

EXECUTIVE SUMMARY
UGC-MAJOR RESEARCH PROJECT
F. No. 41-509/2012(SR)

**Cloning, expression, purification and
characterization of chromatin assembly factor 1
from human malaria parasite *Plasmodium
falciparum***

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Executive Summary

WD40 repeats (WDR) proteins comprise one of the largest and functionally diverse protein families in eukaryotes. WDR proteins are involved in a number of biological processes including transcription regulation and chromatin remodeling. Chromatin Assembly Factor 1 (CAF-1) is one of the histone chaperones that mediate replication coupled chromatin assembly. Interestingly some members of the CAF-1 family are the part of chromatin remodeling complexes such as HDAC, NuRD, NuRF, Sin3, PRC2 etc. In the present study, we report a comprehensive genome-wide analysis of WDR family and CAF-1 family in human malarial parasite *Plasmodium falciparum*. Our genome-wide analysis has revealed eighty WDR genes and five CAF-1 genes in *P. falciparum*. Notably, all five CAF-1 proteins possess WD40 repeats in addition to CAF1 domain. We investigated domain architecture, functional classification based on orthologs, evolutionary relationships, expression patterns; homology modeling enabled three dimensional structure prediction and protein- protein interactions networks for both families.

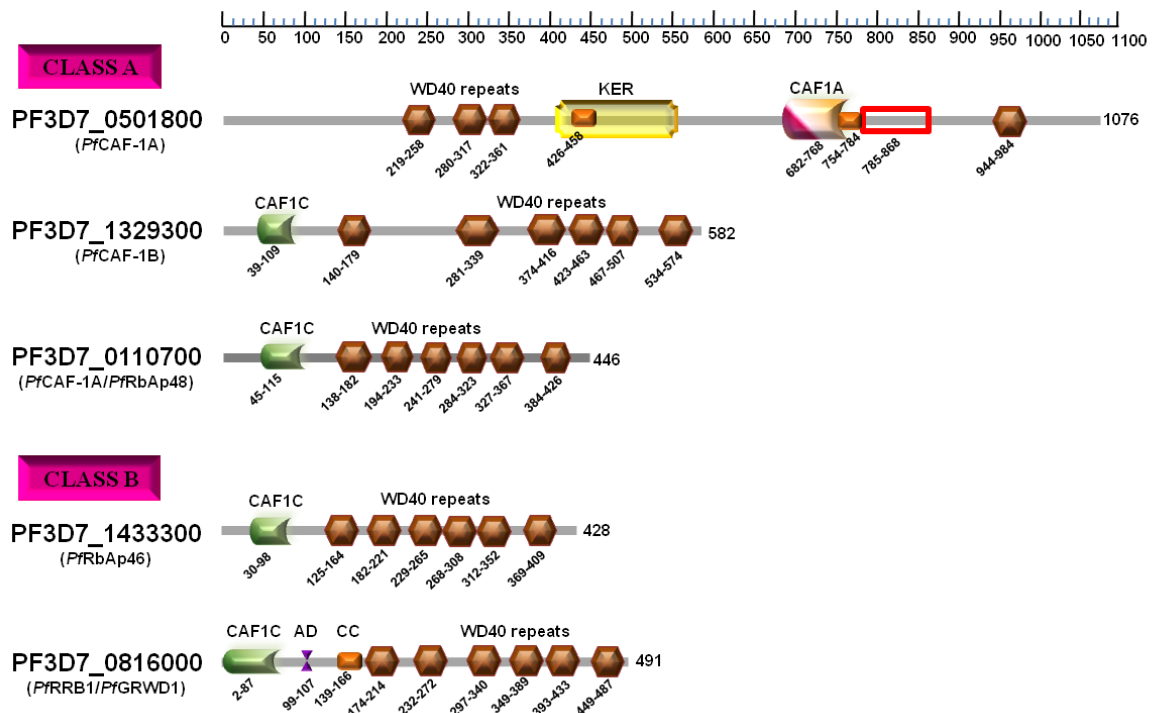


Figure 1: Domain composition analysis of CAF1 family genes of *P. falciparum*.

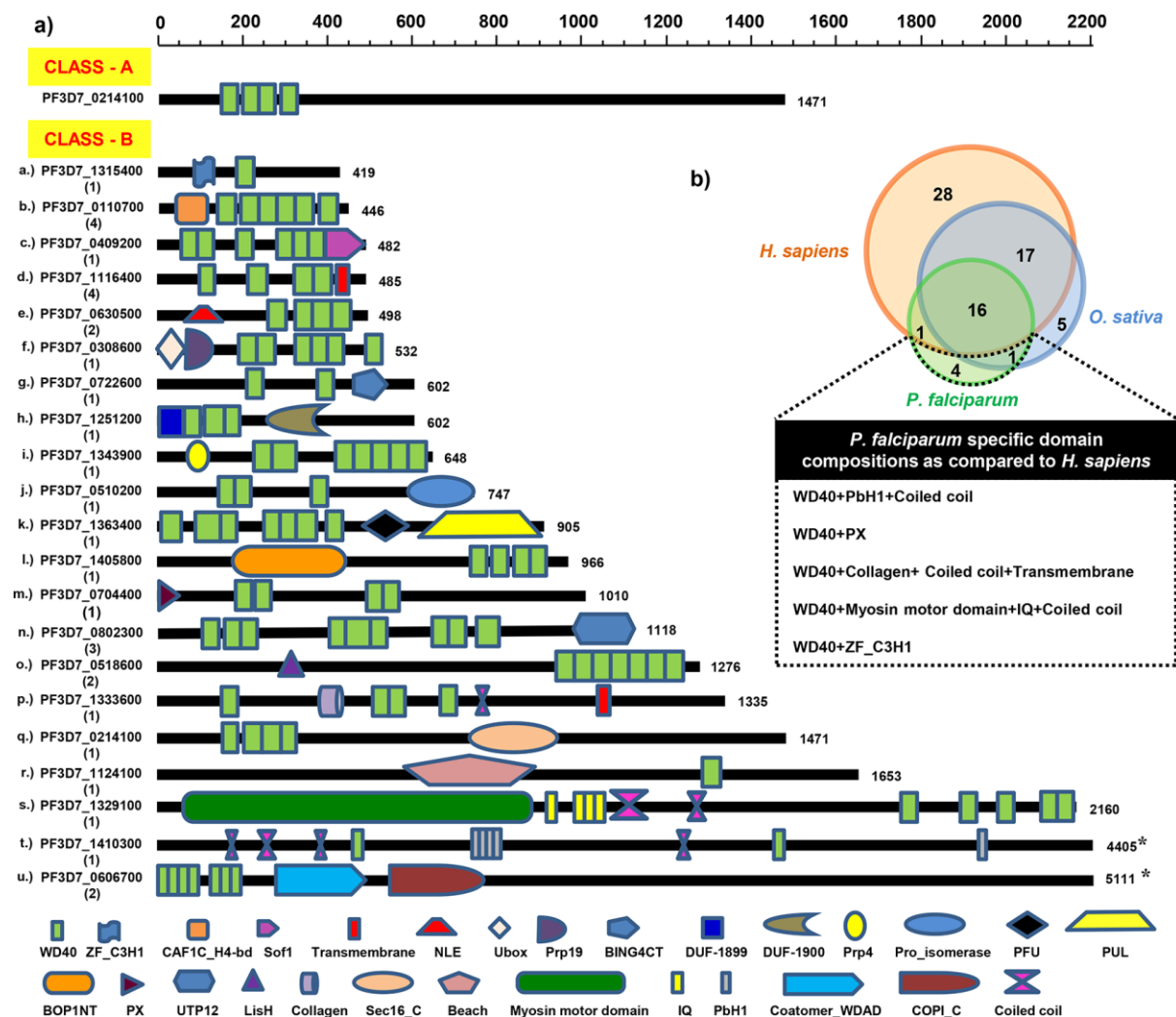


Figure 2: Domain composition analysis of *Pf*WDR superfamily.

This analysis highlighted role and relevance of WDR family and CAF family in *P. falciparum*, and identified unique features that lay a foundation for further experimental dissection. Further, we cloned expressed, purified and characterized PF3D7_0110700, a putative chromatin assembly factor 1. PF3D7_0110700 revealed its expression in all the three asexual erythrocytic stages- rings, trophozoites and schizonts. The protein was found to be localized to the nucleus by immunofluorescence assay and exhibited interaction with histone H4, thus confirming its role as chromatin assembly factor-1.

a) PRE-IMMUNE SERA



b) IMMUNE SERA

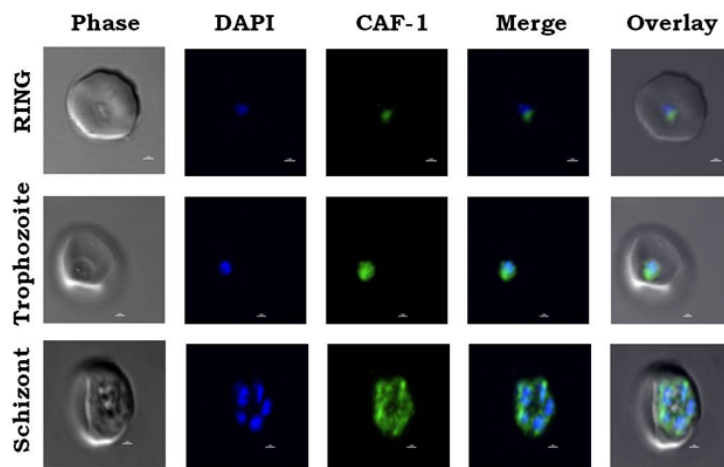


Figure 3: Subcellular localization of *PfCAF-1* by immunofluorescence assay in different stages of IDC using pre-immune and immune antibodies.

Publications:

1. Kaushik M, Nehra A, Gill SS, **Gill R** (2019) Unraveling CAF-1 family in *Plasmodium falciparum*: comparative genome-wide identification and phylogenetic analysis among eukaryotes, expression profiling and protein-protein interaction studies. *3 Biotech* 10.1007/s13205-020-2096-7
2. Kaushik M, Nehra A, Gakhar SK, Gill SS, **Gill R** (2019) The Multifaceted Histone Chaperone RbAp46/48 in *Plasmodium falciparum*: Structural insights, Production and Characterization. *Parasitology Research* (accepted)
3. Chahar P, Kaushik M, Gill SS, Gakhar SK, Gopalan N, Datt M, Sharma A, **Gill R** (2015) Genome-wide collation of the *Plasmodium falciparum* WDR protein superfamily reveals malaria parasite-specific features. *PloS One* 10(6): e0128507. ISSN 1932-6203
4. Kaushik M, Gill SS, **Gill R** (2016) In-silico analysis of Chromatin Assembly Factor 1 (CAF-1) family and production of PF3D7_0110700 protein in human malaria parasite *Plasmodium falciparum*. *International Journal of Infectious Diseases* 45 :(1) 362–363. DOI: <http://dx.doi.org/10.1016/j.ijid.2016.02.780>