Characterization of PAMAM-peptide Conjugates

Student Project

January 2021

1 Background Information

Gel electrophoresis is a widely used tool in biophysics, as it is a relative simple technique capable of characterizing size and/or charge of biomolecules. Different biomolecules require different gel properties and stains in order to be separated adequately. For proteins and other molecules containing amine groups, Coomassie blue is a suitable dye for detection, while DNA, for example, is often stained using ethidium bromide, GelRed/GelGreen or GelStar. Typically agarose or polyacrylamide gels are used, with varying pore size tuned by adjusting the polymer concentration.

Poly(amidoamine) dendrimers (PAMAM) are dendritic polymers often used in the biomedical field, due to their biocompatibility. Due to the possibility to adjust their generation, core and surface functional groups, they offer a large spectrum of possible applications. PAMAM with positively charged amine end groups can be conjugated with peptides using a crosslinker for amine-to-sulfhydryl conjugation [1, 2]. This is a very useful property with regards to, among others, drug delivery.

2 Scope of the Project

This project aims at developing a protocol for the characterization of PAMAM-peptide conjugates using gel electrophoresis. It has been shown to be possible to detect PAMAM in agarose gels with Coomassie blue dye [3, 4], however, preliminary tests in our group have revealed a need for optimization in this technique.

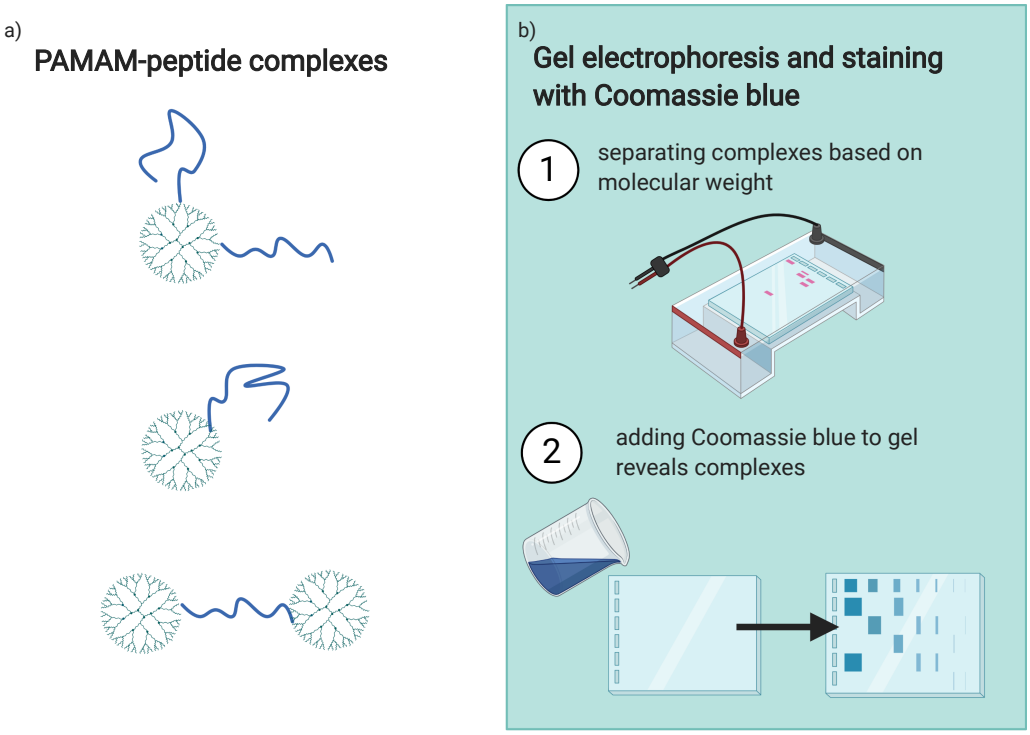

Figure 1: a) Scheme of the different PAMAM-peptide complexes to be characterized, b) illustration of gel electrophoresis with Coomassie blue to stain the dendrimers. (Created with BioRender.com)

Complexes with one or multiple PAMAM dendrimers and one or multiple peptides (see fig. 1 a) for a schematic representation) have been synthesized by our group and we would like to characterize the formed complexes using using gel electrophoresis (see fig. 1 b)).

Through this project, the student will use well lab techniques to conjugate peptides to PAMAM dendrimers and to characterize the formed complexes. The project is suitable even for those who have little experience in the lab from before. The student will receive close guidance and training, but will also have the chance to work independently.

Qualifications: Some experience in the lab and interest in learning more.
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References

1. Santos, J. L. *et al.* Receptor-Mediated Gene Delivery Using PAMAM Dendrimers Conjugated with Peptides Recognized by Mesenchymal Stem Cells. *Molecular Pharmaceutics* **7,** 763–774 (June 2010).
2. Waite, C. L. & Roth, C. M. PAMAM-RGD Conjugates Enhance siRNA Delivery Through a Multicellular Spheroid Model of Malignant Glioma. *Bioconjugate Chemistry* **20,** 1908–1916 (Oct. 2009).
3. Cheng, Y., Wu, Q., Li, Y., Hu, J. & Xu, T. New insights into the interactions between dendrimers and surfactants: 2. Design of new drug formulations based on dendrimer-surfactant aggregates. *Journal of Physical Chemistry B* **113,** 8339–8346 (June 2009).
4. Sharma, A., Desai, A., Ali, R. & Tomalia, D. Polyacrylamide gel electrophoresis separation and detection of polyamidoamine dendrimers possessing various cores and terminal groups. *Journal of Chromatography A* **1081,** 238–244 (July 2005).