A new way to read H3K27 methylation

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On September 27, the research team led by Prof. MA Zhonghua at the Zhejiang University College of Agriculture & Biotechnology published an article titled "Fusarium BP1 is a reader of H3K27 methylation" in the journal *Nucleic Acids Research*.

Histone H3 lysine 27 methylation (H3K27me3) can result in facultative heterochromatin for transcriptional repression. Polycomb repressive

complex 2 (PRC2) is responsible for catalyzing and maintaining H3K27me3, and polycomb repressive complex 1 (PRC1) for recognizing H3K27me3, catalyzing H2Aub modifications, promoting chromatin compaction for gene silencing and recruiting PRC2 in animals and plants. Although PRC2 is also well conserved in fungi, components of PRC1 are notably absent in this kingdom. Thus, the mechanism for recognition of H3K27me3 remains obscure in fungi.

Fusarium head blight caused by Fusarium graminearum is a devastating disease of cereal crops worldwide. In addition to the yield loss caused by the disease, mycotoxins deoxynivalenol (DON) and its derivatives, produced by the pathogen in infested grains, represent a serious threat to human and animal health. In order to develop new management technologies against this disease, it is urgent to analyze the pathogenesis of the pathogen and the mechanism of toxin biosynthesis.

In recent years, the team led by Prof. Ma has conducted intensive research into the biological function of epigenetic modifications in the pathogenesis and toxin biosynthesis of F. graminearum, including acetylation, methylation, ubiquitination and phosphorylation. In this study, researchers identified the bromo-adjacent homology (BAH)-plant homeodomain (PHD) domain containing protein BAH-PHD protein 1 (BP1) as a reader of H3K27 methylation in F. graminearum. BP1 is distributed in a subset of genomic regions marked by H3K27me3 and co-represses gene transcription. The BP1 deletion mutant shows identical phenotypes on mycelial growth and virulence, as well as similar expression profiles of secondary metabolite genes to the strain lacking the H3K27 methyltransferase Kmt6. More importantly, BP1 can directly bind DNA through its PHD finger, which might increase nucleosome residence and subsequently reinforce transcriptional repression in H3K27me3-marked target regions.

"This study provides novel insights into the mechanism by which PRC2

mediates gene repression in fungi, which is distinct from the PRC1-PRC2 system in plants and mammals," said MA. "It also offers an interpretation of the biological function of H3K27 methylation in regulating the pathogenesis and toxin biosynthesis in F. graminearum."

More information: Guangfei Tang et al, Fusarium BP1 is a reader of H3K27 methylation, *Nucleic Acids Research* (2021). DOI: 10.1093/nar/gkab844

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