

# Increasing the water binding of protein systems

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## Objective

To produce **low caloric dairy products** by increasing the water content, **whey protein microparticles** can be used:

- with an enhanced **water binding capacity**
- which do not affect the texture of the product

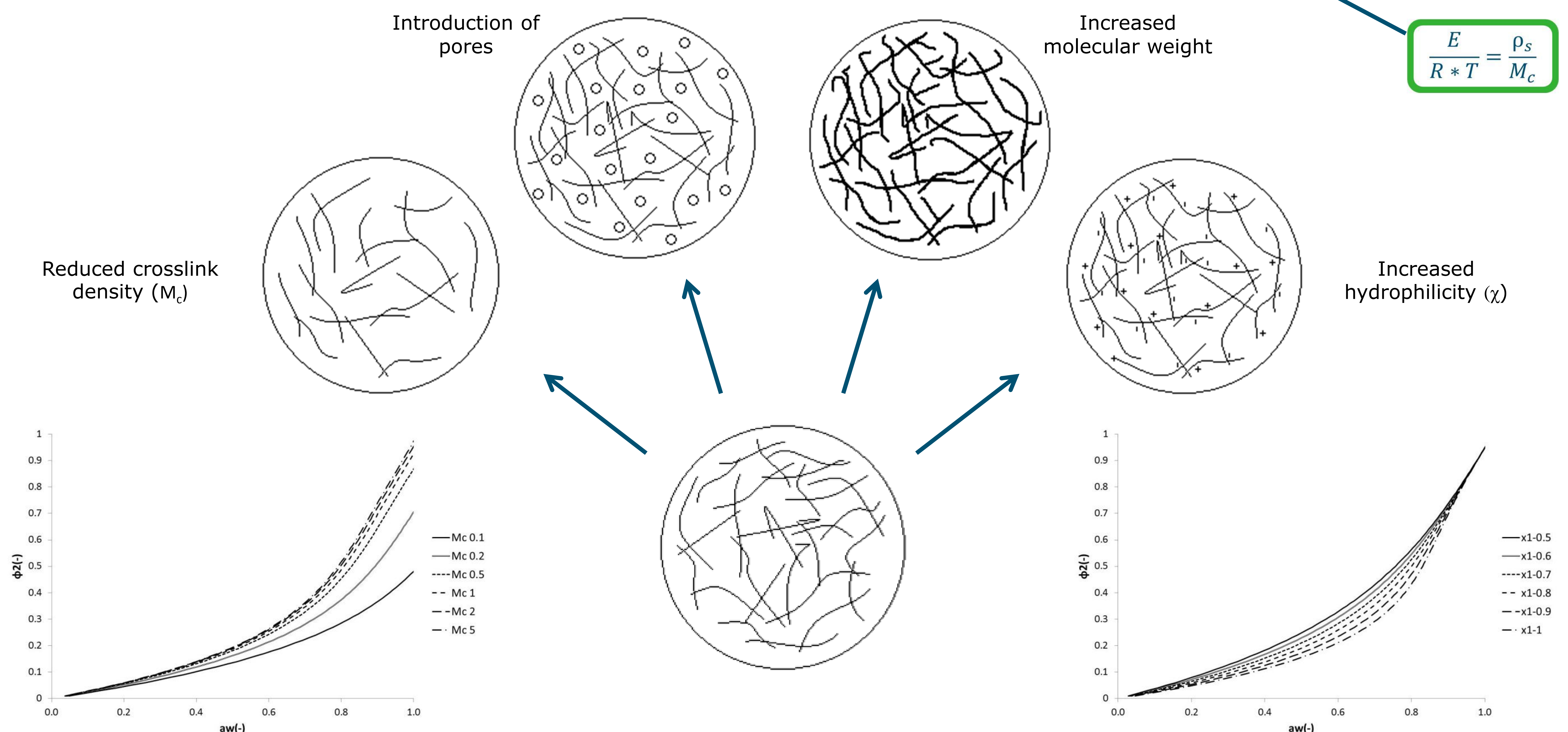
## Conclusions

Increasing the water binding of dairy protein particles can be done by:

- Decreasing crosslink density
- Increasing hydrophilicity
- Increasing molecular weight
- Introducing pores
- Or a combination of above → **superabsorber**

## Creation of dairy proteins with an enhanced water binding

$$aw = \exp(\ln(1 - \varphi_1) + \varphi_1 + \chi * \varphi_1) * \exp\left(\frac{E * v_w}{R * T} * \left[\varphi_1^{\frac{1}{3}} * \varphi_0^{\frac{2}{3}} - \frac{\varphi_1}{2}\right]\right)$$

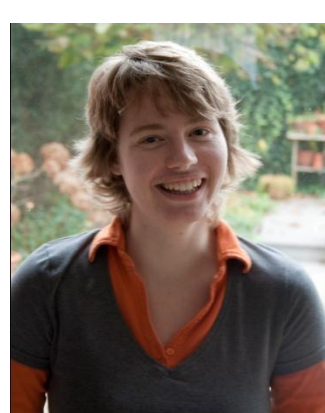


## Creation of a superabsorber



Using a combination of factors that increase water binding can result in the formation of a **superabsorber**

|             |   |  |
|-------------|---|--|
| $a_w$       | = | water activity   |
| $\varphi_1$ | = | volume fraction polymer                                |
| $\chi$      | = | polymer solvent interaction parameter                  |
| $E$         | = | elastic modulus  |
| $v_w$       | = | molar volume water                                     |
| $R$         | = | molar gas constant                                     |
| $T$         | = | temperature  |
| $\varphi_0$ | = | volume fraction gel in the relaxed state               |
| $\rho_s$    | = | density of the polymer                                 |
| $M_c$       | = | molar weight of polymeric units between the crosslinks |
| $\varphi_2$ | = | volume fraction water                                  |



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