## Elucidation of the catalytic mechanism of a novel lytic polysaccharide monooxygenase for unlocking recalcitrant xylan.

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The discovery of lytic polysaccharide monooxygenases (LPMOs) has profoundly changed the way in which we view the enzymatic conversion of polysaccharides, in particular recalcitrant biomass. These enigmatic “boosting” enzymes catalyze oxidative cleavage of glycosidic bonds, which suggests that LPMOs have a catalytic role in biomass conversion [1]. LPMOs are currently grouped into six CAZy auxiliary activities (AA) families (AA9–11, AA13–15), based on bioinformatic analysis of their amino acid sequences similarities, while they are continuously expanding with the novel AA16 and AA17 families [2, 3]. There is no doubt that LPMOs, which are remarkably abundant in nature, still hold many unanswered questions. One of the most exciting is the discovery of novel activities, i.e., new modes of action and substrate specificities. LPMOs seem well suited to act on a wide variety of interfaces and it is probably only a matter of time before novel LPMO substrates, such as different polysaccharides, various recalcitrant protein fibers, lignin, or perhaps even synthetic polymers will be discovered. Here we present a novel LPMO from Thermothelomyces thermophilus, member of AA16 family, exhibiting a strong xylanolytic activity, which is demonstrated for the first time regarding this recently discovered family. The corresponding enzyme named TtLPMO16a, is capable of the oxidative cleavage of recalcitrant xylan that is present in insoluble wheat arabinoxylan as well as in beechwood and birchwood xylan, while it is unable of recognizing cellulose based substrates. In this study we focus on the biochemical characterization of this LPMO, but also on the identification of its oxidized oligosaccharide products, in order to determine this enzyme’s mode of action and reveal its substrate specificity.

References

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