

# Genetic Diversity of *cbpA* among invasive *Streptococcus pneumoniae* isolates from India

Vijay K<sup>1</sup>, Geetha N<sup>1</sup>, Varun S<sup>1</sup>, Sowmya PR<sup>1</sup>, Stephen D. Bentley<sup>2</sup>, Rebecca A. Gladstone<sup>2</sup>, Stephanie W. Lo<sup>2</sup>, Robert F. Breiman<sup>3</sup>, Lesley McGee<sup>4</sup>, Ravikumar KL<sup>1</sup> and the Global Pneumococcal Sequencing Consortium

<sup>1</sup> Central Research laboratory, KIMS H&RC, Bangalore, India

<sup>2</sup> Parasites and Microbes Programme, The Wellcome Sanger Institute, Wellcome Genome Campus, Hinxton, Cambridge, CB10 1SA, UK

<sup>3</sup> Hubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, GA 30322, USA

<sup>4</sup> Respiratory Diseases Branch, Centers for Disease Control and Prevention, Atlanta, GA 30333, USA

## Background:

*Streptococcus pneumoniae* is a human opportunistic pathogen responsible for morbidity and mortality worldwide. Pneumococcal surface protein, Choline-binding protein A (CbpA) plays a key biological role in nasopharyngeal colonization and modulating the immune response to pneumococci. We have analyzed the genetic diversity of *cbpA* in invasive isolates.

## Materials and methods:

264 invasive *S.pneumoniae* isolates collected from 2010-2018, were sequenced on Illumina Platform. The CRL in-house bioinformatics pipeline was used to extract gene sequences, alignment and phylogeny analysis. Allelic variations of CbpA gene was analyzed by comparing the identity with a well-defined virulent strain of *S. pneumoniae* TIGR4. The phylogenetic tree was visualized using Microreact (<https://microreact.org/>).

## Results:

36 Gene *cbpA* was identified in 261(99%) of the 264 genomes. The sequences were highly polymorphic at both nucleotide and amino acid levels. Similarity of *cbpA* gene ranged from 65 – 98%, while 80- 99% homology was observed at amino acid level. Amino acid residues with similar physicochemical properties aligned allowing the identification of broadly conserved CbpA domains.

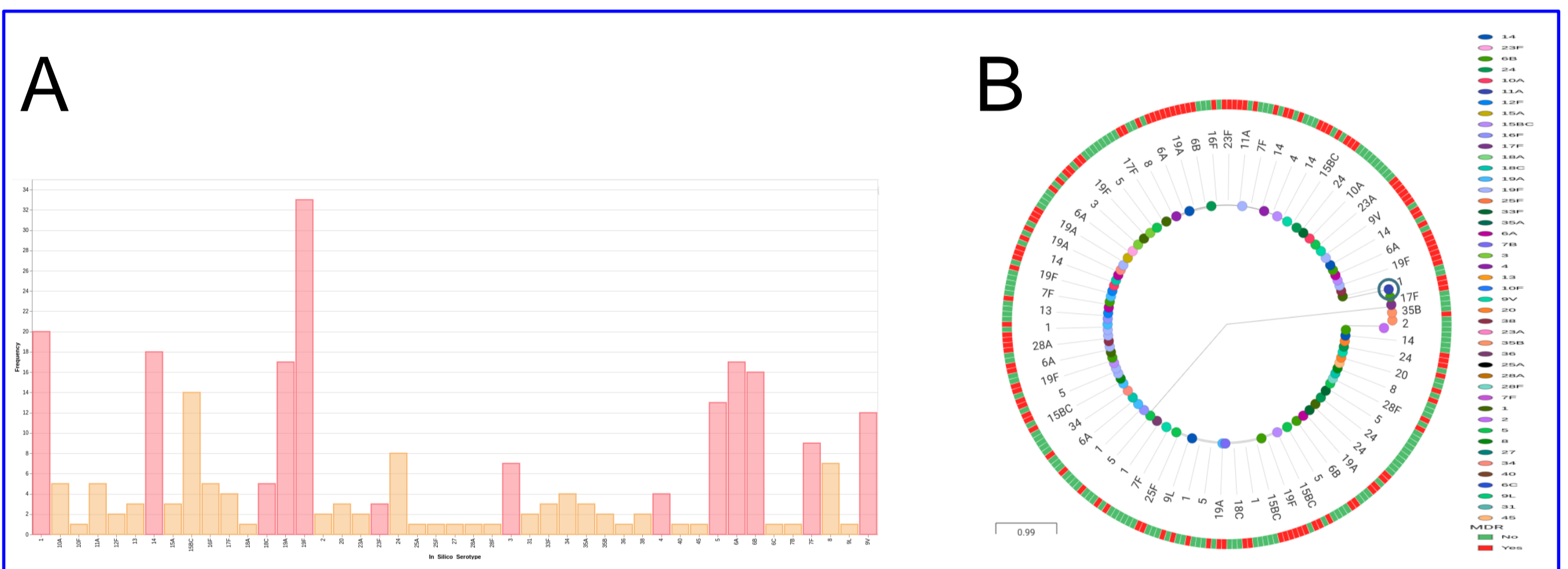


Figure (A). Frequency distribution of vaccine (Light pink color-non-PCV; light orange color-PCV) coverage and (B) Representation of Serotypes distribution and MDR of invasive *S. pneumoniae* ( $n=264$ ) isolates with respect to *cbpA* gene.

## Conclusion:

Due to high polymorphism at the *cbpA* locus, analysis of this loci from different isolates highlights how sequence diversity correlates with structural variation. The conserved epitope regions of the CbpA protein fragments can be exploited to develop more efficacious serotype-independent vaccines.

## References:

1. Abry, M. F., Kimenyi, K. M., Osowo, F. O., Odhiambo, W. O., Sewe, S. O., & Kulohoma, B. W. (2015). Genetic diversity of the Pneumococcal CbpA: Implications for next-generation vaccine development. *Human Vaccines & Immunotherapeutics*, 11(5), 1261–1267. <https://doi.org/10.1080/21645515.2015.1021521>
2. Mann, B., Thornton, J., Heath, R., Wade, K. R., Tweten, R. K., Gao, G., El Kasmi, K., Jordan, J. B., Mitrea, D. M., Kriwacki, R., Maisonneuve, J., Alderson, M., & Tuomanen, E. I. (2013). Broadly Protective Protein-Based Pneumococcal Vaccine Composed of Pneumolysin Toxoid–CbpA Peptide Recombinant Fusion Protein. *The Journal of Infectious Diseases*, 209(7), 1116–1125. <https://doi.org/10.1093/infdis/jit502>
3. Argimón, S., Abudahab, K., Goater, R. J. E., Fedosejev, A., Bhai, J., Glasner, C., ... Aanensen, D. M. (2016). Microreact: visualizing and sharing data for genomic epidemiology and phylogeography. *Microbial Genomics*, 2(11). <https://doi.org/10.1099/mgen.0.000093>
4. Chernomor, O., von Haeseler, A., & Minh, B. Q. (2016). Terrace Aware Data Structure for Phylogenomic Inference from Supermatrices. *Systematic Biology*, 65(6), 997–1008. <https://doi.org/10.1093/sysbio/syw037>



National Centre for Pneumococcal immunogenicity evaluation GHRU, India Unit - Genomic AMR surveillance

Central Research Laboratory, KIMS, Bangalore-70



12<sup>TH</sup> INTERNATIONAL SYMPOSIUM ON PNEUMOCOCCI & PNEUMOCOCCAL DISEASES Toronto, Canada

ISPPD-12



2020  
21-25 June

isppd2020.kenes.com