Chlamydia-like parasites are comprised of two main groups

The genus Chlamydia is best known for the species Chlamydia trachomatis and C. pneumoniae, which are causative agents, respectively, of the most prevalent sexually transmitted infection and community-acquired pneumoniae, bronchitis, and sinusitis. The genus Chlamydia and other Chlamydia-related bacteria are members of a group of intracellular parasites known as the phylum Chlamydiae which cause a wide variety of diseases in humans, mammals, birds and other animals. The phylum Chlamydiae contains a large number of ecologically and genetically diverse parasitic bacteria with different characteristic host ranges that are divided into a number of smaller groups called families. The species from the family containing the genus Chlamydia (the family Chlamydiaceae) generally infect humans, mammals, and birds while other Chlamydiae families generally infect fish, insects, turtles and even single cell amoebae.

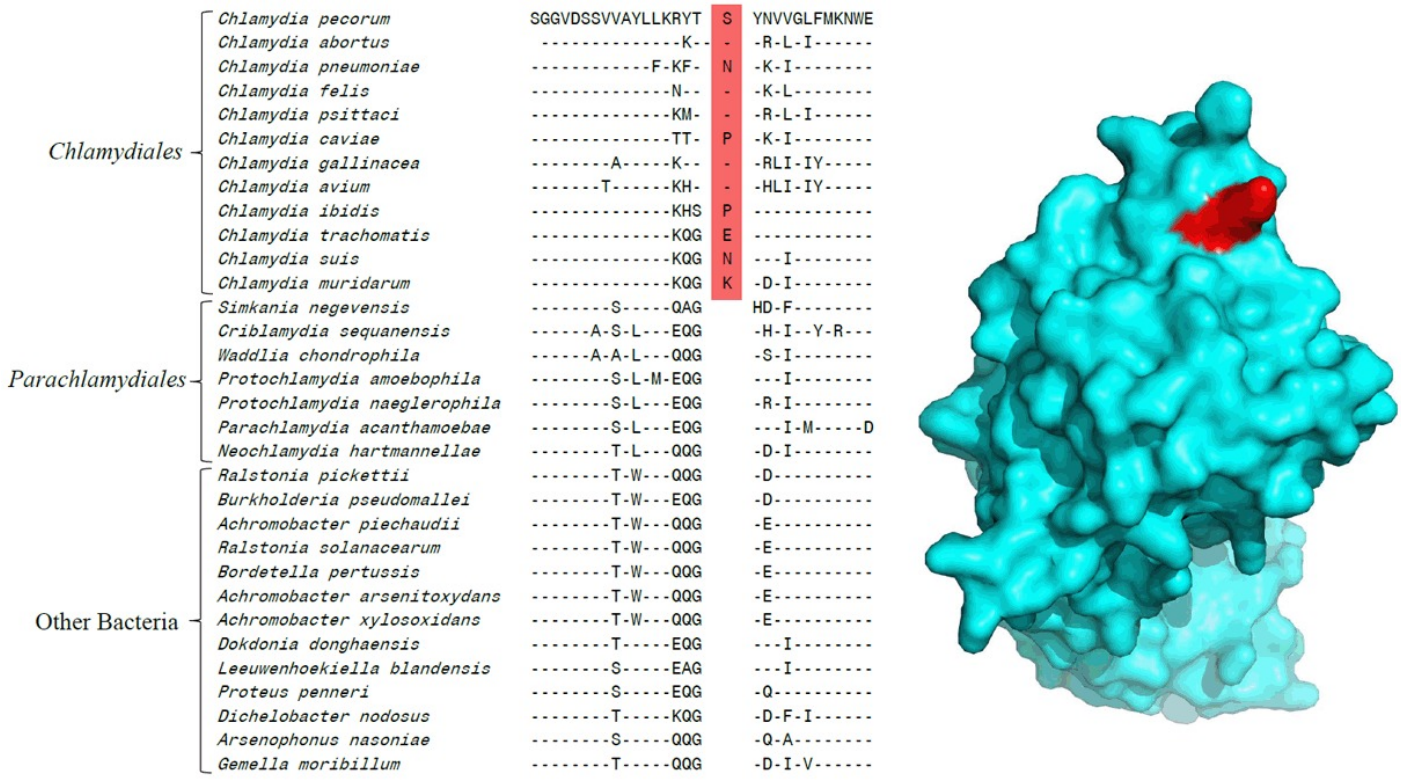

Fig. 1. Example of a molecular signature, a 1 amino acid insert in a protein sequence, that distinguishes the Chlamydia-containing order of Chlamydiae (order Chlamydiales) from other Chlamydia-related organisms (i.e. Parachlamydiales). The location of the insert in the protein structure is shown in red.

In this study, we have compared the genomic sequences of different Chlamydiae species (36 in all)

to identify genetic traits, which can distinguish chlamydial parasites which infect human, mammals and birds from those infecting other distantly related organisms. The two types of differentiating traits we have focussed on are known as conserved signature insertions/deletions (CSIs), which are insertions or deletions only present in the protein sequences of a related group of organisms (Fig. 1.), and conserved signature proteins (CSPs), which are proteins found only in a related group of organisms.

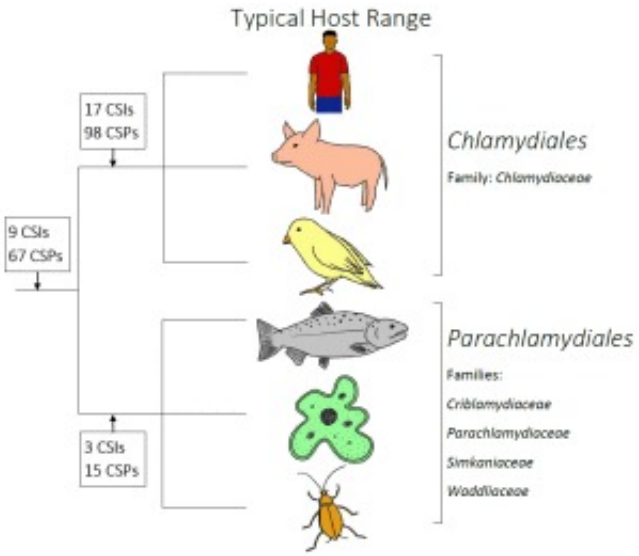

Fig. 2. The two groups of chlamydiae species differ in their host range and they are distinguished by many unique molecular signatures such as that shown in figure 1. (Drawing credited to Jeffrey Chan).

Many genetic traits (CSIs and CSPs) identified in this work were specific for all Chlamydiae species. However, 17 CSIs and 98 CSPs were specific only for the Chlamydia-containing family, Chlamydiaceae (Fig. 1) and they serve to differentiate members of this family from all other families within the phylum Chlamydiae. Additionally, 3 CSI variants and 15 CSPs described in this study were uniquely shared by members of the other families of Chlamydiae (Criblamydiaceae, Parachlamydiaceae, Simkaniaceae and Waddliaceae), providing evidence that they all shared a common ancestor exclusive of the Chlamydia-containing family (Chlamydiaceae). Further analysis of these genetic traits will provide an understanding of their function in these organisms and may lead to new insights regarding the differences between these two groups Chlamydia-related bacteria.

The Chlamydia-containing family, Chlamydiaceae, which primarily contains human, mammal and avian pathogens, is also differentiated from the other families within the phylum Chlamydiae by their characteristic host ranges (Fig. 2.), differences in genome size, and by their distinct branching in phylogenetic trees and analyses carried out on different datasets. Based on these results, this

study proposes a division of the Chlamydiae species into two main groups or orders: the order Chlamydiales, containing the family Chlamydiaceae, harboring species which are human, mammals and avian pathogens and a new order Parachlamydiales, containing the families Parachlamydiaceae, Simkaniaceae and Waddliaceae that generally infect other hosts (e.g. fish, insects, turtles, amoebae, etc).

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Publication

A phylogenomic and molecular markers based analysis of the phylum Chlamydiae: proposal to divide the class Chlamydiia into two orders, Chlamydiales and Parachlamydiales ord. nov., and emended description of the class Chlamydiia.
Gupta RS, Naushad S, Chokshi C, Griffiths E, Adeolu M.
Antonie Van Leeuwenhoek. 2015 Sep