PUBLISHED: 18 APRIL 2017 | VOLUME: 3 | ARTICLE NUMBER: 17062

research highlights

POLYSACCHARIDE STRUCTURE

A hint from gut bacteria

Nature http://doi.org/b45n (2017)

Structurally, pectin is the most complex polysaccharide in plant cell walls. It plays an irreplaceable role in plant growth and development, and also serves as a healthy natural fibre of human diet. One of the predominant pectic polysaccharides, rhamnogalacturonan-II (RG-II), consisting of at least 13 different glycosyl residues and 21 different glycosidic linkages, has a highly conserved structure among angiosperms and gymnosperms, and even some lower plants. A recent study from Harry Gilbert's group, Institute for Cell and Molecular Biosciences, Newcastle University, Newcastle, UK, and his collaborators uncovered the metabolic mechanism of how RG-II is used by the human gut bacterium *Bacteroides thetaiotaomicron*. The degradation of the pectic glycan involved new classes of

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glycoside hydrolases and shed light on a revised structural model of RG-II.

RG-II was sufficient to sustain the growth of around 30% of the strains of *Bacteroides* species from the human gut microbiota. The stationary-phase culture only contained monosaccharides and one disaccharide, suggesting almost complete degradation. Further investigation of enzymes and polysaccharide utilization loci that are involved in RG-II degradation allowed the identification of seven enzymes that belong to new families of glycoside hydrolases and adds to the toolbox of biocatalyst engineering and pectin manipulation. Moreover, the specificity of these glycoside hydrolases is supported by the crystal structure of one particular enzyme, a β-L-arabinofuranosidase, in complex with the complete side chain B of RG-II. This specific enzyme system, as well as the elaborated degradome, reveals new features of RG-II structure and points to a revision of the current structural model of RG-II.

Other than RG-II, plants contain many other structurally enigmatic polymers, such as lignin, cutin and suberin. Employing specific enzyme systems from microbiota might be a useful strategy for reconstituting the structural models of these complex polymers.

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