Additional File 12: Order-level affiliations of the various genera constituting the gut microbial networks of different geographies, along with the number of co-occurrence and mutual exclusion interactions between them

Comparison of relationships among taxonomic groups at order level in the microbial networks across different geographies

Given the preference of specific bacterial genera to exist either in the co-occurrence or the mutual exclusion network of the gut microbiomes, the relationships between various bacterial groups in the guts of individuals from different geographies were investigated. The objective was to identify common trends of interactions that exist amongst the different bacterial groups across gut microbiomes of individuals belonging to different nationalities. For this purpose, the order-level affiliations of the various genera constituting the gut microbial networks were obtained for the different geographies, along with the number of co-occurrence and mutual exclusions among them. These were subsequently compared across different nationalities as summarized in the tables below.

In the gut microbiome of the American individuals, 126 interactions out of 866 co-occurrence relations were observed to be within genera belonging to the order Clostridiales. Clostridiales also showed a noticeably high number of positive interactions with Erysipelotrichales, Coriobacteriales, Thermoanaerobacterales, Synergistales, Bifidobacteriales, Selenomonadales, Bacillales, Lactobacillales (all more than 20 interactions). On the other hand, as observed in the previous section for the constituent genera Bacteroides, the corresponding order Bacteroidales was observed to serve as the hub for mutual exclusion relationships. Of these, the maximum number of mutual exclusion relationships (41) was found to be with the Clostridiales order.

Individuals from Denmark, Spain and China were found to have similar trend with Clostridiales order showing maximum co-occurrence interactions amongst them as well as with Synergistales, Erysipelotrichales, Fusobacteriales, Selenomonadales, Coriobacteriales (in Denmark), Clostridiales, Coriobacteriales, Thermoanaerobacterales (in Spain) and Erysipelotrichales, Coriobacteriales (in China). As in the American population, the pattern of mutual exclusion interactions also showed similar patterns (for these regions), with most of them again formed by Bacteroidales with Clostridiales. These results indicate the overall similarities in the taxonomic composition of the gut microbial co-occurrence/co-exclusion networks across different geographies.

The current study detected the largest number of co-occurrence relations between genera belonging to the same taxonomic order (Clostridiales v/s Clostridiales). Genera belonging to Clostridiales (phylum Firmicutes) were also observed to have large number of co-occurrence relationships with genera belonging to Ruminococcales, Lactobacillales and Erysipelotrichales (all belonging to the phylum Firmicutes). The gene content of bacterial species showed progressive similarity with decreasing phylogenetic distance. Consequently, bacterial groups belonging to the same taxonomic clades are expected to have similarities in their gene content and hence metabolic potential (consequently their nutrient requirements). The increased co-occurrence relationships between taxonomically similar genera could thus be a consequence of the above observation. The similarity in metabolic profile as one of the reasons for co-occurrence is further evident in the investigation of the gut microbial interaction networks across individuals from various age-groups.

Co-occurrence network

Order	Clostridiales	Erysipelotrichales	Coriobacteriales	Synergistales	Thermoanaerobacterales	Lactobacillales	Bifidobacteriales
Clostridiales	122	68	56	36	39	22	29
Erysipelotrichales	68	4	13	7	9	6	3
Coriobacteriales	56	13	6	11	9	4	7
Synergistales	36	7	11	3	8	3	5
Thermoanaerobacterales	39	9	9	8	3	3	5
Lactobacillales	22	6	4	3	3	0	3
Bifidobacteriales	29	3	7	5	5	3	1
Bacillales	24	5	6	5	6	2	2
Selenomonadales	24	8	8	6	6	2	4
Spirochaetales	13	4	4	3	3	2	1
Bacteroidales	0	0	0	0	0	0	0
Fusobacteriales	14	5	3	1	4	2	0
Acholeplasmatales	13	3	3	2	3	2	1
Desulfovibrionales	10	2	4	2	1	1	1
Asterales	12	3	4	3	3	1	1
Entomoplasmatales	13	3	3	2	3	2	1
Fibrobacterales	8	3	4	3	3	1	1
Aeromonadales	5	0	0	0	1	0	0
Flavobacteriales	0	0	0	0	0	0	0
Dehalococcoidales	5	1	1	1	1	1	0
Burkholderiales	5	1	1	2	2	0	1
Verrucomicrobiales	2	0	0	0	0	0	0
Cytophagales	0	0	0	0	0	0	1
Actinomycetales	2	0	1	0	0	0	0
Sphingobacteriales	0	0	0	0	0	0	0

Order	Bacillales	Selenomonadales	Spirochaetales	Bacteroidales	Fusobacteriales	Acholeplasmatales	Desulfovibrionales
Clostridiales	24	24	13	0	14	13	10
Erysipelotrichales	5	8	4	0	5	3	2
Coriobacteriales	6	8	4	0	3	3	4
Synergistales	5	6	3	0	1	2	2
Thermoanaerobacterales	6	6	3	0	4	3	1
Lactobacillales	2	2	2	0	2	2	1
Bifidobacteriales	2	4	1	0	0	1	1
Bacillales	1	4	2	0	2	2	1
Selenomonadales	4	1	2	0	1	2	2

Spirochaetales	2	2	0	0	2	1	1
Bacteroidales	0	0	0	13	0	0	0
Fusobacteriales	2	1	2	0	1	2	0
Acholeplasmatales	2	2	1	0	2	0	0
Desulfovibrionales	1	2	1	0	0	0	0
Asterales	2	2	1	0	1	1	1
Entomoplasmatales	2	2	1	0	2	1	0
Fibrobacterales	2	2	1	0	1	1	0
Aeromonadales	0	0	1	0	0	0	0
Flavobacteriales	0	0	0	5	0	0	0
Dehalococcoidales	1	0	1	0	0	0	0
Burkholderiales	1	1	1	1	1	1	0
Verrucomicrobiales	0	0	0	0	0	1	0
Cytophagales	0	0	0	3	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Sphingobacteriales	0	0	0	1	0	0	0

Order	**Asterales**	**Entomoplasmatales**	**Fibrobacterales**	**Aeromonadales**	**Flavobacteriales**	**Dehalococcoidales**	**Burkholderiales**
Clostridiales	12	13	8	5	0	5	5
Erysipelotrichales	3	3	3	0	0	1	1
Coriobacteriales	4	3	4	0	0	1	1
Synergistales	3	2	3	0	0	1	2
Thermoanaerobacterales	3	3	3	1	0	1	2
Lactobacillales	1	2	1	0	0	1	0
Bifidobacteriales	1	1	1	0	0	0	1
Bacillales	2	2	2	0	0	1	1
Selenomonadales	2	2	2	0	0	0	1
Spirochaetales	1	1	1	1	0	1	1
Bacteroidales	0	0	0	0	5	0	1
Fusobacteriales	1	2	1	0	0	0	1
Acholeplasmatales	1	1	1	0	0	0	1
Desulfovibrionales	1	0	0	0	0	0	0
Asterales	0	1	1	0	0	1	1
Entomoplasmatales	1	0	1	0	0	0	1
Fibrobacterales	1	1	0	0	0	0	1
Aeromonadales	0	0	0	0	0	1	0
Flavobacteriales	0	0	0	0	0	0	0
Dehalococcoidales	1	0	0	1	0	0	0
Burkholderiales	1	1	1	0	0	0	0

Verrucomicrobiales	0	0	0	0	0	0	0
Cytophagales	0	0	1	0	0	0	1
Actinomycetales	0	0	0	0	0	0	0
Sphingobacteriales	0	0	0	0	1	0	0

Order	Verrucomicrobiales	Cytophagales	Actinomycetales	Sphingobacteriales
Clostridiales	2	0	2	0
Erysipelotrichales	0	0	0	0
Coriobacteriales	0	0	1	0
Synergistales	0	0	0	0
Thermoanaerobacterales	0	0	0	0
Lactobacillales	0	0	0	0
Bifidobacteriales	0	1	0	0
Bacillales	0	0	0	0
Selenomonadales	0	0	0	0
Spirochaetales	0	0	0	0
Bacteroidales	0	3	0	1
Fusobacteriales	0	0	0	0
Acholeplasmatales	1	0	0	0
Desulfovibrionales	0	0	0	0
Asterales	0	0	0	0
Entomoplasmatales	0	0	0	0
Fibrobacterales	0	1	0	0
Aeromonadales	0	0	0	0
Flavobacteriales	0	0	0	1
Dehalococcoidales	0	0	0	0
Burkholderiales	0	1	0	0
Verrucomicrobiales	0	0	0	0
Cytophagales	0	0	0	1
Actinomycetales	0	0	0	0
Sphingobacteriales	0	1	0	0

Mutual exclusion network

Order	Selenomonadales	Entomoplasmatales	Cytophagales	Coriobacteriales	Burkholderiales	Lactobacillales	Bacteroidales
Selenomonadales	1	1	1	1	1	0	2
Entomoplasmatales	1	0	0	0	0	0	1
Cytophagales	1	0	0	0	0	0	0

Coriobacteriales	1	0	0	0	0	0	4
Burkholderiales	1	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	1
Bacteroidales	2	1	0	4	0	1	0
Erysipelotrichales	0	0	0	0	0	0	5
Clostridiales	0	0	1	0	2	0	41
Sphingobacteriales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	1
Spirochaetales	0	0	0	0	0	0	1
Fibrobacterales	0	0	0	0	0	0	1
Desulfovibrionales	0	0	0	0	0	0	1
Bacillales	0	0	0	0	0	0	2
Asterales	0	0	0	0	0	0	1
Aeromonadales	0	0	0	0	0	0	1
Acholeplasmatales	0	0	0	0	0	0	1
Flavobacteriales	0	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	2
Bifidobacteriales	0	0	0	0	0	0	2
Synergistales	0	0	0	0	0	0	3

Order	Erysipelotrichales	Clostridiales	Sphingobacteriales	Fusobacteriales	Spirochaetales	Fibrobacterales	Desulfovibrionales
Selenomonadales	0	0	0	0	0	0	0
Entomoplasmatales	0	0	0	0	0	0	0
Cytophagales	0	1	0	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Burkholderiales	0	2	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Bacteroidales	5	41	0	1	1	1	1
Erysipelotrichales	0	0	0	0	0	0	0
Clostridiales	0	4	1	1	0	0	0
Sphingobacteriales	0	1	0	0	0	0	0
Fusobacteriales	0	1	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	0	0	0	0
Desulfovibrionales	0	0	0	0	0	0	0
Bacillales	0	0	0	0	0	0	0
Asterales	0	0	0	0	0	0	0
Aeromonadales	0	0	0	0	0	0	0
Acholeplasmatales	0	1	0	0	0	0	0

Flavobacteriales	0	2	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0

Order	Bacillales	Asterales	Aeromonadales	Acholeplasmatales	Flavobacteriales	Thermoanaerobacterales	Bifidobacteriales
Selenomonadales	0	0	0	0	0	0	0
Entomoplasmatales	0	0	0	0	0	0	0
Cytophagales	0	0	0	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Bacteroidales	2	1	1	1	0	2	2
Erysipelotrichales	0	0	0	0	0	0	0
Clostridiales	0	0	0	1	2	0	0
Sphingobacteriales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	0	0	0	0
Desulfovibrionales	0	0	0	0	0	0	0
Bacillales	0	0	0	0	0	0	0
Asterales	0	0	0	0	0	0	0
Aeromonadales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0

Order	Synergistales
Selenomonadales	0
Entomoplasmatales	0
Cytophagales	0
Coriobacteriales	0
Burkholderiales	0
Lactobacillales	0
Bacteroidales	3
Erysipelotrichales	0
Clostridiales	0

Sphingobacteriales	0
Fusobacteriales	0
Spirochaetales	0
Fibrobacterales	0
Desulfovibrionales	0
Bacillales	0
Asterales	0
Aeromonadales	0
Acholeplasmatales	0
Flavobacteriales	0
Thermoanaerobacterales	0
Bifidobacteriales	0
Synergistales	0

Co-occurrence network

Order	Clostridiales	Erysipelotrichales	Coriobacteriales	Lactobacillales	Selenomonadales	Bacteroidales	Synergistales	Asterales
Clostridiales	104	58	37	13	17	7	11	6
Erysipelotrichales	58	6	13	1	3	1	4	1
Coriobacteriales	37	13	6	0	7	2	4	2
Lactobacillales	13	1	0	0	0	0	0	0
Selenomonadales	17	3	7	0	7	5	4	4
Bacteroidales	7	1	2	0	5	10	1	0
Synergistales	11	4	4	0	4	1	0	1
Asterales	6	1	2	0	4	0	1	0
Fusobacteriales	5	2	3	0	0	0	0	0
Enterobacteriales	0	0	0	0	2	0	0	0
Flavobacteriales	0	0	0	0	0	3	0	0
Desulfovibrionales	1	0	0	0	0	4	0	0
Burkholderiales	0	0	0	0	0	1	0	0

Order	Fusobacteriales	Enterobacteriales	Flavobacteriales	Desulfovibrionales	Burkholderiales
Clostridiales	5	0	0	1	0
Erysipelotrichales	2	0	0	0	0
Coriobacteriales	3	0	0	0	0
Lactobacillales	0	0	0	0	0
Selenomonadales	0	2	0	0	0
Bacteroidales	0	0	3	4	1
Synergistales	0	0	0	0	0
Asterales	0	0	0	0	0
Fusobacteriales	0	0	0	0	0
Enterobacteriales	0	1	0	0	0
Flavobacteriales	0	0	0	0	0
Desulfovibrionales	0	0	0	0	0
Burkholderiales	0	0	0	0	0

Mutual exclusion network

Order	Lactobacillales	Desulfovibrionales	Burkholderiales	Fusobacteriales	Erysipelotrichales	Flavobacteriales	Clostridiales	Coriobacteriales
Lactobacillales	0	1	1	0	0	0	0	0
Desulfovibrionales	1	0	0	0	0	0	1	0
Burkholderiales	1	0	0	0	0	0	0	0

Fusobacteriales	0	0	0	0	1	0	3	0
Erysipelotrichales	0	0	0	1	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	1	0
Clostridiales	0	1	0	3	0	1	0	0
Coriobacteriales	0	0	0	0	0	0	0	0
Selenomonadales	0	0	0	0	0	0	7	1
Bacteroidales	2	0	0	0	2	0	29	1
Synergistales	0	0	0	0	0	0	0	0
Enterobacteriales	2	0	0	0	0	0	14	0

Order	Selenomonadales	Bacteroidales	Synergistales	Enterobacteriales
Lactobacillales	0	2	0	2
Desulfovibrionales	0	0	0	0
Burkholderiales	0	0	0	0
Fusobacteriales	0	0	0	0
Erysipelotrichales	0	2	0	0
Flavobacteriales	0	0	0	0
Clostridiales	7	29	0	14
Coriobacteriales	1	1	0	0
Selenomonadales	0	3	0	0
Bacteroidales	3	0	1	0
Synergistales	0	1	0	0
Enterobacteriales	0	0	0	0

Co-occurrence network

Order	Clostridiales	Synergistales	Erysipelotrichales	Fusobacteriales	Thermoanaerobacterales	Selenomonadales	Coriobacteriales
Clostridiales	40	24	24	20	12	16	16
Synergistales	24	3	5	1	3	5	6
Erysipelotrichales	24	5	3	8	6	4	0
Fusobacteriales	20	1	8	3	6	0	0
Thermoanaerobacterales	12	3	6	6	1	1	0
Selenomonadales	16	5	4	0	1	3	6
Coriobacteriales	16	6	0	0	0	6	3
Bacillales	14	2	4	3	2	3	2
Asterales	9	3	3	0	2	3	2
Acholeplasmatales	8	1	4	3	2	1	0
Lactobacillales	11	1	4	4	4	1	0
Mycoplasmatales	10	2	3	3	2	1	0
Entomoplasmatales	8	1	4	3	2	1	0
Bifidobacteriales	8	3	0	0	0	2	3
Spirochaetales	7	1	2	4	3	1	0
Verrucomicrobiales	3	3	2	1	1	1	2
Bacteroidales	3	0	0	0	0	0	0
Rhodospirillales	2	1	0	2	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Desulfovibrionales	3	2	0	0	0	0	0
Fibrobacterales	1	0	0	0	0	0	0
Dehalococcoidales	1	0	0	0	0	0	0

Order	Bacillales	Asterales	Acholeplasmatales	Lactobacillales	Mycoplasmatales	Entomoplasmatales	Bifidobacteriales
Clostridiales	14	9	8	11	10	8	8
Synergistales	2	3	1	1	2	1	3
Erysipelotrichales	4	3	4	4	3	4	0
Fusobacteriales	3	0	3	4	3	3	0
Thermoanaerobacterales	2	2	2	4	2	2	0
Selenomonadales	3	3	1	1	1	1	2
Coriobacteriales	2	2	0	0	0	0	3
Bacillales	0	2	2	3	2	2	1
Asterales	2	0	1	1	1	1	1
Acholeplasmatales	2	1	0	2	1	1	0
Lactobacillales	3	1	2	1	2	1	0
Mycoplasmatales	2	1	1	2	0	1	1

Entomoplasmatales	2	1	1	1	1	0	0
Bifidobacteriales	1	1	0	0	1	0	0
Spirochaetales	1	0	2	3	2	2	0
Verrucomicrobiales	0	1	0	0	1	0	1
Bacteroidales	0	0	0	0	0	0	0
Rhodospirillales	0	0	0	2	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Desulfovibrionales	1	0	0	0	1	0	1
Fibrobacterales	0	0	0	0	0	1	0
Dehalococcoidales	0	0	0	0	0	0	0

Order	Spirochaetales	Verrucomicrobiales	Bacteroidales	Rhodospirillales	Flavobacteriales	Desulfovibrionales	Fibrobacterales
Clostridiales	7	3	3	2	0	3	1
Synergistales	1	3	0	1	0	2	0
Erysipelotrichales	2	2	0	0	0	0	0
Fusobacteriales	4	1	0	2	0	0	0
Thermoanaerobacterales	3	1	0	0	0	0	0
Selenomonadales	1	1	0	0	0	0	0
Coriobacteriales	0	2	0	0	0	0	0
Bacillales	1	0	0	0	0	1	0
Asterales	0	1	0	0	0	0	0
Acholeplasmatales	2	0	0	0	0	0	0
Lactobacillales	3	0	0	2	0	0	0
Mycoplasmatales	2	1	0	0	0	1	0
Entomoplasmatales	2	0	0	0	0	0	1
Bifidobacteriales	0	1	0	0	0	1	0
Spirochaetales	0	0	0	1	0	1	1
Verrucomicrobiales	0	0	0	0	0	0	0
Bacteroidales	0	0	3	0	2	2	0
Rhodospirillales	1	0	0	1	0	2	0
Flavobacteriales	0	0	2	0	0	0	0
Desulfovibrionales	1	0	2	2	0	0	0
Fibrobacterales	1	0	0	0	0	0	0
Dehalococcoidales	0	0	0	0	0	0	0

Order	Dehalococcoidales
Clostridiales	1
Synergistales	0
Erysipelotrichales	0

Fusobacteriales	0
Thermoanaerobacterales	0
Selenomonadales	0
Coriobacteriales	0
Bacillales	0
Asterales	0
Acholeplasmatales	0
Lactobacillales	0
Mycoplasmatales	0
Entomoplasmatales	0
Bifidobacteriales	0
Spirochaetales	0
Verrucomicrobiales	0
Bacteroidales	0
Rhodospirillales	0
Flavobacteriales	0
Desulfovibrionales	0
Fibrobacterales	0
Dehalococcoidales	0

Mutual exclusion network

Order	Selenomonadales	Clostridiales	Mycoplasmatales	Entomoplasmatales	Coriobacteriales	Burkholderiales	Synergistales
Selenomonadales	1	2	0	0	0	0	0
Clostridiales	2	8	1	2	2	0	3
Mycoplasmatales	0	1	0	0	0	0	0
Entomoplasmatales	0	2	0	0	0	0	0
Coriobacteriales	0	2	0	0	0	1	0
Burkholderiales	0	0	0	0	1	0	0
Synergistales	0	3	0	0	0	0	0
Bacillales	0	2	0	0	0	0	0
Bifidobacteriales	0	1	0	0	0	0	0
Bacteroidales	2	11	0	1	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Fusobacteriales	0	2	0	0	0	0	0
Asterales	0	1	0	0	0	0	0
Acholeplasmatales	0	2	0	0	0	0	0
Verrucomicrobiales	0	2	0	0	0	0	0

Erysipelotrichales	0	6	0	0	0	0	0

Order	Bacillales	Bifidobacteriales	Bacteroidales	Thermoanaerobacterales	Fusobacteriales	Asterales	Acholeplasmatales
Selenomonadales	0	0	2	0	0	0	0
Clostridiales	2	1	11	0	2	1	2
Mycoplasmatales	0	0	0	0	0	0	0
Entomoplasmatales	0	0	1	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0
Bacillales	0	0	1	0	0	0	0
Bifidobacteriales	0	0	1	0	0	0	0
Bacteroidales	1	1	3	1	1	1	1
Thermoanaerobacterales	0	0	1	0	0	0	0
Fusobacteriales	0	0	1	0	0	0	0
Asterales	0	0	1	0	0	0	0
Acholeplasmatales	0	0	1	0	0	0	0
Verrucomicrobiales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	0	0

Order	Verrucomicrobiales	Erysipelotrichales
Selenomonadales	0	0
Clostridiales	2	6
Mycoplasmatales	0	0
Entomoplasmatales	0	0
Coriobacteriales	0	0
Burkholderiales	0	0
Synergistales	0	0
Bacillales	0	0
Bifidobacteriales	0	0
Bacteroidales	0	0
Thermoanaerobacterales	0	0
Fusobacteriales	0	0
Asterales	0	0
Acholeplasmatales	0	0
Verrucomicrobiales	0	0
Erysipelotrichales	0	0

Co-occurrence network

Order	Clostridiales	Selenomonadales	Actinomycetales	Thermoanaerobacterales	Synergistales	Erysipelotrichales	Cytophagales
Clostridiales	9	3	3	1	1	2	0
Selenomonadales	3	0	1	0	1	0	0
Actinomycetales	3	1	0	0	2	0	0
Thermoanaerobacterales	1	0	0	0	2	0	0
Synergistales	1	1	2	2	1	0	0
Erysipelotrichales	2	0	0	0	0	1	0
Cytophagales	0	0	0	0	0	0	0
Rhodospirillales	0	0	0	0	0	0	2
Bifidobacteriales	2	1	0	0	0	0	1
Bacillales	3	0	1	1	1	0	1
Burkholderiales	0	0	0	0	0	0	0
Verrucomicrobiales	0	0	0	0	0	0	0
Bacteroidales	1	1	0	0	0	0	0
Sphaerobacterales	0	0	0	1	1	0	0
Spirochaetales	1	0	0	0	0	1	0
Cardiobacteriales	0	0	0	0	0	1	0
Rubrobacterales	0	0	0	0	0	0	0
Opitutales	0	0	0	0	0	0	1
Caulobacterales	0	0	0	0	0	0	0
Neisseriales	0	0	0	0	0	0	0
Methanobacteriales	0	0	0	0	0	0	0
Methanomicrobiales	1	0	1	0	0	0	0
Flavobacteriales	1	0	0	0	0	0	0
Fibrobacterales	0	0	0	0	0	0	1
Entomoplasmatales	0	0	0	0	0	0	0
Enterobacteriales	0	0	0	0	0	0	0
Desulfovibrionales	0	1	0	0	0	0	0
Desulfobacterales	0	0	0	0	0	0	1
Chromatiales	0	0	0	1	0	0	1
Coriobacteriales	1	0	0	0	0	0	0
Fusobacteriales	1	0	0	0	0	0	0
Bacteroidetes	1	0	0	0	0	0	0
Chlorobiales	1	0	0	0	0	0	0
Asterales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	0	0	0	0	0

Order	Rhodospirillales	Bifidobacteriales	Bacillales	Burkholderiales	Verrucomicrobiales	Bacteroidales	Sphaerobacterales
Clostridiales	0	2	3	0	0	1	0
Selenomonadales	0	1	0	0	0	1	0
Actinomycetales	0	0	1	0	0	0	0
Thermoanaerobacterales	0	0	1	0	0	0	1
Synergistales	0	0	1	0	0	0	1
Erysipelotrichales	0	0	0	0	0	0	0
Cytophagales	2	1	1	0	0	0	0
Rhodospirillales	0	1	1	0	0	0	0
Bifidobacteriales	1	0	0	0	0	0	0
Bacillales	1	0	0	2	0	0	1
Burkholderiales	0	0	2	0	0	0	0
Verrucomicrobiales	0	0	0	0	0	1	0
Bacteroidales	0	0	0	0	1	0	0
Sphaerobacterales	0	0	1	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Cardiobacteriales	0	0	0	0	0	0	0
Rubrobacterales	0	1	0	0	0	0	0
Opitutales	1	1	0	0	0	0	0
Caulobacterales	1	1	0	0	0	0	0
Neisseriales	0	0	0	0	0	0	0
Methanobacteriales	0	0	0	0	0	0	0
Methanomicrobiales	0	0	1	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Fibrobacterales	1	0	1	0	0	0	0
Entomoplasmatales	0	0	0	1	0	0	0
Enterobacteriales	0	0	0	0	0	0	0
Desulfovibrionales	1	1	0	0	0	0	0
Desulfobacterales	1	1	0	0	0	0	0
Chromatiales	0	1	1	0	0	0	0
Coriobacteriales	0	0	0	0	0	1	0
Fusobacteriales	0	0	0	0	0	0	0
Bacteroidetes	0	0	0	0	0	0	0
Chlorobiales	0	0	0	0	0	0	0
Asterales	0	0	0	0	0	1	0
Acholeplasmatales	0	0	0	0	0	0	0

Order	Spirochaetales	Cardiobacteriales	Rubrobacterales	Opitutales	Caulobacterales	Neisseriales	Methanobacteriales
Clostridiales	1	0	0	0	0	0	0

Selenomonadales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0
Erysipelotrichales	1	1	0	0	0	0	0
Cytophagales	0	0	0	1	0	0	0
Rhodospirillales	0	0	0	1	1	0	0
Bifidobacteriales	0	0	1	1	1	0	0
Bacillales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Verrucomicrobiales	0	0	0	0	0	0	0
Bacteroidales	0	0	0	0	0	0	0
Sphaerobacterales	0	0	0	0	0	0	0
Spirochaetales	0	1	0	0	0	0	0
Cardiobacteriales	1	0	0	0	0	0	0
Rubrobacterales	0	0	0	0	0	0	0
Opitutales	0	0	0	0	1	0	0
Caulobacterales	0	0	0	1	0	0	0
Neisseriales	0	0	0	0	0	0	1
Methanobacteriales	0	0	0	0	0	1	0
Methanomicrobiales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	1	0	0	0
Entomoplasmatales	0	0	0	0	0	0	0
Enterobacteriales	1	0	0	0	0	0	0
Desulfovibrionales	0	0	0	1	1	0	0
Desulfobacterales	0	0	0	1	1	0	0
Chromatiales	0	0	0	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Bacteroidetes	0	0	0	0	1	0	0
Chlorobiales	0	0	0	0	1	0	0
Asterales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	0	0	0	0	0

Order	Methanomicrobiales	Flavobacteriales	Fibrobacterales	Entomoplasmatales	Enterobacteriales	Desulfovibrionales	Desulfobacterales
Clostridiales	1	1	0	0	0	0	0
Selenomonadales	0	0	0	0	0	1	0
Actinomycetales	1	0	0	0	0	0	0

Thermoanaerobacterales	0	0	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	0	0
Cytophagales	0	0	1	0	0	0	1
Rhodospirillales	0	0	1	0	0	1	1
Bifidobacteriales	0	0	0	0	0	1	1
Bacillales	1	0	1	0	0	0	0
Burkholderiales	0	0	0	1	0	0	0
Verrucomicrobiales	0	0	0	0	0	0	0
Bacteroidales	0	0	0	0	0	0	0
Sphaerobacterales	0	0	0	0	0	0	0
Spirochaetales	0	0	0	0	1	0	0
Cardiobacteriales	0	0	0	0	0	0	0
Rubrobacterales	0	0	0	0	0	0	0
Opitutales	0	0	1	0	0	1	1
Caulobacterales	0	0	0	0	0	1	1
Neisseriales	0	0	0	0	0	0	0
Methanobacteriales	0	0	0	0	0	0	0
Methanomicrobiales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	0	0	0	1
Entomoplasmatales	0	0	0	0	0	0	0
Enterobacteriales	0	0	0	0	0	0	0
Desulfovibrionales	0	0	0	0	0	0	1
Desulfobacterales	0	0	1	0	0	1	0
Chromatiales	0	0	0	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Bacteroidetes	0	0	0	0	0	0	0
Chlorobiales	0	0	0	0	0	0	0
Asterales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	0	1	0	0	1

Order	**Chromatiales**	**Coriobacteriales**	**Fusobacteriales**	**Bacteroidetes**	**Chlorobiales**	**Asterales**	**Acholeplasmatales**
Clostridiales	0	1	1	1	1	0	0
Selenomonadales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Thermoanaerobacterales	1	0	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0

Erysipelotrichales	0	0	0	0	0	0	0
Cytophagales	1	0	0	0	0	0	0
Rhodospirillales	0	0	0	0	0	0	0
Bifidobacteriales	1	0	0	0	0	0	0
Bacillales	1	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Verrucomicrobiales	0	0	0	0	0	0	0
Bacteroidales	0	1	0	0	0	1	0
Sphaerobacterales	0	0	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Cardiobacteriales	0	0	0	0	0	0	0
Rubrobacterales	0	0	0	0	0	0	0
Opitutales	0	0	0	0	0	0	0
Caulobacterales	0	0	0	1	1	0	0
Neisseriales	0	0	0	0	0	0	0
Methanobacteriales	0	0	0	0	0	0	0
Methanomicrobiales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	0	0	0	0
Entomoplasmatales	0	0	0	0	0	0	1
Enterobacteriales	0	0	0	0	0	0	0
Desulfovibrionales	0	0	0	0	0	0	0
Desulfobacterales	0	0	0	0	0	0	1
Chromatiales	0	0	0	0	0	0	0
Coriobacteriales	0	1	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Bacteroidetes	0	0	0	0	1	0	0
Chlorobiales	0	0	0	1	0	0	0
Asterales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	0	0	0	0	0

Mutual exclusion network

Order	Thermoanaerobacterales	Actinomycetales	Synergistales	Bacteroidales	Spirochaetales	Fibrobacterales	Selenomonadales
Thermoanaerobacterales	0	1	0	0	0	0	0
Actinomycetales	1	0	0	1	0	0	0
Synergistales	0	0	0	1	0	0	0
Bacteroidales	0	1	1	0	0	0	1

Spirochaetales	0	0	0	0	0	1	0
Fibrobacterales	0	0	0	0	1	0	0
Selenomonadales	0	0	0	1	0	0	0
Erysipelotrichales	0	0	0	0	0	0	1
Opitutales	0	0	0	1	0	0	0
Neisseriales	0	0	0	0	0	0	0
Clostridiales	0	0	0	3	0	1	2
Lactobacillales	0	0	1	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0
Aeromonadales	0	0	0	0	0	0	0
Desulfovibrionales	0	1	0	1	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Cardiobacteriales	0	0	0	0	0	1	0
Bifidobacteriales	0	0	0	1	0	0	0
Rhodospirillales	0	0	0	1	0	0	0
Caulobacterales	0	0	0	1	0	0	0
Bacillales	0	0	0	0	0	0	0
Desulfobacterales	0	0	0	0	0	0	0

Order	Erysipelotrichales	Opitutales	Neisseriales	Clostridiales	Lactobacillales	Coriobacteriales	Flavobacteriales
Thermoanaerobacterales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Synergistales	0	0	0	0	1	0	0
Bacteroidales	0	1	0	3	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	1	0	0	0
Selenomonadales	1	0	0	2	0	0	0
Erysipelotrichales	1	0	0	1	0	3	1
Opitutales	0	0	0	1	0	0	0
Neisseriales	0	0	0	1	0	0	0
Clostridiales	1	1	1	4	3	0	0
Lactobacillales	0	0	0	3	0	1	0
Coriobacteriales	3	0	0	0	1	0	0
Flavobacteriales	1	0	0	0	0	0	0
Fabales	0	0	0	1	0	0	0
Aeromonadales	0	0	0	0	0	0	0
Desulfovibrionales	0	0	0	1	1	0	0

Burkholderiales	0	0	0	1	0	1	0
Cardiobacteriales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	1	0	0	0
Rhodospirillales	0	0	0	0	0	0	0
Caulobacterales	0	0	0	0	2	0	0
Bacillales	0	0	0	0	1	0	0
Desulfobacterales	0	0	0	2	0	0	0

Order	Fabales	Aeromonadales	Desulfovibrionales	Burkholderiales	Cardiobacteriales	Bifidobacteriales	Rhodospirillales
Thermoanaerobacterales	0	0	0	0	0	0	0
Actinomycetales	0	0	1	0	0	0	0
Synergistales	0	0	0	0	0	0	0
Bacteroidales	0	0	1	0	0	1	1
Spirochaetales	0	0	0	0	0	0	0
Fibrobacterales	0	0	0	0	1	0	0
Selenomonadales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	0	0
Opitutales	0	0	0	0	0	0	0
Neisseriales	0	0	0	0	0	0	0
Clostridiales	1	0	1	1	0	1	0
Lactobacillales	0	0	1	0	0	0	0
Coriobacteriales	0	0	0	1	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Fabales	0	1	0	0	0	0	0
Aeromonadales	1	0	0	0	0	0	0
Desulfovibrionales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Cardiobacteriales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Rhodospirillales	0	0	0	0	0	0	0
Caulobacterales	0	0	0	0	0	0	0
Bacillales	0	0	0	0	0	0	0
Desulfobacterales	0	0	0	0	0	0	0

Order	Caulobacterales	Bacillales	Desulfobacterales
Thermoanaerobacterales	0	0	0
Actinomycetales	0	0	0
Synergistales	0	0	0
Bacteroidales	1	0	0

Spirochaetales	0	0	0
Fibrobacterales	0	0	0
Selenomonadales	0	0	0
Erysipelotrichales	0	0	0
Opitutales	0	0	0
Neisseriales	0	0	0
Clostridiales	0	0	2
Lactobacillales	2	1	0
Coriobacteriales	0	0	0
Flavobacteriales	0	0	0
Fabales	0	0	0
Aeromonadales	0	0	0
Desulfovibrionales	0	0	0
Burkholderiales	0	0	0
Cardiobacteriales	0	0	0
Bifidobacteriales	0	0	0
Rhodospirillales	0	0	0
Caulobacterales	0	0	0
Bacillales	0	0	0
Desulfobacterales	0	0	0

Co-occurrence network

Order	Clostridiales	Erysipelotrichales	Enterobacteriales	Lactobacillales	Bacteroidales	Vibrionales	Aeromonadales
Clostridiales	62	19	0	5	6	3	1
Erysipelotrichales	19	1	0	0	2	2	1
Enterobacteriales	0	0	6	2	0	0	0
Lactobacillales	5	0	2	0	0	0	0
Bacteroidales	6	2	0	0	2	0	0
Vibrionales	3	2	0	0	0	1	4
Aeromonadales	1	1	0	0	0	4	1
Fibrobacterales	4	1	0	0	2	0	0
Selenomonadales	7	1	3	0	3	0	0
Fusobacteriales	5	1	0	0	0	2	1
Flavobacteriales	5	0	0	0	2	0	0
Coriobacteriales	6	4	0	0	3	0	0
Synergistales	4	1	0	0	1	0	0
Asterales	1	1	0	0	1	0	0
Spirochaetales	4	0	0	0	0	2	1
Desulfovibrionales	1	1	0	0	1	0	0
Bifidobacteriales	3	0	0	0	0	0	0
Burkholderiales	0	0	1	0	2	0	0
Pasteurellales	0	0	0	0	0	1	1
Campylobacterales	0	0	0	1	0	0	0

Order	Fibrobacterales	Selenomonadales	Fusobacteriales	Flavobacteriales	Coriobacteriales	Synergistales	Asterales
Clostridiales	4	7	5	5	6	4	1
Erysipelotrichales	1	1	1	0	4	1	1
Enterobacteriales	0	3	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Bacteroidales	2	3	0	2	3	1	1
Vibrionales	0	0	2	0	0	0	0
Aeromonadales	0	0	1	0	0	0	0
Fibrobacterales	0	1	0	0	2	1	0
Selenomonadales	1	3	0	2	2	1	3
Fusobacteriales	0	0	0	0	0	0	0
Flavobacteriales	0	2	0	0	0	0	0
Coriobacteriales	2	2	0	0	1	2	0
Synergistales	1	1	0	0	2	0	0
Asterales	0	3	0	0	0	0	0

Spirochaetales	0	0	1	0	1	0	0
Desulfovibrionales	1	0	0	0	2	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Burkholderiales	1	0	0	0	0	0	0
Pasteurellales	0	0	0	0	0	0	0
Campylobacterales	0	0	0	0	0	0	0

Order	Spirochaetales	Desulfovibrionales	Bifidobacteriales	Burkholderiales	Pasteurellales	Campylobacterales
Clostridiales	4	1	3	0	0	0
Erysipelotrichales	0	1	0	0	0	0
Enterobacteriales	0	0	0	1	0	0
Lactobacillales	0	0	0	0	0	1
Bacteroidales	0	1	0	2	0	0
Vibrionales	2	0	0	0	1	0
Aeromonadales	1	0	0	0	1	0
Fibrobacterales	0	1	0	1	0	0
Selenomonadales	0	0	0	0	0	0
Fusobacteriales	1	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0
Coriobacteriales	1	2	0	0	0	0
Synergistales	0	0	0	0	0	0
Asterales	0	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0
Desulfovibrionales	0	0	1	0	0	0
Bifidobacteriales	0	1	0	0	0	0
Burkholderiales	0	0	0	0	0	0
Pasteurellales	0	0	0	0	0	0
Campylobacterales	0	0	0	0	0	1

Mutual exclusion network

Order	Coriobacteriales	Bacteroidales	Clostridiales	Lactobacillales	Bifidobacteriales
Coriobacteriales	0	1	0	0	0
Bacteroidales	1	0	1	0	1
Clostridiales	0	1	0	1	0
Lactobacillales	0	0	1	0	0
Bifidobacteriales	0	1	0	0	0

Co-occurrence network

Order	Enterobacteriales	Actinomycetales	Myxococcales	Clostridiales	Synergistales	Flavobacteriales	Hexacorallia
Enterobacteriales	4	0	0	0	0	2	0
Actinomycetales	0	3	7	2	3	3	3
Myxococcales	0	7	1	0	2	2	2
Clostridiales	0	2	0	3	3	0	0
Synergistales	0	3	2	3	0	1	1
Flavobacteriales	2	3	2	0	1	0	1
Hexacorallia	0	3	2	0	1	1	0
Methanomicrobiales	2	0	0	0	0	1	0
Fusobacteriales	2	0	0	0	0	1	0
Thermoanaerobacterales	0	1	0	1	0	0	0
Opitutales	0	0	0	0	0	0	0
Methylococcales	0	0	0	0	0	0	0
Caulobacterales	0	1	0	1	0	0	0
Sphaerobacterales	0	0	0	1	0	0	0
Rubrobacterales	0	0	0	1	0	0	0
Rhodocyclales	0	0	0	1	0	0	0
Bacillales	0	1	1	0	0	0	0
Fabales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Desulfuromonadales	0	1	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Chromatiales	0	2	0	0	0	0	0
Deinococcales	0	0	0	0	0	0	0
Sphingomonadales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	1	0	0	0
Rhodospirillales	0	1	0	0	0	0	0
Chlorobiales	0	0	0	0	0	0	0
Burkholderiales	0	1	0	0	0	0	0
Asterales	0	1	0	0	0	0	0
Bacteroidales	0	0	0	1	0	0	0

Order	Methanomicrobiales	Fusobacteriales	Thermoanaerobacterales	Opitutales	Methylococcales	Caulobacterales	Sphaerobacterales
Enterobacteriales	2	2	0	0	0	0	0
Actinomycetales	0	0	1	0	0	1	0
Myxococcales	0	0	0	0	0	0	0
Clostridiales	0	0	1	0	0	1	1

Synergistales	0	0	0	0	0	0	0
Flavobacteriales	1	1	0	0	0	0	0
Hexacorallia	0	0	0	0	0	0	0
Methanomicrobiales	0	1	0	0	0	0	0
Fusobacteriales	1	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	1	1	1	0
Opitutales	0	0	1	0	1	0	0
Methylococcales	0	0	1	1	0	0	0
Caulobacterales	0	0	1	0	0	0	0
Sphaerobacterales	0	0	0	0	0	0	0
Rubrobacterales	0	0	0	0	0	0	1
Rhodocyclales	0	0	0	0	0	0	0
Bacillales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Desulfuromonadales	0	0	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Chromatiales	0	0	0	0	0	0	0
Deinococcales	0	0	0	0	0	0	0
Sphingomonadales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	0	0
Rhodospirillales	0	0	0	0	0	0	0
Chlorobiales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Asterales	0	0	0	0	0	0	0
Bacteroidales	0	0	0	0	0	0	1

Order	**Rubrobacterales**	**Rhodocyclales**	**Bacillales**	**Fabales**	**Lactobacillales**	**Desulfuromonadales**	**Spirochaetales**
Enterobacteriales	0	0	0	0	0	0	0
Actinomycetales	0	0	1	0	0	1	0
Myxococcales	0	0	1	0	0	0	0
Clostridiales	1	1	0	0	0	0	0
Synergistales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Hexacorallia	0	0	0	0	0	0	0
Methanomicrobiales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Opitutales	0	0	0	0	0	0	0

Methylococcales	0	0	0	0	0	0	0
Caulobacterales	0	0	0	0	0	0	0
Sphaerobacterales	1	0	0	0	0	0	0
Rubrobacterales	0	0	0	0	0	0	0
Rhodocyclales	0	0	0	0	0	0	0
Bacillales	0	0	0	0	0	0	0
Fabales	0	0	0	0	1	0	0
Lactobacillales	0	0	0	1	0	0	0
Desulfuromonadales	0	0	0	0	0	0	1
Spirochaetales	0	0	0	0	0	1	0
Chromatiales	0	0	0	0	0	1	0
Deinococcales	0	0	0	0	0	0	0
Sphingomonadales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	0	0
Rhodospirillales	0	0	0	0	0	0	0
Chlorobiales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	1	0
Asterales	0	0	0	0	0	1	0
Bacteroidales	1	0	0	0	0	0	0

Order	**Chromatiales**	**Deinococcales**	**Sphingomonadales**	**Erysipelotrichales**	**Rhodospirillales**	**Chlorobiales**	**Burkholderiales**
Enterobacteriales	0	0	0	0	0	0	0
Actinomycetales	2	0	0	0	1	0	1
Myxococcales	0	0	0	0	0	0	0
Clostridiales	0	0	0	1	0	0	0
Synergistales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Hexacorallia	0	0	0	0	0	0	0
Methanomicrobiales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Opitutales	0	0	0	0	0	0	0
Methylococcales	0	0	0	0	0	0	0
Caulobacterales	0	0	0	0	0	0	0
Sphaerobacterales	0	0	0	0	0	0	0
Rubrobacterales	0	0	0	0	0	0	0
Rhodocyclales	0	0	0	0	0	0	0
Bacillales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0

Lactobacillales	0	0	0	0	0	0	0
Desulfuromonadales	1	0	0	0	0	0	1
Spirochaetales	0	0	0	0	0	0	0
Chromatiales	0	0	0	0	1	0	1
Deinococcales	0	0	1	0	0	0	0
Sphingomonadales	0	1	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	1	0
Rhodospirillales	1	0	0	0	0	0	0
Chlorobiales	0	0	0	1	0	0	0
Burkholderiales	1	0	0	0	0	0	0
Asterales	1	0	0	0	0	0	1
Bacteroidales	0	0	0	0	0	0	0

Order	Asterales	Bacteroidales
Enterobacteriales	0	0
Actinomycetales	1	0
Myxococcales	0	0
Clostridiales	0	1
Synergistales	0	0
Flavobacteriales	0	0
Hexacorallia	0	0
Methanomicrobiales	0	0
Fusobacteriales	0	0
Thermoanaerobacterales	0	0
Opitutales	0	0
Methylococcales	0	0
Caulobacterales	0	0
Sphaerobacterales	0	1
Rubrobacterales	0	1
Rhodocyclales	0	0
Bacillales	0	0
Fabales	0	0
Lactobacillales	0	0
Desulfuromonadales	1	0
Spirochaetales	0	0
Chromatiales	1	0
Deinococcales	0	0
Sphingomonadales	0	0
Erysipelotrichales	0	0

Rhodospirillales	0	0
Chlorobiales	0	0
Burkholderiales	1	0
Asterales	0	0
Bacteroidales	0	0

Mutual exclusion network

Order	Verrucomicrobiales	Pasteurellales	Thermoanaerobacterales	Clostridiales	Synergistales	Fusobacteriales	Erysipelotrichales
Verrucomicrobiales	0	1	0	0	0	0	0
Pasteurellales	1	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	1	0	0	0
Clostridiales	0	0	1	1	1	0	0
Synergistales	0	0	0	1	0	0	0
Fusobacteriales	0	0	0	0	0	0	1
Erysipelotrichales	0	0	0	0	0	1	0
Desulfovibrionales	0	0	0	0	0	0	0
Hydrogenophilales	0	0	0	0	0	0	0
Coriobacteriales	0	0	0	0	0	0	0
Enterobacteriales	0	0	0	1	0	0	0
Caulobacterales	0	0	0	1	0	0	0
Actinomycetales	0	0	0	1	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Selenomonadales	0	0	0	0	0	0	0
Bacteroidales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0

Order	Desulfovibrionales	Hydrogenophilales	Coriobacteriales	Enterobacteriales	Caulobacterales	Actinomycetales	Burkholderiales
Verrucomicrobiales	0	0	0	0	0	0	0
Pasteurellales	0	0	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0	0	0
Clostridiales	0	0	0	1	1	1	0
Synergistales	0	0	0	0	0	0	0
Fusobacteriales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	0	0	0	0	0
Desulfovibrionales	0	1	0	0	0	0	0
Hydrogenophilales	1	0	0	0	0	0	0

Coriobacteriales	0	0	1	0	0	0	0
Enterobacteriales	0	0	0	0	0	0	0
Caulobacterales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Burkholderiales	0	0	0	0	0	0	0
Selenomonadales	0	0	0	0	0	0	1
Bacteroidales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0

Order	Selenomonadales	Bacteroidales	Lactobacillales	Fabales
Verrucomicrobiales	0	0	0	0
Pasteurellales	0	0	0	0
Thermoanaerobacterales	0	0	0	0
Clostridiales	0	0	0	0
Synergistales	0	0	0	0
Fusobacteriales	0	0	0	0
Erysipelotrichales	0	0	0	0
Desulfovibrionales	0	0	0	0
Hydrogenophilales	0	0	0	0
Coriobacteriales	0	0	0	0
Enterobacteriales	0	0	0	0
Caulobacterales	0	0	0	0
Actinomycetales	0	0	0	0
Burkholderiales	1	0	0	0
Selenomonadales	0	0	0	0
Bacteroidales	0	0	1	1
Lactobacillales	0	1	0	0
Fabales	0	1	0	0

Co-occurrence network

Order	Clostridiales	Bacteroidales	Coriobacteriales	Selenomonadales	Erysipelotrichales	Synergistales	Bacillales
Clostridiales	69	30	21	18	24	16	13
Bacteroidales	30	8	2	1	3	4	4
Coriobacteriales	21	2	2	2	4	5	3
Selenomonadales	18	1	2	4	4	3	2
Erysipelotrichales	24	3	4	4	2	3	4
Synergistales	16	4	5	3	3	1	2
Bacillales	13	4	3	2	4	2	0
Spirochaetales	9	0	1	2	1	1	1
Asterales	12	2	2	1	2	1	1
Fibrobacterales	9	2	3	2	2	2	2
Desulfovibrionales	8	7	2	4	2	2	3
Chromatiales	5	1	3	2	1	2	1
Burkholderiales	6	6	2	0	0	2	1
Aeromonadales	5	0	1	0	0	0	0
Thermoanaerobacterales	7	1	2	2	3	2	1
Pasteurellales	5	3	2	1	1	2	1
Hydrogenophilales	2	4	0	0	1	0	1
Lactobacillales	3	0	0	0	1	0	0
Flavobacteriales	3	2	1	1	1	0	1
Enterobacteriales	0	0	0	4	0	0	0
Verrucomicrobiales	0	1	0	0	0	0	0
Neisseriales	0	0	0	0	0	0	0
Bifidobacteriales	2	0	0	0	0	0	1
Actinomycetales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0

Order	Spirochaetales	Asterales	Fibrobacterales	Desulfovibrionales	Chromatiales	Burkholderiales	Aeromonadales
Clostridiales	9	12	9	8	5	6	5
Bacteroidales	0	2	2	7	1	6	0
Coriobacteriales	1	2	3	2	3	2	1
Selenomonadales	2	1	2	4	2	0	0
Erysipelotrichales	1	2	2	2	1	0	0
Synergistales	1	1	2	2	2	2	0
Bacillales	1	1	2	3	1	1	0
Spirochaetales	0	1	0	1	0	0	1
Asterales	1	0	1	0	0	0	0

Fibrobacterales	0	1	0	1	1	1	0
Desulfovibrionales	1	0	1	1	2	3	0
Chromatiales	0	0	1	2	0	1	0
Burkholderiales	0	0	1	3	1	0	1
Aeromonadales	1	0	0	0	0	1	0
Thermoanaerobacterales	0	0	1	1	1	1	1
Pasteurellales	0	0	1	2	1	1	0
Hydrogenophilales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Flavobacteriales	0	0	1	2	0	0	0
Enterobacteriales	0	0	0	0	0	2	0
Verrucomicrobiales	0	0	0	1	0	0	0
Neisseriales	0	0	0	0	0	1	0
Bifidobacteriales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0

Order	Thermoanaerobacterales	Pasteurellales	Hydrogenophilales	Lactobacillales	Flavobacteriales	Enterobacteriales	Verrucomicrobiales
Clostridiales	7	5	2	3	3	0	0
Bacteroidales	1	3	4	0	2	0	1
Coriobacteriales	2	2	0	0	1	0	0
Selenomonadales	2	1	0	0	1	4	0
Erysipelotrichales	3	1	1	1	1	0	0
Synergistales	2	2	0	0	0	0	0
Bacillales	1	1	1	0	1	0	0
Spirochaetales	0	0	0	0	0	0	0
Asterales	0	0	0	0	0	0	0
Fibrobacterales	1	1	0	0	1	0	0
Desulfovibrionales	1	2	0	0	2	0	1
Chromatiales	1	1	0	0	0	0	0
Burkholderiales	1	1	0	0	0	2	0
Aeromonadales	1	0	0	0	0	0	0
Thermoanaerobacterales	0	1	0	0	0	0	0
Pasteurellales	1	0	0	0	0	0	1
Hydrogenophilales	0	0	0	0	1	0	0
Lactobacillales	0	0	0	0	0	0	0
Flavobacteriales	0	0	1	0	0	0	0
Enterobacteriales	0	0	0	0	0	2	0
Verrucomicrobiales	0	1	0	0	0	0	0

Neisseriales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Fabales	0	0	0	0	0	0	0

Order	Neisseriales	Bifidobacteriales	Actinomycetales	Fabales
Clostridiales	0	2	0	0
Bacteroidales	0	0	0	0
Coriobacteriales	0	0	0	0
Selenomonadales	0	0	0	0
Erysipelotrichales	0	0	0	0
Synergistales	0	0	0	0
Bacillales	0	1	0	0
Spirochaetales	0	0	0	0
Asterales	0	0	0	0
Fibrobacterales	0	0	0	0
Desulfovibrionales	0	0	0	0
Chromatiales	0	0	0	0
Burkholderiales	1	0	0	0
Aeromonadales	0	0	0	0
Thermoanaerobacterales	0	0	0	0
Pasteurellales	0	0	0	0
Hydrogenophilales	0	0	0	0
Lactobacillales	0	0	0	0
Flavobacteriales	0	0	0	0
Enterobacteriales	0	0	0	0
Verrucomicrobiales	0	0	0	0
Neisseriales	0	0	0	0
Bifidobacteriales	0	0	0	0
Actinomycetales	0	0	0	1
Fabales	0	0	1	0

Mutual exclusion network

Order	Xanthomonadales	Burkholderiales	Selenomonadales	Pasteurellales	Actinomycetales	Lactobacillales	Hydrogenophilales
Xanthomonadales	0	1	1	0	0	0	0
Burkholderiales	1	0	0	0	1	0	0
Selenomonadales	1	0	0	0	0	0	0

Pasteurellales	0	0	0	0	1	0	0
Actinomycetales	0	1	0	1	0	0	0
Lactobacillales	0	0	0	0	0	0	1
Hydrogenophilales	0	0	0	0	0	1	0
Clostridiales	2	0	0	0	2	1	0
Bacillales	0	0	0	0	0	1	0
Flavobacteriales	0	0	0	0	0	1	0
Enterobacteriales	0	1	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Bacteroidales	2	0	0	0	3	4	0

Order	**Clostridiales**	**Bacillales**	**Flavobacteriales**	**Enterobacteriales**	**Bifidobacteriales**	**Bacteroidales**
Xanthomonadales	2	0	0	0	0	2
Burkholderiales	0	0	0	1	0	0
Selenomonadales	0	0	0	0	0	0
Pasteurellales	0	0	0	0	0	0
Actinomycetales	2	0	0	0	0	3
Lactobacillales	1	1	1	0	0	4
Hydrogenophilales	0	0	0	0	0	0
Clostridiales	1	0	0	0	1	0
Bacillales	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0
Enterobacteriales	0	0	0	0	0	0
Bifidobacteriales	1	0	0	0	0	0
Bacteroidales	0	0	0	0	0	0

Co-occurrence network

Order	Clostridiales	Fusobacteriales	Coriobacteriales	Thermoanaerobacterales	Bacillales	Synergistales	Bacteroidales
Clostridiales	23	11	13	11	8	7	0
Fusobacteriales	11	1	0	6	2	0	0
Coriobacteriales	13	0	5	0	0	2	0
Thermoanaerobacterales	11	6	0	1	1	1	0
Bacillales	8	2	0	1	0	1	0
Synergistales	7	0	2	1	1	1	0
Bacteroidales	0	0	0	0	0	0	5
Rhodospirillales	2	0	0	1	1	4	1
Selenomonadales	6	0	3	0	0	1	0
Erysipelotrichales	5	3	0	2	2	0	0
Asterales	3	0	2	0	0	1	0
Verrucomicrobiales	0	0	0	0	0	0	0
Lactobacillales	2	1	0	1	0	0	0
Flavobacteriales	0	0	0	0	0	0	2
Burkholderiales	1	0	0	1	0	2	0
Spirochaetales	0	0	0	0	0	1	0
Entomoplasmatales	1	0	0	1	0	0	0
Desulfovibrionales	0	0	0	0	0	0	0
Actinomycetales	0	0	1	0	0	0	0
Bifidobacteriales	0	0	1	0	0	0	0
Acholeplasmatales	1	0	0	1	0	0	0

Order	Rhodospirillales	Selenomonadales	Erysipelotrichales	Asterales	Verrucomicrobiales	Lactobacillales	Flavobacteriales
Clostridiales	2	6	5	3	0	2	0
Fusobacteriales	0	0	3	0	0	1	0
Coriobacteriales	0	3	0	2	0	0	0
Thermoanaerobacterales	1	0	2	0	0	1	0
Bacillales	1	0	2	0	0	0	0
Synergistales	4	1	0	1	0	0	0
Bacteroidales	1	0	0	0	0	0	2
Rhodospirillales	3	0	0	0	2	0	0
Selenomonadales	0	1	1	1	0	0	0
Erysipelotrichales	0	1	0	0	0	1	0
Asterales	0	1	0	0	0	0	0
Verrucomicrobiales	2	0	0	0	0	0	0
Lactobacillales	0	0	1	0	0	0	0

Flavobacteriales	0	0	0	0	0	0	0
Burkholderiales	1	0	0	0	0	0	0
Spirochaetales	0	0	0	0	0	0	0
Entomoplasmatales	0	0	1	0	0	0	0
Desulfovibrionales	1	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	0	0	0	0	0

Order	Burkholderiales	Spirochaetales	Entomoplasmatales	Desulfovibrionales	Actinomycetales	Bifidobacteriales	Acholeplasmatales
Clostridiales	1	0	1	0	0	0	1
Fusobacteriales	0	0	0	0	0	0	0
Coriobacteriales	0	0	0	0	1	1	0
Thermoanaerobacterales	1	0	1	0	0	0	1
Bacillales	0	0	0	0	0	0	0
Synergistales	2	1	0	0	0	0	0
Bacteroidales	0	0	0	0	0	0	0
Rhodospirillales	1	0	0	1	0	0	0
Selenomonadales	0	0	0	0	0	0	0
Erysipelotrichales	0	0	1	0	0	0	0
Asterales	0	0	0	0	0	0	0
Verrucomicrobiales	0	0	0	0	0	0	0
Lactobacillales	0	0	0	0	0	0	0
Flavobacteriales	0	0	0	0	0	0	0
Burkholderiales	0	1	0	0	0	0	0
Spirochaetales	1	0	0	0	0	0	0
Entomoplasmatales	0	0	0	0	0	0	1
Desulfovibrionales	0	0	0	0	0	0	0
Actinomycetales	0	0	0	0	0	0	0
Bifidobacteriales	0	0	0	0	0	0	0
Acholeplasmatales	0	0	1	0	0	0	0

Mutual exclusion network

Order	Selenomonadales	Anthribidae	Flavobacteriales	Clostridiales	Erysipelotrichales	Bacteroidales	Synergistales
Selenomonadales	1	1	0	1	0	2	0
Anthribidae	1	0	0	0	0	0	0
Flavobacteriales	0	0	0	2	0	0	0

Clostridiales	1	0	2	2	0	10	1
Erysipelotrichales	0	0	0	0	0	2	0
Bacteroidales	2	0	0	10	2	0	0
Synergistales	0	0	0	1	0	0	0
Asterales	0	0	0	2	0	0	0
Lactobacillales	0	0	0	0	0	1	0
Fusobacteriales	0	0	0	0	0	1	0
Coriobacteriales	0	0	0	2	0	0	0
Thermoanaerobacterales	0	0	0	0	0	2	0

Order	Asterales	Lactobacillales	Fusobacteriales	Coriobacteriales	Thermoanaerobacterales
Selenomonadales	0	0	0	0	0
Anthribidae	0	0	0	0	0
Flavobacteriales	0	0	0	0	0
Clostridiales	2	0	0	2	0
Erysipelotrichales	0	0	0	0	0
Bacteroidales	0	1	1	0	2
Synergistales	0	0	0	0	0
Asterales	0	0	0	0	0
Lactobacillales	0	0	0	0	0
Fusobacteriales	0	0	0	0	0
Coriobacteriales	0	0	0	0	0
Thermoanaerobacterales	0	0	0	0	0