

交流電界によるウシ血清アルブミンの立体構造の変化 Conformational Change in Bovine Serum Albumin by AC Electric Field

奥村賢直¹, 山田和樹¹, 八重樫大朗¹, 高橋克幸¹, 井上諭宜², 會澤純雄³, 首藤文榮², 高木浩一¹
OKUMURA Takamasa, YAEGASHI Taro, YAMADA Kazuki, TAKAHASHI Katsuyuki, INOUE Yuki,
AISAWA Sumio, SYUTO Bunei, TAKAKI Koichi

¹ 岩手大 工学部 電気電子・情報システム工学科

² 岩手大 地域連携推進センター

³ 岩手大 工学部 応用化学・生命工学科

¹ *Dep. of Electrical Eng. and Comp. Sci., Iwate Uni., Japan*

² *Cent. for Regional Collab. in Res. and Edu., Iwate Uni., Japan*

³ *Dep. of Chem. and Bioeng., Iwate Uni., Japan*

1. Introduction

An AC electric field seems to inhibit protein digestion of the food material in our recent study¹. The inhibition of protein digestion is caused by conformational changes of membrane proteins. In this study the influence of an AC electric field in the conformational change of protein molecule was investigated by using bovine serum albumin (BSA) as a model material.

2. Experimental

BSA solution was divided into two groups. They were kept in an incubator at 4°C for 72 hours. One was preserved with an AC electric field and the other was preserved without the AC electric field. The amplitude of the AC electric field was about 66.7 kV/m with a frequency of 50 Hz. When the conformational change of the BSA molecule is induced its sensitivity to trypsin will be changed because the trypsin is highly specific to the C-terminal sides of lysine and arginine residues of the protein molecule. Then, the kinds and amounts of tryptic peptides will be changed. The specimen was digested by trypsin at 30°C for predetermined time. The tryptic peptides were analyzed with SDS-PAGE. We used e-PAGEL (E-T 520L, ATTO), a silver stain reagent (2D-Silver Stain Reagent II, Cosmo Bio) to detect protein and a densitometer (GS-800, Bio-Rad) to analyze protein bands.

3. Results

Figure 1 shows the SDS-PAGE pattern. The bands with an arrow in Fig. 1 are of BSA. Fig. 2 shows densitograms of specimens digested for 30 minutes. The relative absorbance of BSA band without the AC electric field is lower than that with the AC electric field. Peaks in the gray region in Fig. 2 show the tryptic peptides. OD value on arrowed peak of the specimen without the AC electric field is higher than that with the AC electric field. These results strongly suggest that the conformational change in BSA is induced by the application of the AC electric field. These results correspond to [2].

4. Conclusion

Influence of an AC electric field on conformation of bovine serum albumin (BSA) was investigated. As a result the process of trypsin digestion of BSA was affected by the application of the AC electric field, suggesting that the conformation of BSA was changed by the application of the AC electric field.

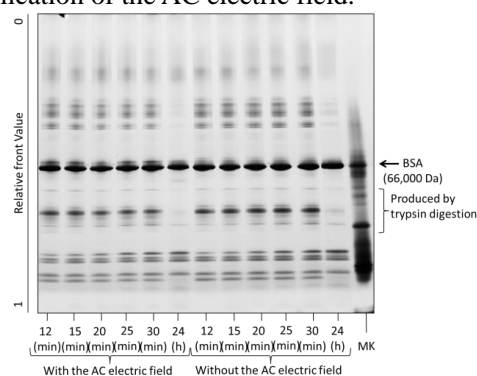


Fig. 1. SDS-PAGE pattern for BSA digested by trypsin.

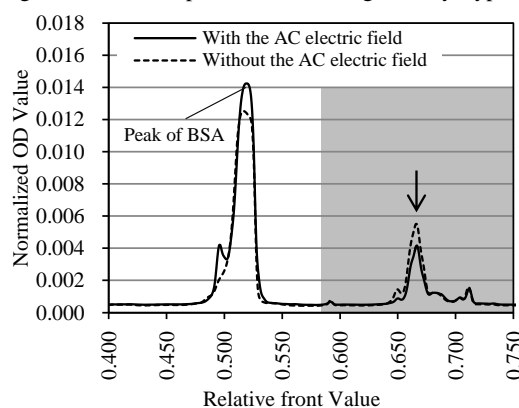


Fig. 2. SDS-PAGE analysis of specimens digested for 30 minutes.

References

- [1] T. Ito et al., Preservation of Fresh Food Using AC Electric Field, *J. Adv. Oxid. Technol*, Vol. 17, No. 2, pp. 1-5, 2014
- [2] I. Bekard and D.E. Dunstan: "Electric field induced changes in protein conformation", *Soft Matter*, 10 (2014) pp. 431-437.