

Field-Flow Fractionation: Size Characterization of Food Protein Aggregates



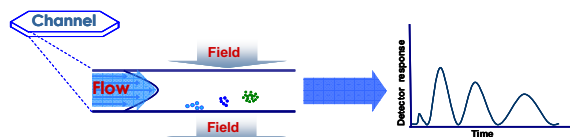
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OBJECTIVES

- To illustrate the applications of field-flow fractionation for food particles
- To examine parameters affecting aggregation behavior of a major protein in whey, i.e., β -lactoglobulin, and hen egg white protein

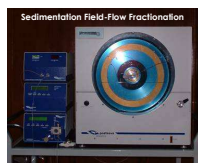
METHODOLOGY

Field-Flow Fractionation



$$d = \left(\frac{36 kT t_r}{\pi \omega^2 r^0 \Delta \rho w} \right)^{\frac{1}{3}}$$

k = Boltzmann constant
 T = temperature (K)
 t_r = retention time t^0 = void time
 ω = angular speed of the centrifuge (rad/s)
 r = rotor radius between the particle and the carrier liquid
 w = channel thickness



SdFFF condition:
 • 1,500 rpm field strength
 • 15 min relaxation time
 • 0.02% FL-70 as carrier liquid
 • 1.0 mL min⁻¹ channel flow rate

Aggregation behavior of β -lactoglobulin or hen egg white protein

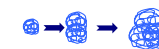
4% (w/v) β -lactoglobulin or 10% (w/v) hen egg white powder in doubly distilled water at pH 7

↓ heat to unfold the protein
 ↓ cool at room temperature

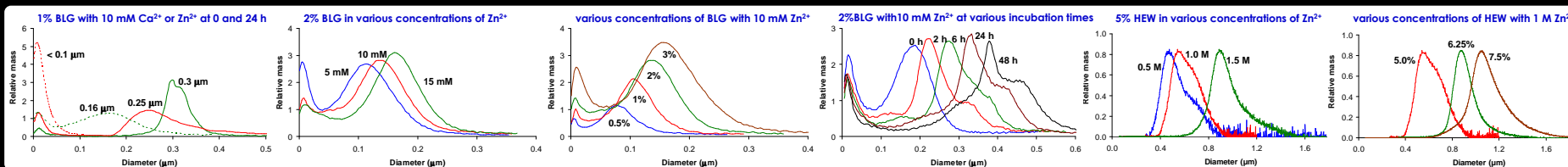
↓ add salt (i.e., CaCl₂, ZnSO₄, ZnCl₂)

↓ observe particle size distribution of β -lactoglobulin or hen egg white protein using sedimentation field-flow fractionation (SdFFF)

- salt concentration
- incubation time
- β -lactoglobulin or hen egg white protein concentration



RESULTS



DISCUSSION AND CONCLUSIONS

Aggregation behavior of β -lactoglobulin

- Both Ca²⁺ and Zn²⁺ can induce aggregation of BLG
- At higher Zn²⁺ concentration, aggregates grow larger
- At higher BLG concentration, aggregates grow larger
- At increased contact time, aggregates grow larger

Aggregation behavior of hen egg white protein

- Zn²⁺ can induce aggregation of BLG
- At higher Zn²⁺ concentration, aggregates grow larger
- At higher HEW concentration, aggregates grow larger

FFF is a useful tool for food industry

ACKNOWLEDGMENTS



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