^{123}I-labeled microspheres for SPECT embolization procedure imaging

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Vascular embolization is a clinical procedure where dispersed polymer microspheres are injected through a catheter and reach the main blood vessel of the tumor, promoting an immediate obstruction. Consequently, the tumor region tends to shrink due to limited nutrients supply [1]. X-ray imaging techniques monitor this clinical procedure; however, the obtained images cannot show the exact location of the blockade or the location of the particles [1]. In this case, obtaining SPECT images may be an alternative since this technique produces higher resolution images, which would allow more precise tracking of the distribution of these particles in the body [1,2]. Iodine 123 is a radioisotope widely used to obtain SPECT images and presents high *in vivo* stability when the radioiodine insertion occurs in aromatic rings. Previous studies evaluated the suspension polymerization of 4vinylphenol with vinyl acetate and subsequent radioiodination of the obtained polymeric microparticles (Figure 1) using iodobeads [1,2]. Labelling results indicated a significant insertion of radioiodine in both poly(vinyl acetate) (PVAc) and poly(vinyl acetateco4vinylphenol) (P(VAcco4VPh)) backbone [1].

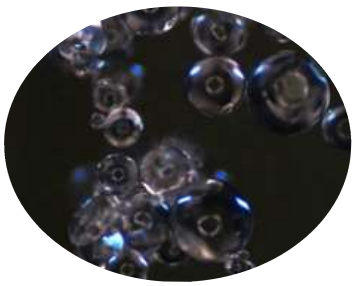

Figure 1. Optical microscopy image of P(VAcco4VPh) microparticles containing 0.10 % (w/w) of 4vinyl acetate

However, the particle agglomeration (Figure 1) decreases the embolization efficiency. The addition of methyl methacrylate (MMA) monomer (10 % (w/w)) to the polymerization of vinyl acetate proposed by Oliveira shows excellent results against the agglomeration effect, being, thus, the standard reference in this study [3]. In this work, a volume of 50 µL from a 1:1000 diluted Na^{123}I solution was added to the reaction vial containing two iodo-beads (original Na^{123}I activity equals 166.5 MBq). Particles labelling occurred for 60 min with 5 mL buffer solution and 0.05 g of P(VAccoMMA) (poly(vinyl acetatecomethyl methacrylate) under magnetic stirring. Table 1 displays the counting measurements performed. Counting measurements were twice replicated.

Table 1 - Counting measurements

Item	Description	CPS
1	^{123}I initial (solution)	814.17 ± 2.24
2	^{123}I final (supernatant)	154.43 ± 3.34*

CPS = counting per second
* decay correction was calculated

Approximately 80 % of the initial ^{123}I migrated from the supernatant to the particles. This labelling yield is far better than the ones observed in the radioiodination of pure PVAc and (P(VAcco4VPh) particles that were agglomerated [1]. Therefore, it is reasonable to affirm that particles agglomeration affects the ^{123}I labelling yield. Further studies consist of studying the stability of this labelling over time. On a broad scale, labelled particles are expected to be viable for a 4 hours time, being, thus, proper for transportation and usable to the embolization procedure.

References

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