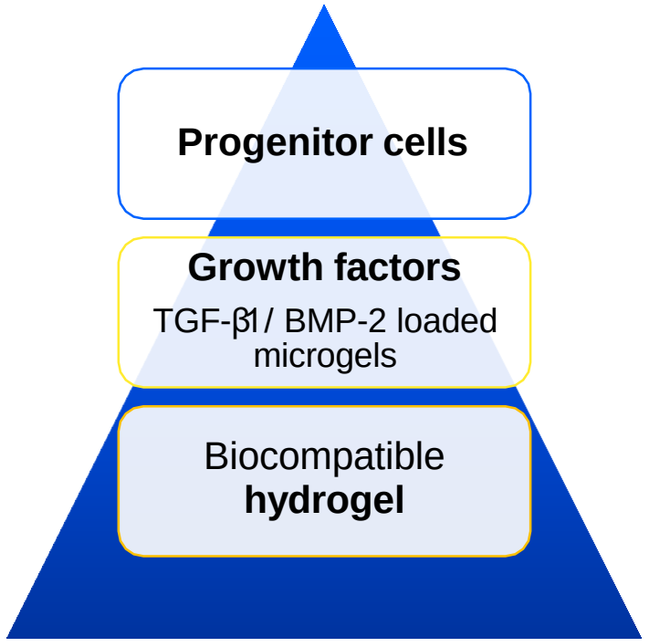
# Encapsulation of growth factor loaded microgels into a thermoresponsive hydrogel based on a marine exopolysaccharide for tissue regeneration

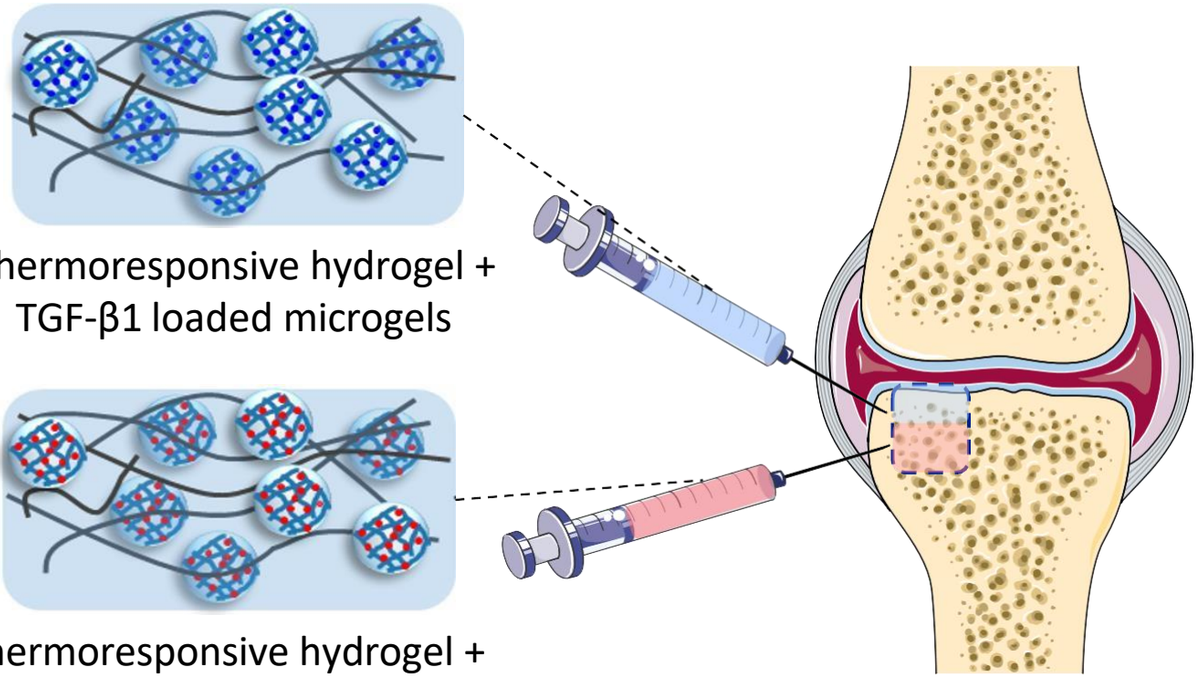
Léna Guyon, Arnaud Fillaudeau, Corinne Sinquin, Méline Calatraba, Stéphane Cuenot, Sylvia Colliec-Jouault and Agata Zykwinska

# Introduction and objectives

anr SmartIEs

## Osteochondral defect treatment



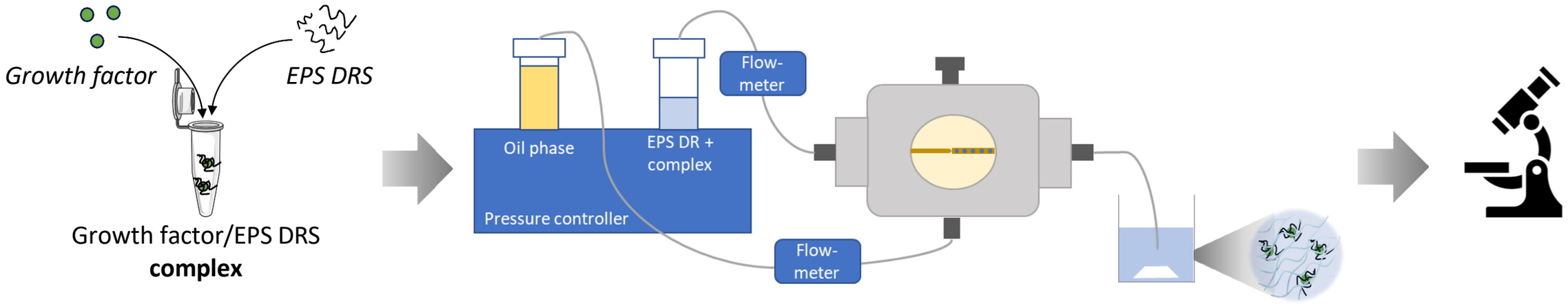
Thermoresponsive hydrogel + TGF-β1 loaded microgels

Thermoresponsive hydrogel + BMP-2 loaded microgels

Both microgels and hydrogel were based on **infernan**, a **marine bacterial exopolysaccharide** (EPS) endowed with glycosaminoglycan (GAG)-mimetic properties

Ifremer

# Microfluidifc microgel formulation for TGF-β1 and BMP-2 encapsulation




**EPS DR** : infernan derivative, Mw 700,000 g/mol → **microgel** formation with **$Ca^{2+}$**

**EPS DRS** : low molecular weight highly sulfated infernan derivative, Mw 20,000 g/mol and 14%S → **growth factor/EPS DRS complex**

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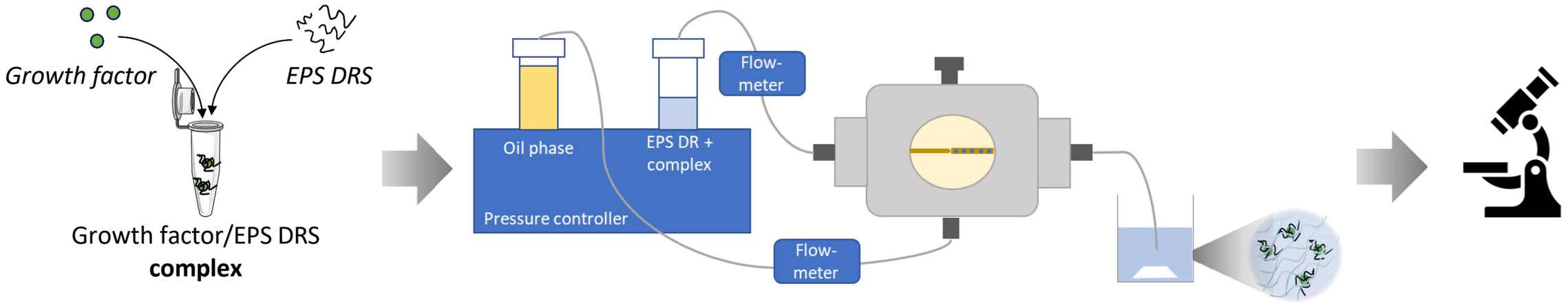


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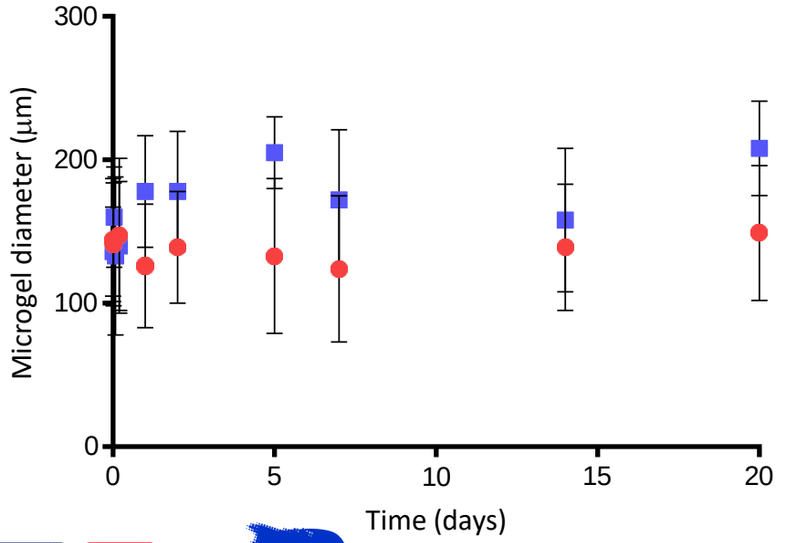
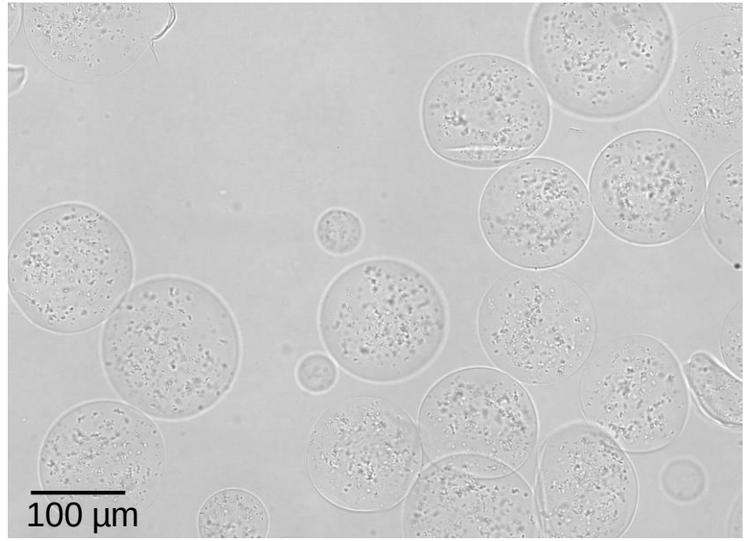


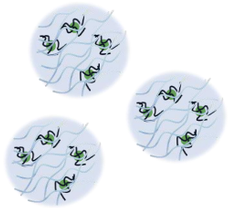

- ⌀ = 140 ± 37 µm
- **Stability** over at least 20 days




*EPS DR* ***microgels***

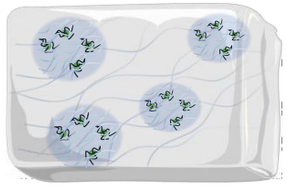
# Growth factor release profiles

**Microgels**



$M_{TGF-\beta1/DRS}$
$M_{BMP-2/DRS}$

**Microgels incorporated in hydrogel**



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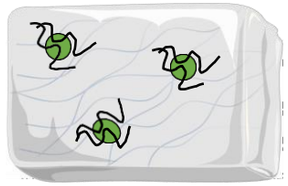

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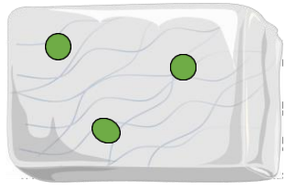
**Growth factor incorporated in hydrogel**



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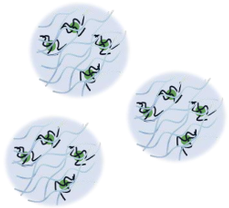
Growth factor release at 37 °C in cell culture medium for 20 days

# Growth factor release profiles

**Microgels**



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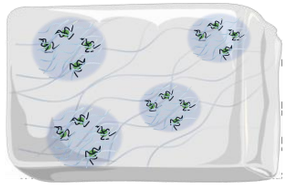

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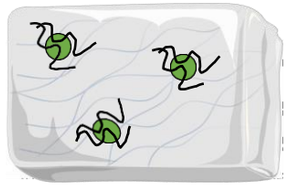

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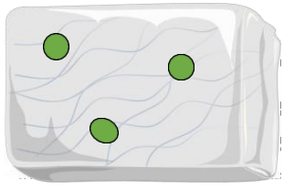
**Growth factor incorporated in hydrogel**



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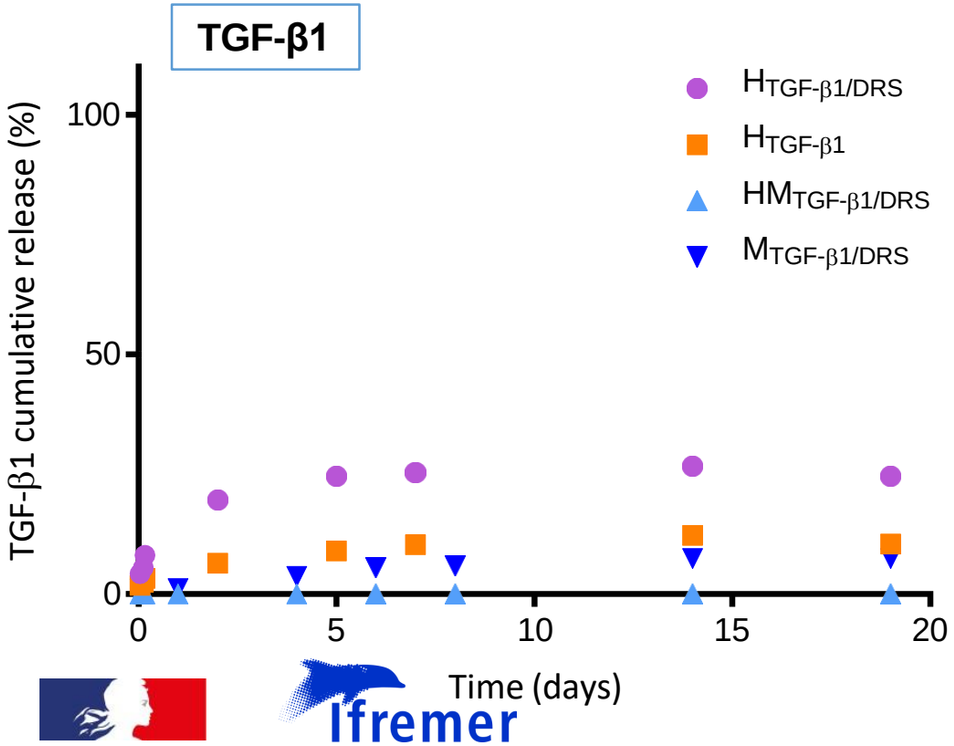
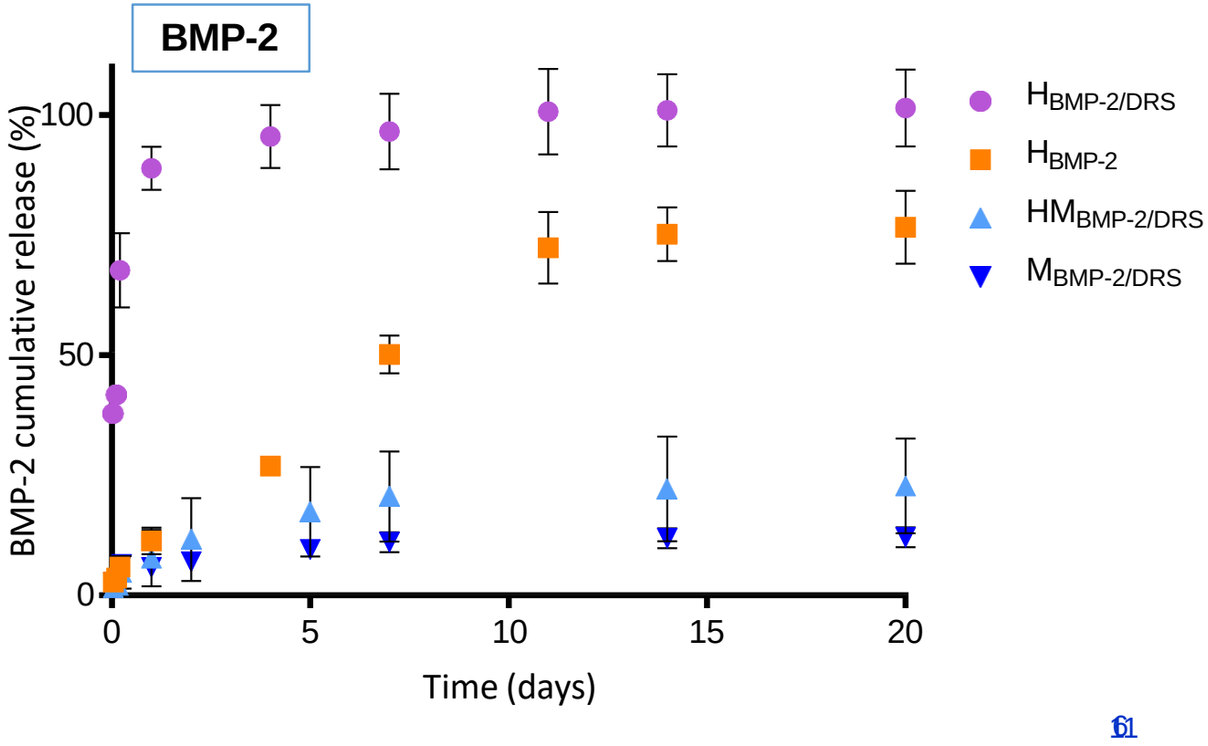
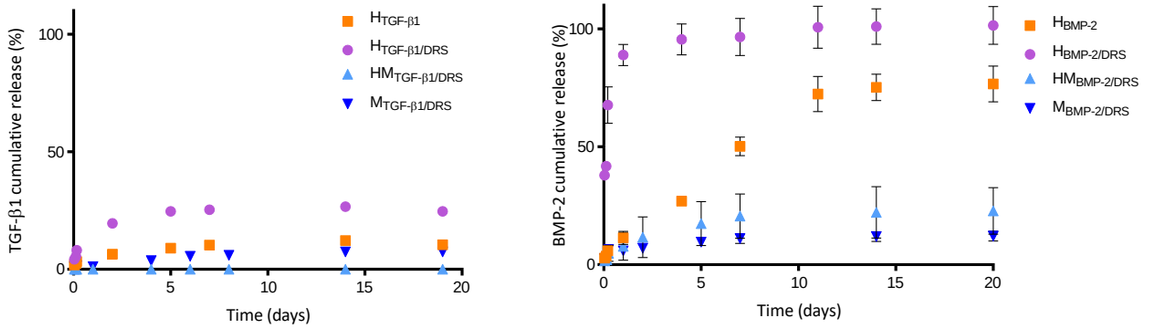


# Conclusion

**Four different matrices** developed

**Two different growth factors release profiles**
→ **molecular interactions** between growth factors and EPS DR/EPS DRS.




# Perspectives

**Molecular modelling** will be used to predict interactions between growth factors and infernan derivatives

Comparison of these matrices will be performed *in vitro*
→ biological activities of released growth factors

# Acknowledgment

Agata Zykwinska
Sylvia Colliec-Jouault
Corinne Sinquin
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Arnaud Fillaudeau
Stéphane Cuenot

# Thank you for your attention!