

# *Polypeptide Block Copolymers and Polymersomes*

Market Sectors: Drug Delivery, Vaccines, Polymers, Biologics, Oncology, Nanotechnology

Type of Opportunity: Licensing

**Researchers at Leiden University have developed a class of novel amphiphilic polypeptide block copolymers. The copolymers self-assemble into polymersomes which can be used as targeted drug delivery vehicles. The unique advantages of the technology include: 1) the ease with which the copolymers are synthesized, and 2) the ability to precisely vary the thickness and the surface chemistry of the polymersome membrane.**

The technology combines for the first time solid-phase synthesis with a new method of ring-opening polymerization (ROP) to build block copolypeptides. The process overcomes one of the main disadvantages of conventional methods of ROP polymer synthesis since any homopolymer that is formed can simply be washed away without the need for further purification steps.

The new synthetic process makes it relatively easy to control the length of the hydrophobic block, resulting in copolypeptides with well-defined block sizes and functionalities. This also makes it possible to control the thickness of the polymersome membrane. The membrane thickness has thus far been varied between 15-90nm, making the polymersomes far more robust and stable than liposomes (whose membrane thickness is only 4-6nm).

The size and properties of the hydrophilic block can also be varied by binding a variety of moieties (e.g. PEG and antibodies). In this manner the surface of the polymersomes can be functionalized in order to specify behavior (e.g. targeting of the polymersomes).

The copolypeptides are able to self assemble into polymersomes in water at neutral pH over the entire compositional range (i.e. with a wide range of hydrophilic and hydrophobic block sizes and ratios). The polymersomes have also been shown to encapsulate water soluble compounds.



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*In vivo* data has shown that polymersomes tested as an immune adjuvant shows an improved immunogenicity hybrid that improves the immune response for the influenza antigen co-administered with the polymersomes.

### Stage of development

- The synthesis, self-assembly and characterization of polymersomes has been carried out.
- The development of vaccines based on polymersomes is ongoing.
- Experiments with smaller co polypeptides are performed.

### Key Benefits

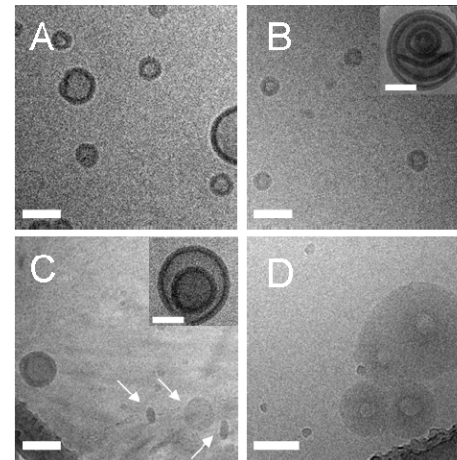
- Ease of synthesis
- Stable and robust polymersomes
- Variability of polymersome size and membrane thickness
- Surface chemistry can be readily modified
- Polymersomes encapsulate water soluble compounds

### Applications

- Drug delivery
- Vaccines

### Patent status

Patent applications for the technology have been filed.



Cryo-TEM images of polymersomes formed from different copolypeptides/complexes. Scale bars = 100nm.

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