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Poster presentation

P19-33. Trafficking of a synthetic vaccine vehicle made of poly(lactic acid) fluorescent nanoparticles, in intestinal mucosa

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Background

Mucosal administration of vaccine candidate is a challenging strategy to induce protective HIV immune responses at portal of entry. For instance, mechanisms involved in the uptake of synthetic particulate vehicles of vaccination such as poly(lactic acid) (PLA) nanoparticles need to be defined. Our approach aims to target intestinal mucosa, and we used fluorescent PLA nanoparticles to decipher the mechanisms of their fate and transport through mucosal barrier.

Methods

Two fluorophores, 6-coumarin or CellTrace BODIPY, were incorporated within the core of PLA nanoparticles, synthesized by solvent diffusion method. Physico-chemical properties of green or red fluorescent particles were analyzed and compared with blank PLA particles (without fluorophore). We have used mice ilea ligated loop to mimic as closely as possible the trafficking of our nanoparticles in the intestinal physiological conditions. The transport of nanoparticles through the epithelium was followed by confocal fluorescent microscopy. The colocalisation of nanoparticles with M-cells, enterocytes and goblet cells was observed by specific lectins labelling. Furthermore, the fate of particles in the sub-epithelial dome was analyzed by flow cytometry, after enzymatic digestion of Peyer's patches.

Results

The fluorescent PLA nanoparticles penetrated the intestinal mucosa preferentially in the Peyer's patches area. Moreover, these nanoparticles crossed the epithelium mainly via M-cells, which are specialized cells in antigen transport from the lumen to the underlying dendritic cells. Thus, the fate of PLA nanoparticles was followed in the sub-epithelial dome, using the technique of flow cytometry, and revealed the specific uptake of particles by dendritic cells and by B cells.

Conclusion

Our findings suggest the appropriate crossing of PLA nanoparticles trough the intestinal barriers and their delivery to the antigen presenting cells of the lamina propria of the Peyer's patches. This cellular specific uptake in intestine is promising for the delivery of HIV antigens associated to PLA particles in the field of mucosal vaccination.