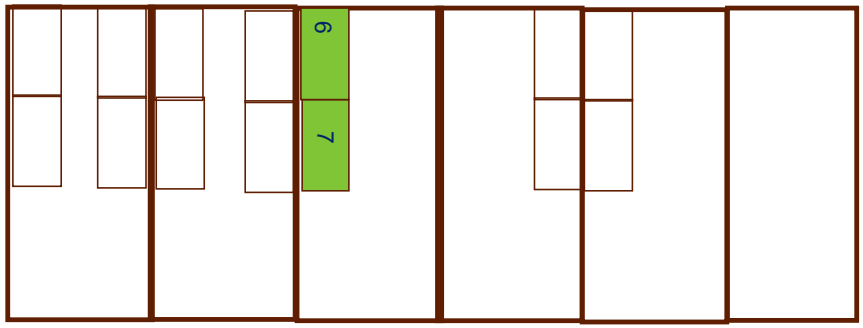
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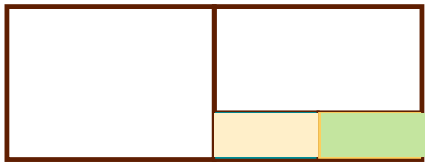


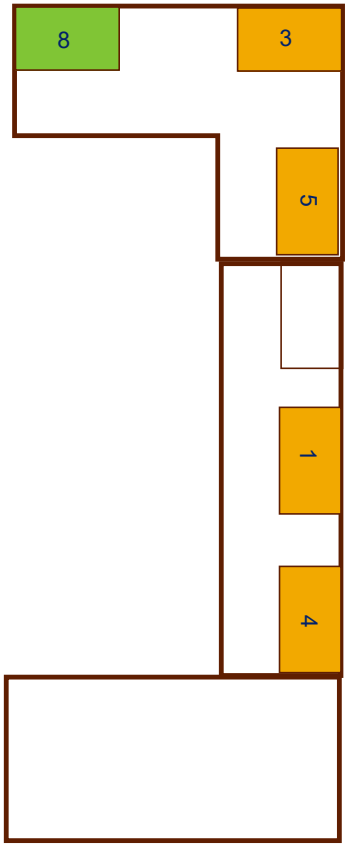




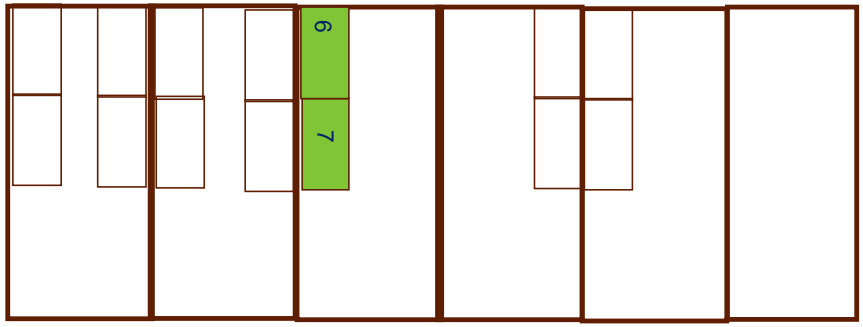
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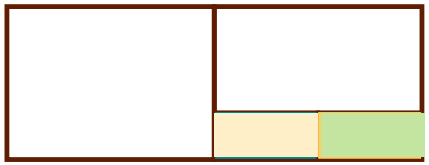


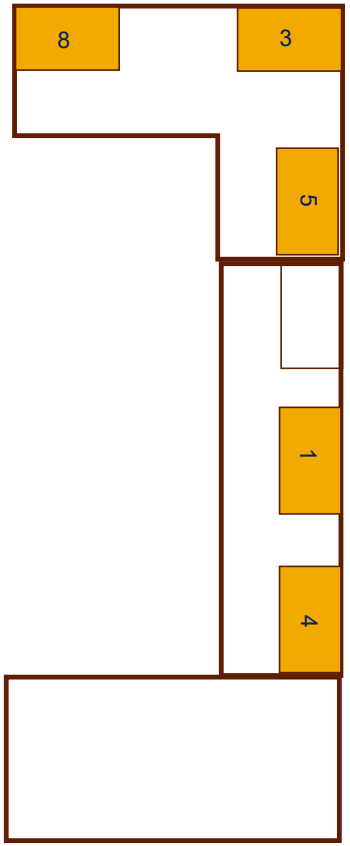




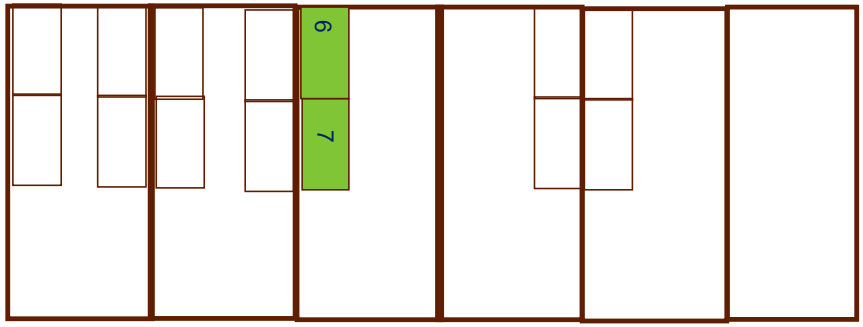
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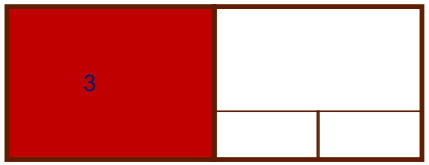


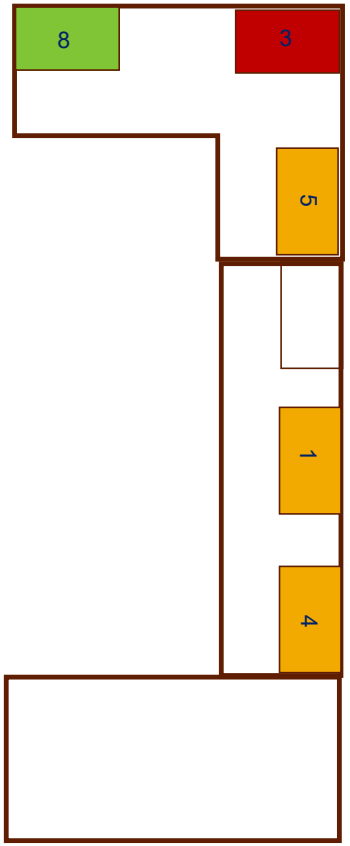




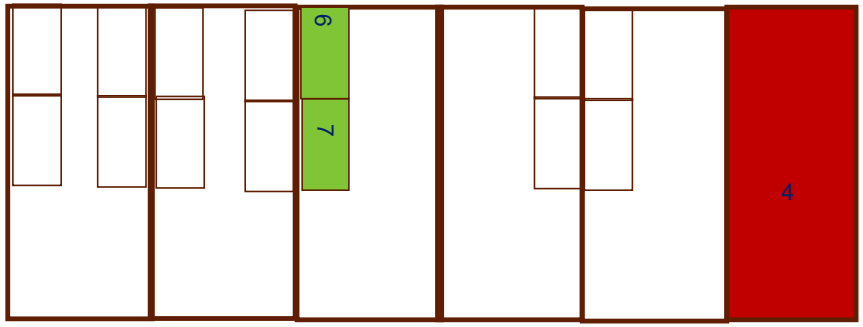
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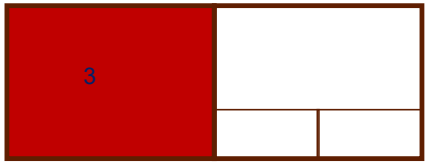


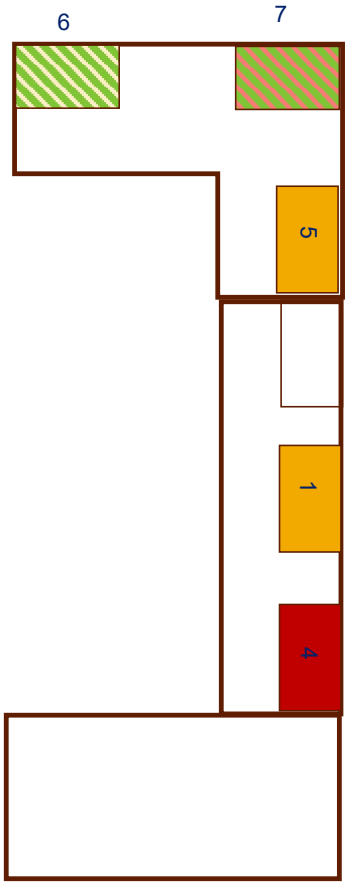




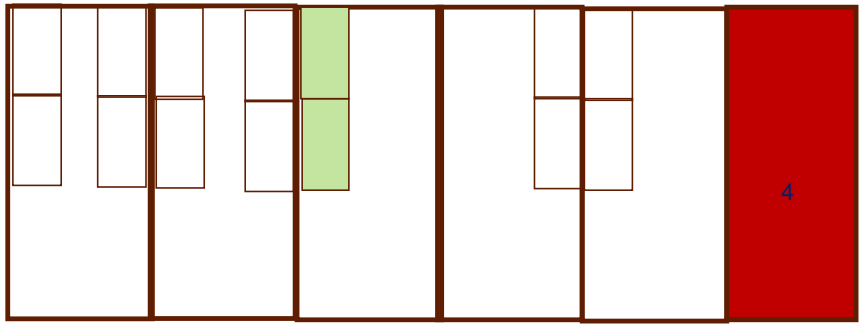
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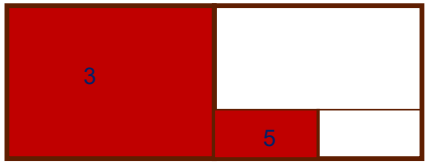


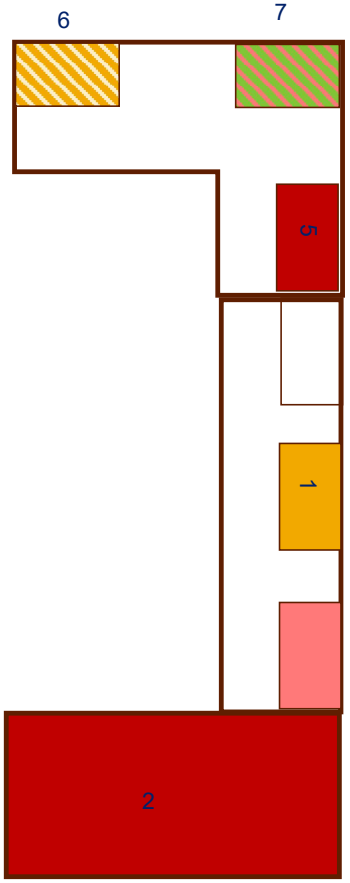




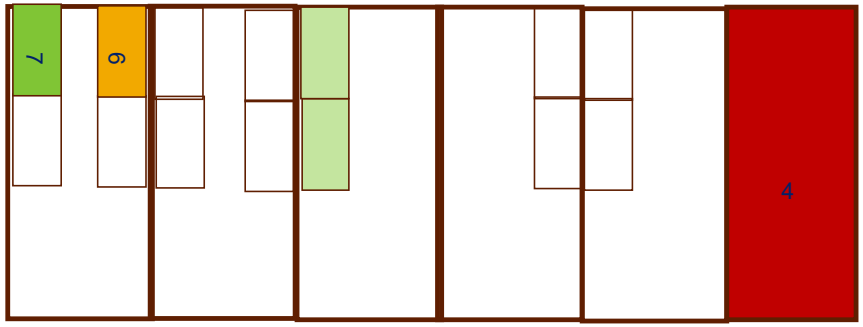
Day 28

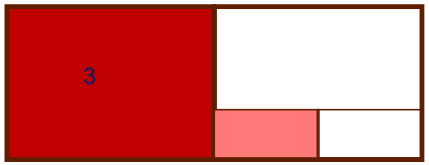


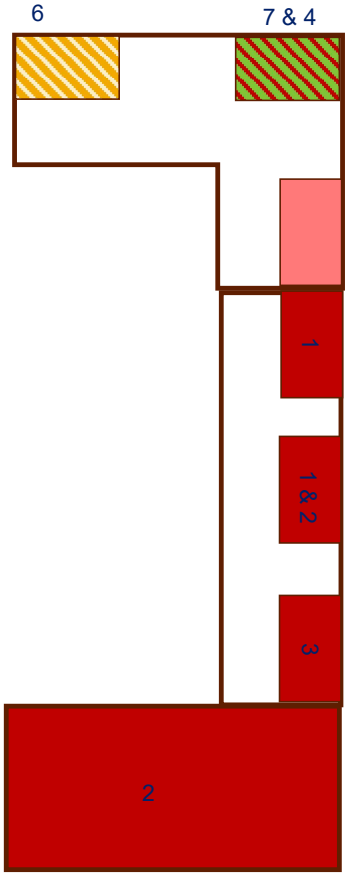




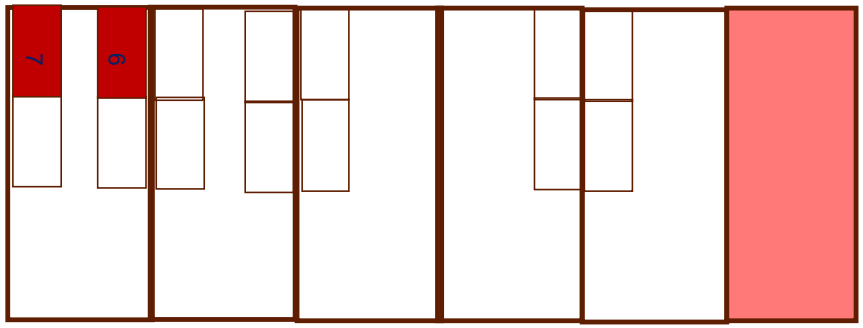
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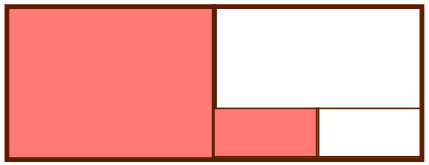


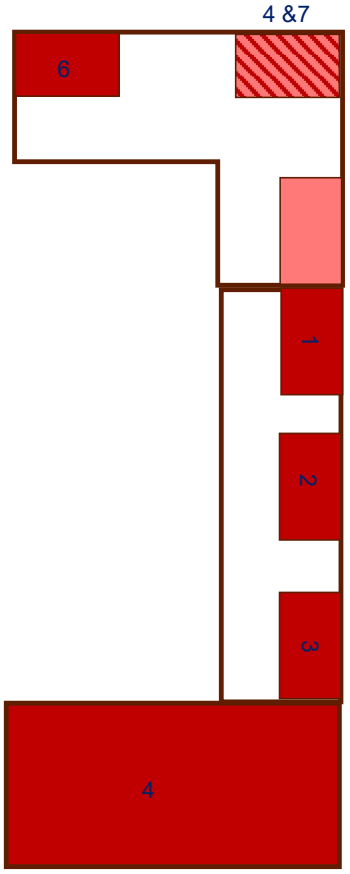




Day 30







Transmission

- Bed trace supported person to person transmission
- Potential environment of care cross contamination
- Potential hand hygiene gaps
- Average time between room overlap and symptom onset 6 days



Whole Genome Sequencing

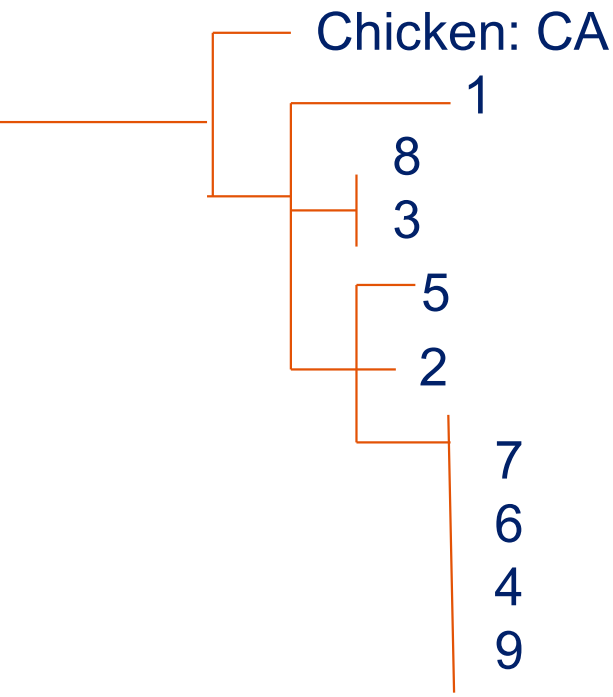
- Whole genome analysis showed that isolates were between 0-3 single nucleotide polymorphisms of each other

2	0	1	1	1	1	3	2
1	1	0	0	0	0	2	1
1	1	0	0	0	0	2	1
1	1	0	0	0	0	2	1
1	1	0	0	0	0	2	1
2	3	2	2	2	2	0	2
0	2	1	1	1	1	2	0
0	2	1	1	1	1	2	0

And There's Another Match

- Several weeks after initial notification we received notification of an additional WGS match
- A household member of one of the infants from the NICU became symptomatic following the infant discharging home

Chicken?



- Additional analysis of the WGS showed the specimens were most closely related to commercial poultry isolates



Possible Introductions

- Staff Illness
  - Sick leave policy could increase presenteeism and staff may be less likely to report symptoms
  - Symptom information was not available for all ill staff during the outbreak

- Visitor Illness
  - No ill contacts were identified during investigation

Possible Introductions

- Bearded dragons and geckos

- 9 staff members reported some level of poultry exposure
  - 8 staff members had backyard poultry at home with some level of contact
  - 1 staff member had a household member who worked in commercial poultry near their home
    - NO specific link between staff poultry exposure and the outbreak was ever confirmed

Key Takeaway

- The importance of quick identification and isolation
- Thoughts on the potential risks posed from outside exposures of staff and visitors
  - Education on steps to mitigate risks
- Challenges in symptom identification in neonate population

Acknowledgments

Bureau of Communicable Disease Control and Prevention

Local Public Health Agencies

Missouri State Public Health Laboratory

Centers for Communicable Disease Control and Prevention