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ORAL PRESENTATION - Polymersomes as nano-carriers for alpha radionuclide therapy

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Alpha radionuclide therapy has a great potential in the fight against cancer as proven by a large number of pre-clinical and clinical studies [1, 2]. In vivo generators capable of delivering a highly efficient cascade of alpha particles are also steadily gaining importance. 225Ac is at the moment the most important radionuclide that can serve as an in vivo generator, providing four alpha particles with a total energy of 28 MeV. However, the alpha emitting daughter nuclides of 225Ac may deviate from their intended destination due to recoil and cause unwanted damage to healthy tissue. Here, we demonstrate that polymer vesicles (i.e. polymersomes), have great potential to retain the recoiling daughter nuclides based on experimental and simulation data. Experiments reveal that polymersomes with dimensions of 100 nm can easily be loaded with radionuclides and are capable of retaining more than 80 % of the daughter nuclide (209Pb) in the case of 213Po decay [3]. Doubling the size of the nano-carriers increases the retention to 95 %. Furthermore, simulation studies, in which the whole decay chain of 225Ac is considered, indicate that polymersomes can be engineered in such a way that several consecutive recoiling daughters can be retained. According to these results double-layered polymersomes with dimensions of 800 nm will enable the complete retention of the first daughter nuclide 221Fr, while the retention of the third radioactive daughter 213Bi will be increased to 80 %.

[1] Allen B.J., Raja C., Rizvi S., Li Y., Tsui W., Graham P., Thompson F., Reisfeld R.A., Kearsley J., Morgenstern A., Apostolidis C., Cancer Biol. Ther., 4, 1318, (2005).
[2] Raja C., Graham V., Abbas Rizvi S.M., Song E., Goldsmith H., Thompson J., Bosserhoff A., Morgenstern A., Apostolidis C., Kearsley J., Reisfeld R.A., Allen B.J., Cancer Biol. Ther., 6, 846, (2007).
[3] Beuren J. van, Wang G., Vries D. de, Morgenstern A., Brucherseifer F., Wolterbeek H.T., Denkova A.G., submitted.
[4] Thijssen L., Schaart D.R., de VriesD., A. Morgenstern A., Brucherseifer F., Denkova A.G., Radiochim. Acta 2012 DOI: 10.1524/ract.2012.1935.

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