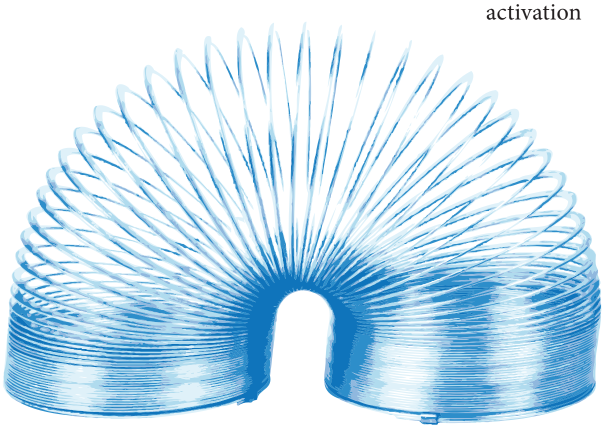
FUNGAL PHYSIOLOGY

Stressed fungi are not highly sprung

Saccharomyces cerevisiae maintains cellular integrity in the presence of cell wall stress by upregulating cell wall-remodelling pathways. Such stresses are detected by a group of five transmembrane sensor proteins, Wsc1–Wsc3, Mid2 and Mtl2. In an article published online in *Nature Chemical Biology*, Dupres *et al.* used atomic force microscopy (AFM) to show that Wsc1 behaves like a nano-spring that is capable of resisting high mechanical force *in vivo*.

In the presence of cell wall stress, Wsc1 interacts with the nucleotide exchange factor Rom2, leading to the activation of a mitogen-activated protein kinase cascade that triggers stress response pathways. Accordingly, *S. cerevisiae* cells lacking Wsc1 are sensitive to extracellular stresses. Wsc1 exhibits an extended rod-like shape, and glycosylation of a serine–threonine-rich region of its extracellular domain is thought to be important for maintaining this structure. It had previously been proposed that Wsc1 might act as a mechanosensor, activating stress pathways in response to physical changes in the cell wall; however, direct evidence for such a mechanism remained elusive.



The authors used AFM to measure the physical properties of single Wsc1 molecules *in vivo*. They found that the force–extension curves for Wsc1 exhibited two distinct behaviours. One region of the curve showed Wsc1 extending at nearly constant force, corresponding to the straightening of the extracellular polypeptide chain. This was followed by a linear region in which the force was directly proportional to the extension, a behaviour that is characteristic of a Hookean spring. Non-linear force peaks, which are characteristic of the unfolding of secondary structural elements such as α-helices and β-sheets, were not observed, even at high forces, indicating that Wsc1 is able to resist high mechanical stresses. Dupres *et al.* found that the spring-like behaviour of Wsc1 was lost in *S. cerevisiae* strains in which the glycosylation of Wsc1 was perturbed.

Interestingly, the spring-like properties of Wsc1 were also lost under hypo-osmotic or heat shock stress conditions, suggesting that, during times of stress, changes in the spring-like properties of Wsc1 might be important for the activation of cell wall-remodelling responses, although further work will be required to determine whether this is indeed the case.

Andrew Jermy

ORIGINAL RESEARCH PAPER Dupres, V. *et al.* The yeast Wsc1 cell surface sensor behaves like a nanospring *in vivo*. *Nature Chem. Biol.* 20 Sep 2009 (doi:10.1038/nchembio.220)