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Basal Plane Affinity of an Insect Antifreeze Protein N.
PERTAYA, Ohio University, S.Y. GAUTHIER, P.L. DAVIES, Queen's
University, I. BRASLAVSKY, Ohio University — sbwAFP is a powerful
antifreeze protein (AFP) with high thermal hysteresis activity that pro-
tects spruce budworm (sbw) from freezing during harsh winters in the
spruce and fir forests of USA and Canada. Different types of antifreeze
proteins have been found in many other species and have potential ap-
plications in cryomedicine and cryopreservation. When an ice crystal is
cooled in the presence of AFP below the non-equilibrium freezing point
the crystal will suddenly and rapidly grow in specific directions. Hy-
peractive antifreezes like sbwAFP expand perpendicular to the c-axis
(in the plane of the a-axes), whereas moderately active AFPs, like type
III from fish, grow in the direction parallel to the c-axis. It has been
proposed that the basis for hyperactivity of certain AFPs is that they
bind and accumulate on the basal plane to inhibit c-axial growth. By
putting fluorescent tags on these two types of AFPs we have been able to
directly visualize the binding of different types of AFPs to ice surfaces.
We do indeed find that the insect AFP accumulates on the basal plane
of an ice crystal while type III AFP does not. Supported by CIHR and
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