Direct comparison of chitinolytic properties and determination of combinatory effects of mouse chitotriosidase and acidic mammalian chitinase

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Outline

Chitotriosidase (Chit1) and acidic mammalian chitinase (AMCase) have been implicated in food processing and various pathophysiological conditions such as chronic inflammatory diseases. By combination of the colorimetric analysis and fluorophore-assisted carbohydrate electrophoresis (FACE) method, we directly compared the chitinolytic properties of mouse Chit1 and AMCase and determined their combinatory effects in artificial and natural chitin substrates processing. Chit1 and AMCase display different dynamics of chitinolytic properties through acidic to neutral conditions. At pH 2.0, the activity of AMCase was higher than that of Chit1 and stronger or comparable with that of *Serratia marcescens* chitinase B, a well-characterized bacterium chitinase (Fig. 1). Changes of degradation products using different substrates indicate that AMCase and Chit1 have different properties under various pH conditions (Figs 2 and 3). Exposure of the chitin substrates to both Chit1 and AMCase did not indicate any mutual interference of these enzymes and showed no synergistic effect, in contrast to observations regarding some bacterial chitinases (Fig. 4). Our results suggest that Chit1 and AMCase showed no synergistic effect under physiological conditions.

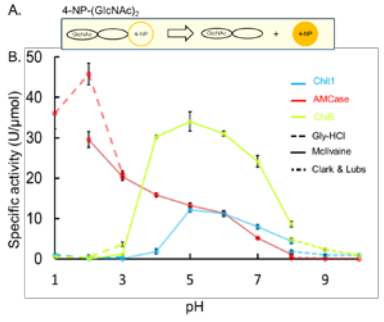

Fig 1. (A) Schematic representation of colorimetric method. (B) The chitinolytic activities of Chit1 (blue), AMCase (red) and *Serratia* ChiB (green)

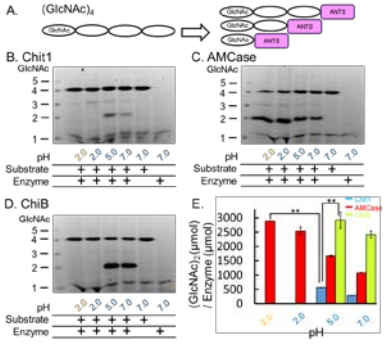

Fig 2. (A) Schematic representation of FACE method. (B) Chit1. (C) AMCase. (D) *Serratia* ChiB. (E) Quantitative data of generated $(GlcNAc)_2$

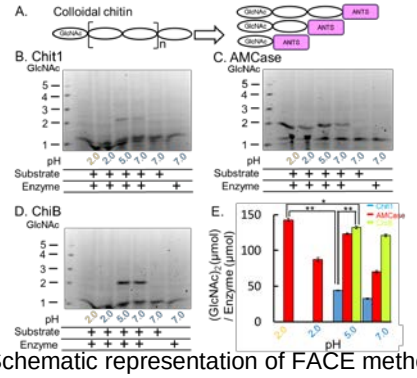

Fig 3. (A) Schematic representation of FACE method. (B) Chit1. (C) AMCase. (D) *Serratia* ChiB. (E) Quantitative data of generated $(GlcNAc)_2$.

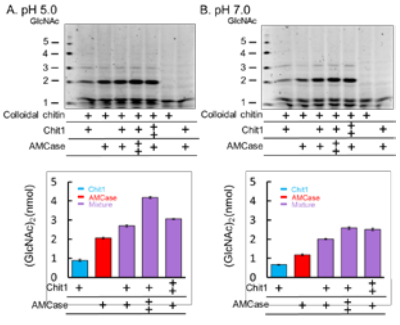

Fig 4. Degradation of colloidal chitin by Chit1 and AMCase combination at pH 5.0 (A) and 7.0 (B).

Novelty

In contrast to the bacterial chitinases, we observed no synergistic effect and interaction of Chit1 and AMCase regardless of MW of the substrates or the pH conditions. These results suggest that Chit1 and AMCase showed no synergistic effect under physiological conditions.

Related information

● Original paper: Kimura M, Umeyama T, Wakita S, Okawa K, Sakaguchi M, Matoska V, Bauer PO, Oyama F. (2019) Direct comparison of chitinolytic properties and determination of combinatory effects of mouse chitotriosidase and acidic mammalian chitinase. ***Int J Biol Macromol***, **134**, 882–890.

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