



The fungal cell wall: Biology, biosynthesis and biotechnology



The Cell Surface journal, one of Elsevier's new interdisciplinary journals for transkingdom cell wall biology research, was officially launched in 2017 during the Fungal Cell Wall conference, which took place at the Scientific Research and Graduate Studies Center (CICESE) in Ensenada, Baja California, Mexico, October 9–12th, 2017 (<https://fcwc2017.cicese.mx/>).

The FCW2017 conference gathered world leaders in fungal cell wall biology, biochemistry, immunology, and antifungal mechanisms (Figs. 1, 2). Some of the attendees committed to contribute to this special issue of The Cell Surface journal entitled "The fungal cell wall: biology, biosynthesis and biotechnology".

This special issue covers several aspects of cell wall biosynthesis in a variety of fungal species including saprophytes, both human and plant pathogens, and organisms that grow in different morphological forms including both, yeast and hyphae. The special issue is a collection of primary Research articles and contemporary reviews:

1. Yeast species-specific, differential inhibition of β -1,3-glucan synthesis by poacic acid and caspofungin. Lee et al.

In this original piece of research the authors show that sensitivity to the plant derived glucan synthase inhibitor poacic acid (PA) is regulated by the calcineurin pathway and that susceptibility to PA varied significantly between *Candida* species, The work shows that there are significant differences in the mode of action of PA and caspofungin.

2. Mitogen activated protein kinases (MAPK) and protein phosphatases are involved in *Aspergillus fumigatus* adhesion and biofilm formation. Oliveira-Manfiolli et al.

The authors show that *A. fumigatus* signalling MAP kinases MpkA, MpkC and SakA affected adhesion to polystyrene and fibronectin as well as biofilm formation. Genetic blockade of MAPK pathways affected carbohydrate exposure at the cell surface. They also demonstrated that the protein phosphatase PphA was required for virulence of this human pathogenic fungus and affected wall carbohydrate composition, adhesion and biofilm formation.

3. Fission yeast cell wall biosynthesis and cell integrity signalling. Pérez et al.

This article provides a compelling overview on the biosynthetic processes leading to cell wall assembly in the fission yeast *Schizosaccharomyces pombe* and discuss as well the regulatory role of the cell integrity MAPK signaling pathway.

4. A conserved fungal hub protein involved in adhesion and drug resistance in the human pathogen *Candida albicans*. Martin-Yken et al.

This original research article describes the functional equivalence of *Candida albicans* SMI1 and *Saccharomyces cerevisiae* KNR4, providing evidence that Smi1 has a role in cell wall synthesis regulation. The study comprises imaging of GFP tagged Smi1 and analysis of *SMI1* deficient or overexpressing cells, including sensitivity to different cell wall stressors and biophysical properties of the cell surface.

5. Priming and elongation of chitin chains: Implications for chitin synthase mechanism. Orléan and Funai

This research article addresses the important question of how the synthesis of a chitin chain is initiated, the role that N-acetylglucosamine plays, as well as the factors that govern chain length. Using *Saccharomyces cerevisiae* and experiments with radiolabeled substrates, they propose a model in which chitin synthases (CS) self-prime by hydrolyzing UDP-GlcNAc and synthesize chitin chains in bursts.

6. Cell wall glucans of fungi. A review. Ruiz-Herrera and Ortiz-Castellanos

This review article compiles information about fungal cell wall glucans, including types, distribution, structures, roles and biosynthetic mechanisms. In addition, it compares the evolutionary relationships of glucan synthases between Ascomycota and Basidiomycota.

7. Off the wall: The rhyme and reason of *Neurospora crassa* hyphal morphogenesis. Verdín et al.

This comprehensive review summarizes the cell biological, biochemical and physiological processes that contribute to the polarized synthesis of the cell wall in filamentous fungi, with an emphasis on the model fungus *Neurospora crassa*. Current models and elegant figures are presented.

8. Composition and biosynthetic machinery of the *Blumeria graminis* f. sp. *hordei* conidia cell wall. Pham et al.

In the first of two back-to-back papers on the powdery mildew pathogen *Blumeria* a detailed structure–function analysis is presented of the critical cell wall of the conidium spore. Here they show some unique chemistry of wall components and that highly active chitin deacetylation takes place in the conidium, contributing to host immune invasion.

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Fig. 1. Group picture of delegates that attended FCW2017.



Fig. 2. Salomon Bartnicki-García (left), José Ruíz-Herrera (center) and Jean-Paul Latgé (right) holding the “brick” (in the wall) awards presented to them in recognition of their contributions to the Fungal Cell Wall field.

9. Analysis of cell wall synthesis and metabolism during early germination of *Blumeria graminis* f. sp. *hordei* conidial cells induced in vitro. Pham et al.

In their accompanying paper the authors used transcript and proteomic profiling of germinating *Blumeria* spores to show that enzymes

associated with cellular respiration and protein synthesis, modification and transport are up-regulated in the pre-penetration phase. They also show how the spore wall is modified chemically during this important phase of the infection cycle of this plant pathogen.

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