Article:
Yang, S, Tyler, AII orcid.org/0000-0003-2116-1084, Ahrné, L et al. (1 more author) (2021) Skimmed milk structural dynamics during high hydrostatic pressure processing from in situ SAXS. Food Research International, 147. 110527. ISSN 0963-9969

https://doi.org/10.1016/j.foodres.2021.110527

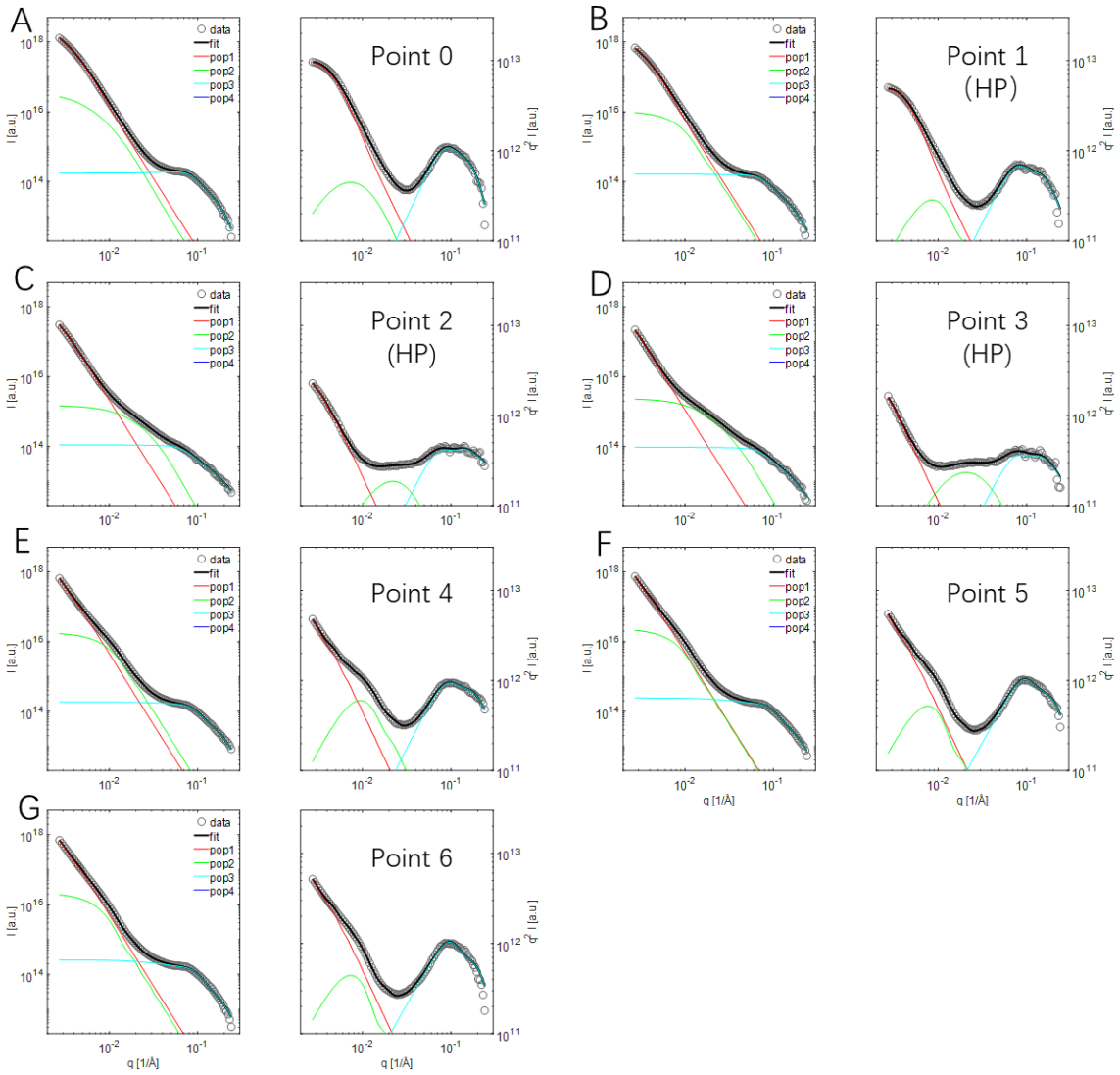

Fig. S1 Scattering curves from skimmed milk under 200 MPa at 25 °C upon HP process 2 fitted with three populations in both log-log (left) and Kratky (right) plots. (A) at P0 (before HP), (B) at P1 (immediately after reaching 200 MPa); (C) at P2 (after 5 min at 200 MPa); (D) at P2 (after 10 min at 200 MPa); (E) at P3 (immediately after depressurization); (F) at P4 (5 min after depressurization); (G) at P5 (10 min after depressurization).

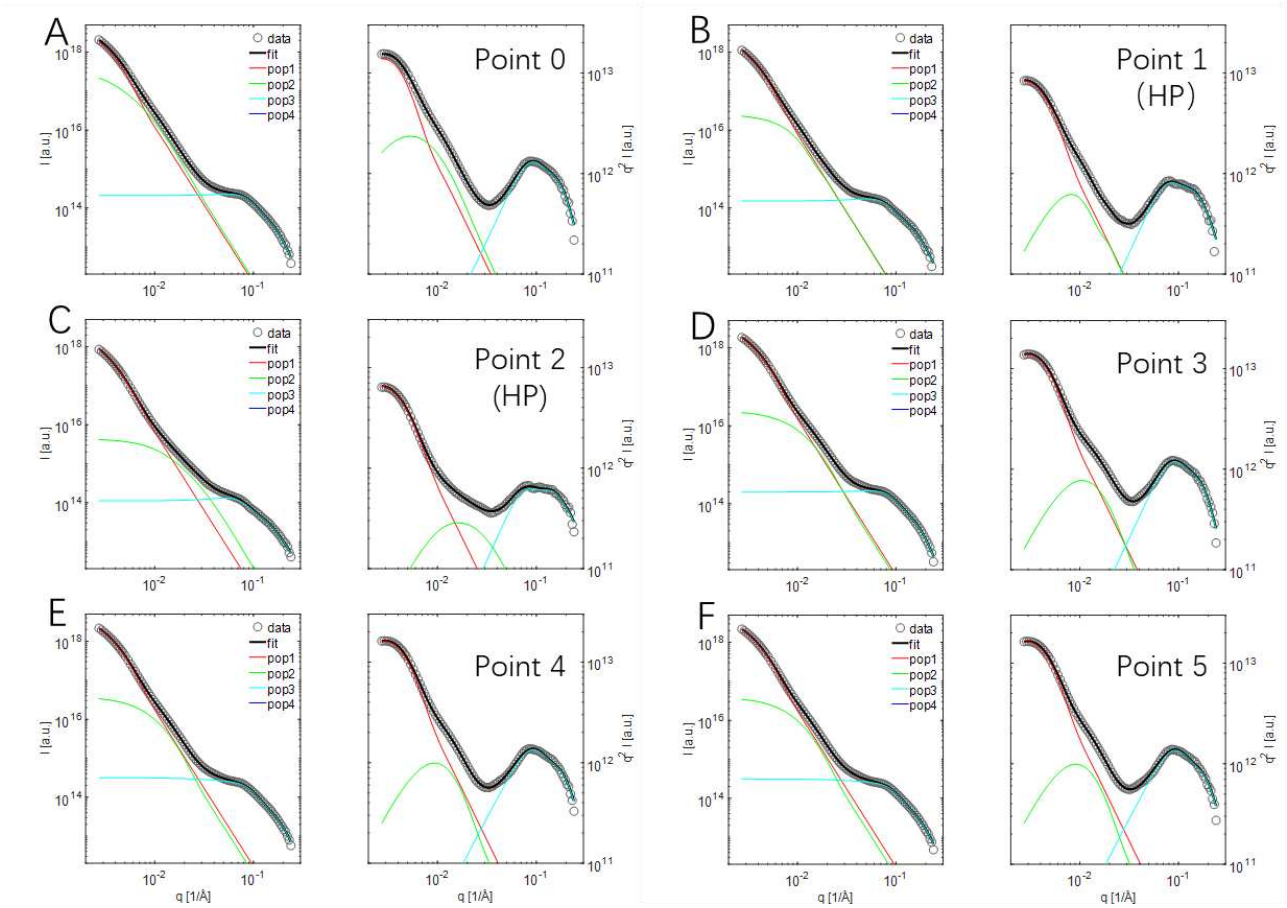

Fig. S2 Scattering curves from skimmed milk under 200 MPa at 40 °C upon HP process 1 fitted with three populations in both log-log (left) and Kratky (right) plots. (A) at P0 (before HP), (B) at P1 (immediately after reaching 200 MPa); (C) at P2 (after 5 min at 200 MPa); (D) at P3 (immediately after depressurization); (E) at P4 (5 min after depressurization); (F) at P5 (10 min after depressurization).

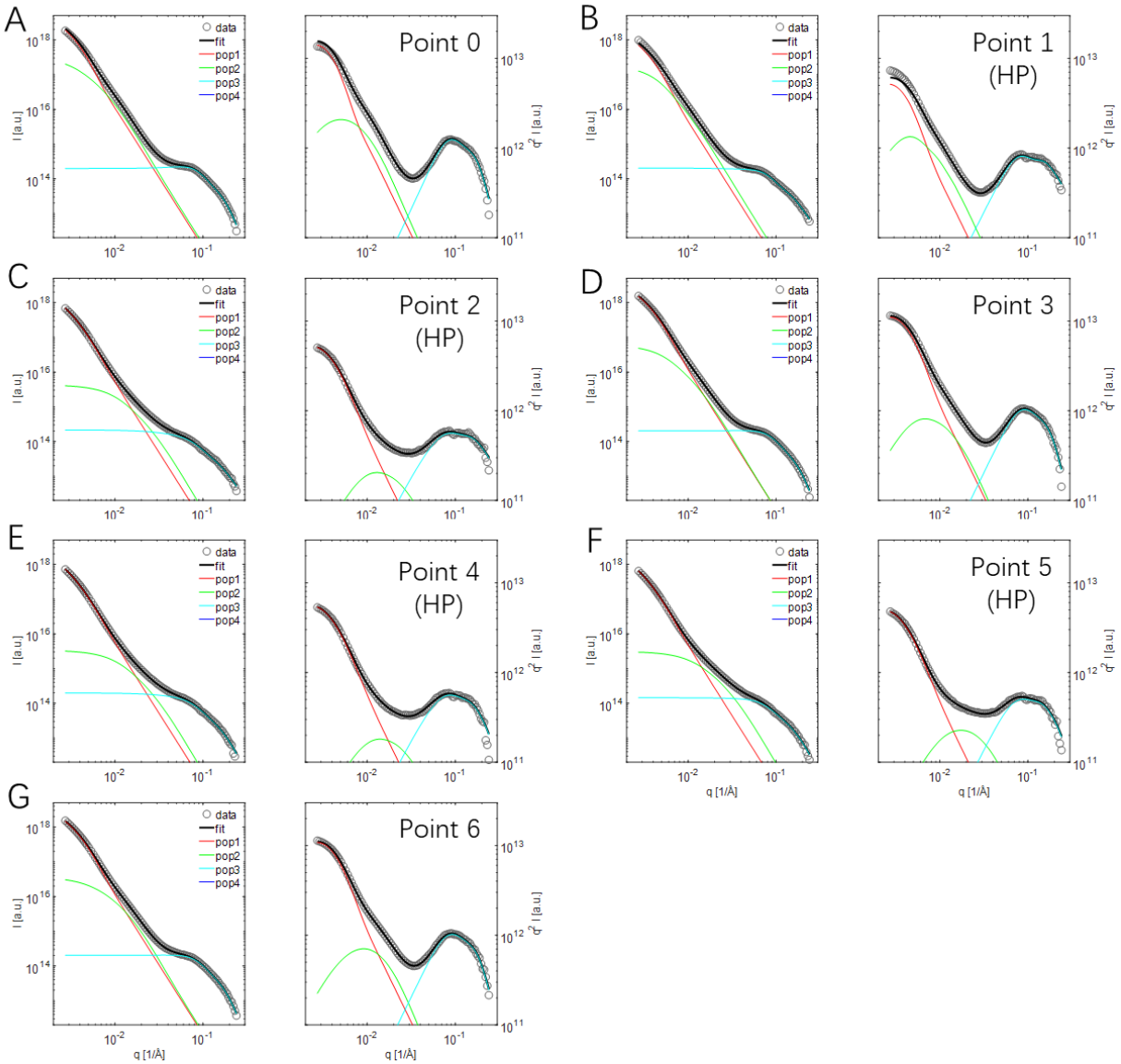

Fig. S3 Scattering curves from skimmed milk under 200 MPa at 25 °C upon HP process 3 fitted with three populations in both log-log (left) and Kratky (right) plots. (A) at P0 (before HP), (B) at P1 (immediately after reaching 200 MPa); (C) at P2 (after 5 min at 200 MPa); (D) at P2 (after 10 min at 200 MPa); (E) at P3 (immediately after depressurization); (F) at P4 (5 min after depressurization); (G) at P5 (10 min after depressurization).

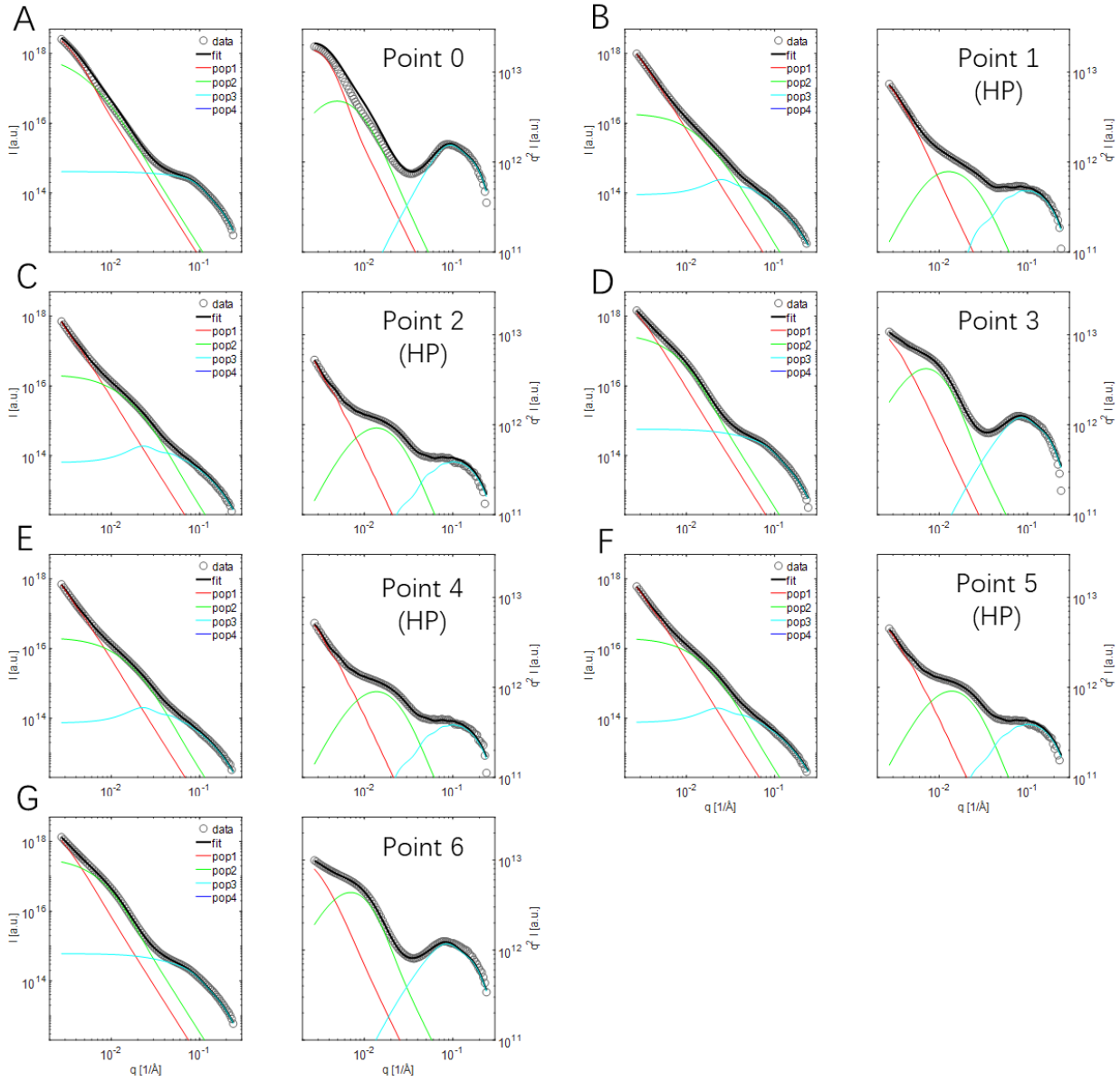

Fig. S4 Scattering curves from skimmed milk under 400 MPa at 25 °C upon HP process 3 fitted with three populations in both log-log (left) and Kratky (right) plots. (A) at P0 (before HP), (B) at P1 (immediately after reaching 400 MPa); (C) at P2 (after 5 min at 400 MPa); (D) at P2 (after 10 min at 400 MPa); (E) at P3 (immediately after depressurization); (F) at P4 (5 min after depressurization); (G) at P5 (10 min after depressurization)

Table S1. Summary of main changes in micelle and protein in skimmed milk during and after HP treatment

HP treatments		Main changes during/under HP		Main changes after HP/when HP releasing	
		Micelles (pop 1, pop 2 and pop 4)	Protein inhomogeneities (pop 3)	Micelles (pop 1, pop 2 and pop 4)	Protein inhomogeneities (pop 3)
1	200 MPa 25 °C, 5 min	Micelles disassociated into submicelles; Both of micelle and submicelle size decreased	Bound proteins dissolved; Protein particle size increased and surface roughness decreased; Particle interaction decreased	Micelle size increased slightly; Micelle number recovered partially; Submicelles aggregation/interaction increase (many smaller submicelles aggregated into larger micelles)	New scatterers generated; Protein particle size further increased and surface roughness further decreased; Particle interaction increased
2	400 MPa 25 °C, 5 min	More severe than treatment 1; Micelles were severely disassociated into submicelles; Both of micelle and submicelle size great decreased	Many bound proteins dissolved; Protein particle size increased and surface roughness decreased; Particle interaction increased	Micelle size decreased; Micelle number recovered partially; Submicelles were split into smaller size (new scatterers generated); Micelles were disrupted into smaller size	Scatterers number recovered partially, still lower; Protein particle size decreased and surface roughness increased; Particle interaction recovered
3	200 MPa 25 °C, 10 min	Micelles first disassociated into submicelles, then part of submicelles re-associated leading small part of micelle size increased; Submicelle size decreased	Consistent with treatment 1	Re-associated micelles were disrupted into smaller sizes; Submicelles were compacted into smaller size or some bound clusters dissolved? (number did not change)	Consistent with treatment 1
4	200 MPa 40 °C, 5 min	Similar with treatment 1, but less decrease;	Consistent with treatment 1	Micelle number increased; Submicelles size increased; Protein aggregation/interaction increase (many protein aggregated into larger submicelles, and submicelles formed into new micelles)	Consistent with treatment 1
5	200 MPa 60 °C, 5 min	Different with other treatments; CCP feature was observed before HP and disappeared under HP; Part of micelles disassociated but combined with other	Protein particle size decreased; Particle interaction decreased (similar with treatment 1) first and then increased (similar with treatment 2); Other parameter similar with treatment 2	Submicelles were split into smaller size (number increased); New CCP formed leading submicelles aggregation/interaction increase (many smaller submicelles aggregated into larger micelles)	Similar with treatment 2, but particle interaction did not fully recovered, still higher than before HP

		micelles leading micelle size increased			
6	200 MPa 25 ℃, 2×2.5 min	Consistent with treatment 1	Consistent with treatment 1	Consistent with treatment 1	Consistent with treatment 1
7	400 MPa 25 ℃, 2×2.5 min	Similar with treatment 2; but micelles size slightly less decreased	Consistent with treatment 2	Both of micelles and submicelles were more recoverable and the submicelle size increased	Different with treatment 2; New scatterers generated; Protein particle size increased (making a volume explosion might also related with submicelle size increased) and surface roughness slightly decreased in 1st cycle and further decreased in 2nd cycle;