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Cell Wall Adsorption in Modeling Germination Inhibition

Yes, it is reasonable to consider cell wall adsorption mechanisms when modeling germination inhibition by a chemical signal diffusing from the spore.

Rationale

- **Self-Inhibitory Compounds and Cell Wall Interaction**
  - Fungal spores can produce and release self-inhibitory compounds—such as volatile organic molecules (e.g., 1-octen-3-ol)—that act as chemical signals to regulate germination in a density-dependent manner[1] [2] [3].
  - For these inhibitors to be effective, their local concentration at the spore surface (where germination processes are initiated) is critical. The fungal cell wall, being the first interface, can adsorb or bind such molecules, influencing their local availability and, consequently, their inhibitory effect.
- **Evidence from Experimental Studies**
  - Studies on germination inhibitors, such as those involving *Penicillium* and *Fusarium* species, show that the action of these compounds often involves direct interaction with the spore surface, affecting membrane integrity, intracellular pH, and other early germination events[2].
  - The effectiveness of self-inhibitors and exogenous antifungal compounds is modulated by their ability to reach and interact with the spore's outer layers, suggesting that adsorption phenomena at the cell wall are relevant to their mode of action.
- **Modeling Implications**
  - If the inhibitor is produced by the spore and diffuses outward, its concentration profile near the spore will depend on both diffusion and any adsorption/desorption dynamics at the cell wall.
  - Ignoring adsorption could lead to inaccurate predictions of local inhibitor concentrations and, therefore, the extent of germination inhibition.

Supporting Concepts

- **Quorum Sensing and Chemical Communication**
  - Fungal quorum sensing involves secreted molecules whose effects depend on their accumulation and interaction with the fungal cell surface[3]. Adsorption to the cell wall can modulate the threshold concentration required for signaling and inhibition.
- **Physical and Chemical Barriers**
  - The fungal cell wall is a complex structure capable of interacting with various molecules, potentially sequestering or concentrating inhibitors at the surface, thus altering their

effective activity.

Conclusion

In summary, incorporating cell wall adsorption mechanisms into models of germination inhibition by self-diffusing chemical signals is both reasonable and biologically justified. This approach will yield more accurate and mechanistically sound predictions of inhibitor dynamics and their effects on fungal germination[1] [2] [3].

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1. https://www.jstage.jst.go.jp/article/jpestics1975/22/4/22_4_342/_pdf
2. https://research.wur.nl/en/publications/germination-inhibitors-of-fungal-spores-identification-and-mode-o
3. https://pmc.ncbi.nlm.nih.gov/articles/PMC6098223/