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Enzymatic activity of *Bacillus thuringiensis* toxins

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When sporulating, *Bacillus thuringiensis* produces paracrystalline inclusions containing one or more proteins which are mainly responsible for the entomopathogenic properties of this bacterium. Such proteins mostly belong to the Cry family which, after spore lysis and solubilization of the crystals, are delivered to specific zones of the gut. Then, they bind to (a) receptor(s) to induce final lysis of intestinal epithelial cells. The potency of these toxins has been linked to the hydrolysis of inactive bigger protoxins. Such an activation is thought to occur in the digestive tract before the toxins reach their final destination. Moreover, several reports indicate that some of the Cry toxins undergo a superactivation step which allows them to multimerize and form ionic pores throughout the plasmic membranes of enterocytes. Until now the catalytic process allowing this superactivation remains unclear.
We now report that some Cry toxins display a protease activity when assayed in adequate conditions. Interestingly, among these toxins are those believed to superactivate. Analysis of reported 3D structures of these toxins allowed us to pinpoint amino-acids putatively involved in the catalytic process. When these amino-acids are mutated, the activity of the resulting toxins is altered which confirms that they are indeed involved in the process. Surprisingly, we have been able to detect such an activity in other toxins which do not belong to the Cry family but which also have entomopathogenic properties. Hence such a property may be shared by much of *Bacillus* toxins which may constitute a milestone in the entomopathogenic power of such bacteria.