Tumorigenic biomembrane morphology: Comparison between directly endothelial cell-spread monolayer and DPPC-based biomimetic systems

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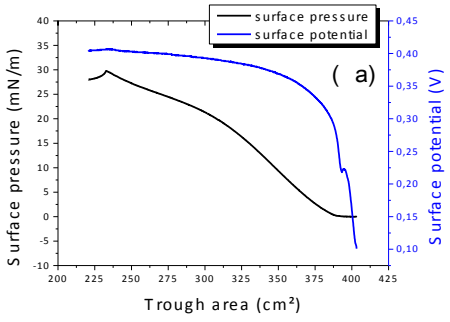
Introduction

Trastuzumab (Tmab) is a monoclonal antibody administered in adjuvant and neoadjuvant therapy of HER2-positive breast cancer and gastric cancer cases. Studies concerning physical-chemical analyses of the tumorigenic biomembrane morphology and the complex Tmab-HER2 receptor through Langmuir technique are scarcely found in literature.

In this study, endothelial cell lines[1] derived from rabbit aorta (EC/parental), EC transfected with EJ-ras oncogene (EJ-ras EC) and EC *anoikis* resistant (Adh-EC) were directly spread and analyzed through Langmuir films (monolayers). Afterwards, DPPC(dipalmitoylphosphatidylcholine)-based systems were assembled and compared to directly cell-spread monolayers. Investigation about molecular architecture of the tumorigenic cell membrane through Langmuir technique may bring new insights for cancer research.

Results e Discussions

Surface pressure versus trough area isotherm (π-A) for Adh2-EC line exhibits monolayer formation and collapse ca. 30 mN/m which is proximate value for cell membrane pressure (Figure 1a). Moreover, surface potential curve indicates molecular ordering between 400 and 360 cm^2 (Figure 1a) and hysteresis assay curve shows expansion of the monolayer in the second compression-decompression cycle (Figure 1b).



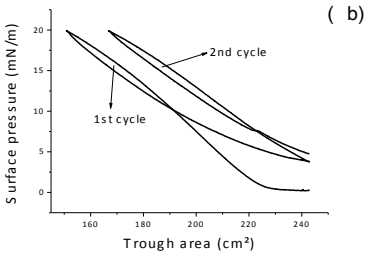


Figure 1. (a) Surface pressure versus trough area isotherm (black line) and surface potential curve (blue line); (b) hysteresis assay curve.

Polarization modulated infrared reflection-absorption spectroscopy (PM-IRRAS) spectrum for Adh2-EC line indicates occurrence of proteins in the monolayer (amide I and II bands ca. 1650 cm^{-1} and 1550 cm^{-1}) (Figure 2a). Brewster-angle microscopy (BAM) endorses stable monolayer formation and indicates presence of domains, that may be related to rich-in-protein regions (Figure 2b).

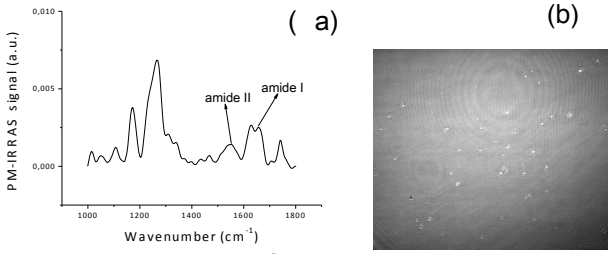


Figure 2. (a) PM-IRRAS spectrum; (b) BAM image.

Conclusions

Directly Adh2-EC cell-spread monolayers enabled the identification of components of cell membranes, which can be useful to understand the action of Tmab in to cells.

Acknowledgements

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[1] Carneiro, B. R.; Pernambuco Filho, P. C. A.; Mesquita, A. P. S. et al. PLoS ONE **2014**, *9(12): e116001*.