

# Analysis of rearrangements in the *Bordetella bronchiseptica* genomes

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# Description of problem

*Bordetella bronchiseptica* is most known for causing “kennel cough” in dogs and bronchopneumonia in cats. It is mostly closely related to *Bordetella pertussis*, which causes whooping cough in humans.

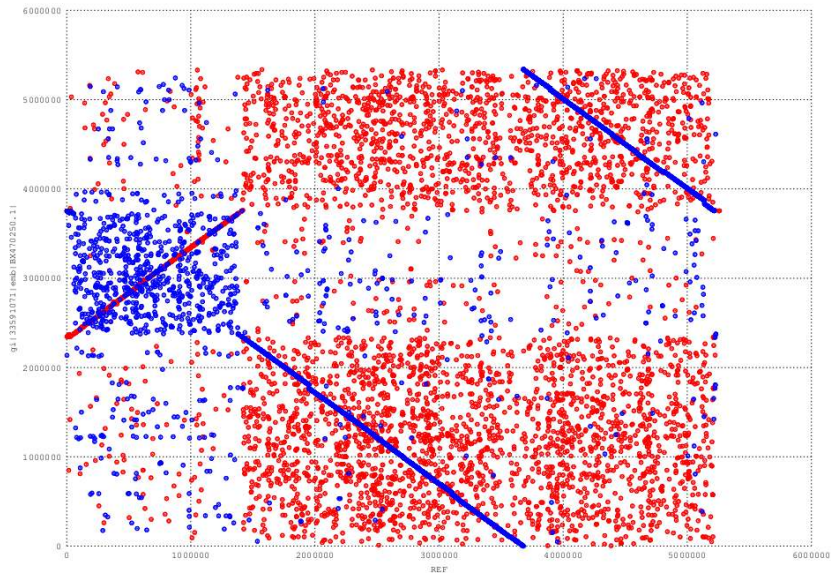
**Goal of project:** The goal of project is describe rearrangements in *Bordetella bronchiseptica* genomes

**Key challenges:**

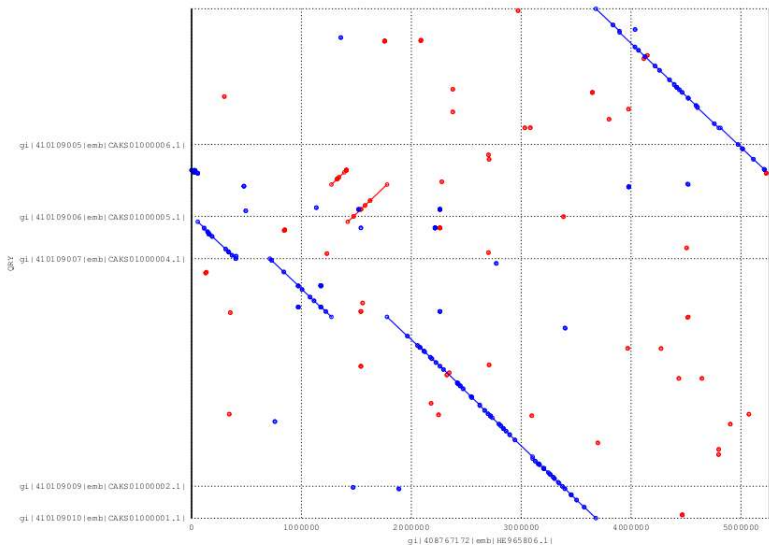
- There are 64 genomes: 3 references and 61 assemblies
- "Crazy" rearrangements

- Construct pairwise dotplots
- Find synteny blocks
- Analyze circos diagrams (for small subsets)
- Construct multiple breakpoint graph
- Detect breakpoint reuses in graph
- Observe genes near points of breakpoint reuse

# Dotplot: reference against reference



# Dotplot: reference against assembly



# Synteny blocks

>gi|408767172|emb|HE965806.1|

+43 -9 -34 -26 -36 +24 +27 -11 -8 +30 -21 +33 +29 -31 -20 +2 +28

-10 +23 -13 -6 -18 +17 -16 -7 -1 -35 +4 +15 +14 -22 -25 +5 +12 -19 -3  
+32 -43

>gi|410109010|emb|CAKS01000001.1|

-28 -2 +20

>gi|410109009|emb|CAKS01000002.1|

+31 -54 -29 -33 +21 -27 -24 +36

>gi|410109007|emb|CAKS01000004.1|

+26 +34 +9 -8

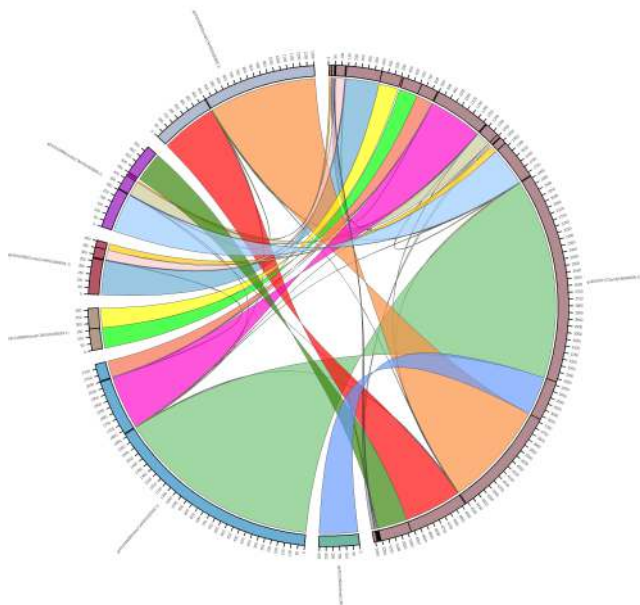
>gi|410109006|emb|CAKS01000005.1|

+30 -11 -32 +3 +19 -12 -5 +25 +22 -14 -15

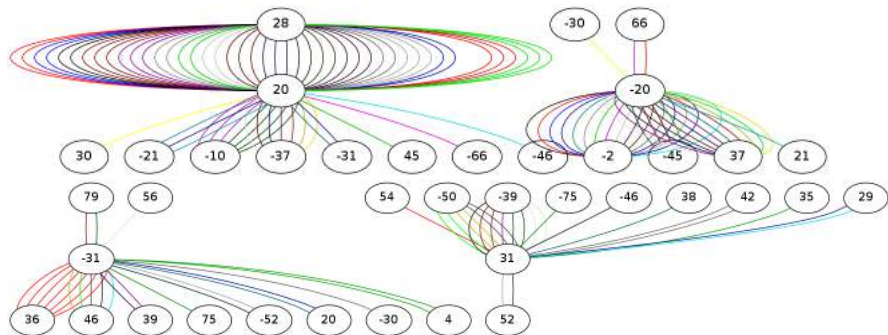
>gi|410109005|emb|CAKS01000006.1|

-4 +1 +7 +16 -17 +18 +6 +13 -23 +10

# Circos diagram



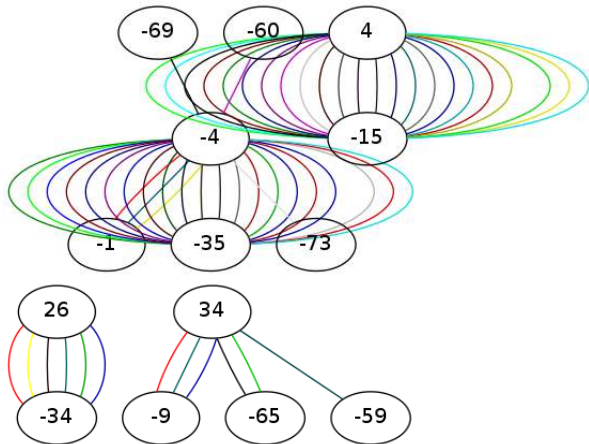
# Breakpoint reuses in graph



Blocks 20 and 31 have "hotspots" on each end.



# Breakpoint reuses in graph



Blocks 4 and 34 have "hotspots" only on the one side.

# Some statistics of breakpoint reuses

- Blocks with 2 and more different adjacencies on each side

N	Block	start: total	start: variants	end: total	end: variants	genes
1	1	13	3	36	2	7
2	2	31	4	60	2	6
3	9	6	4	52	3	7
4	10	9	3	6	2	7
5	20	36	5	6	3	7
6	29	14	2	6	4	7
7	30	10	3	7	4	8
8	31	15	7	6	5	7

# Some statistics of breakpoint reuses

- Blocks with 3 and more different adjacency only on the one side

N	Block side	total	variants
1	-4	28	5
2	-7	24	3
3	+8	51	3
4	-24	7	3
5	+27	6	5
6	+33	15	5
7	+34	6	5
8	+39	6	5
9	+43	4	5

Thank you for attention!

