

## Study on a Simple Method for Reducing Nonvolatile Amines in Soy Sauce - Isolation and application of salt-tolerant histamine-reducing bacteria -

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### Summary

In general soy sauce has no histamine (Hm) or contains a small amount of Hm, but it rarely contains high levels of Hm, which is produced by some wild soy sauce lactic acid bacteria. Therefore, the Japan Soy Sauce Association has been working to reduce Hm in soy sauce, and has achieved a certain level of quality by calling for thorough cleaning of production lines and the addition of the soy sauce lactic acid bacterium that does not produce Hm. However, these processes are time-consuming and costly, and there is a strong need for a simpler method to reduce Hm in soy sauce.

In this study, we established a search system for Hm-reducing bacteria, confirmed its effectiveness, searched for salt-tolerant Hm-reducing bacteria, and investigated Hm reduction in soy sauce using the obtained salt-tolerant Hm-reducing bacteria. The salt-tolerant Hm-reducing bacteria that could grow in oligotrophic medium with 16% (w/v) salt concentration were divided into two groups: those that temporarily reduced Hm in the medium only slightly and those that degraded Hm steadily. The results of the simple identification of the strains showed that *Halomonas* sp. (strain H10) and *Salimicrobium* sp. (strain HOY1) were the bacteria that temporarily reduced Hm in the medium, and *Pseudomonas* sp. (strain KYA11) and *Brevibacterium* sp. (strain NAS10) were identified as the bacteria that degraded Hm, respectively. H10 and HOY1 temporarily reduced Hm, but the reduction state was unstable. On the other hand, strains KYA11 and NAS10 almost degraded 5000 ppm Hm hydrochloride in the medium in about one month.

Next, strain KYA11, which showed the strongest Hm degradation, was immobilized with alginate and shaken in soy sauce containing 5000 ppm Hm hydrochloride for one month, and no clear reduction was observed. Since KYA11 cannot grow at pH less than 6.0, soy sauce prepared by adjusting the pH of de-alcoholized soy sauce to 7.0 was used to inoculate KYA11. When strain KYA11 was inoculated in it, a maximum Hm reduction of approximately 30% was observed within one month. From the above, it was found that Hm hydrochloride in pH-neutralized de-alcoholized soy sauce could be reduced by about 1500 ppm in one month by inoculating KYA11 strain and shaking culture.

In the future, it will be necessary to search for Hm-reducing bacteria that show salt tolerance even in the same slightly acidic condition as soy sauce.