

A grayscale electron micrograph showing a dense field of cells. Some cells are larger and more rounded, while others are smaller and more irregular. The overall appearance is that of a cell culture or a tissue section.

# Fosfoetanolamina

**Efeitos antitumorais e mecanismos de morte celular programada - apoptose**

**Prof. Dr. Durvanei Augusto Maria  
Laboratório de Bioquímica e Biofísica  
Instituto Butantan**

## **Anticancer Effects of Synthetic Phosphoethanolamine on Ehrlich Ascites Tumor: An Experimental Study**

ADILSON KLEBER FERREIRA<sup>1,2</sup>, RENATO MENEGUELO<sup>3</sup>, ALEXANDRE PEREIRA<sup>4</sup>,  
OTAVIANO MENDONÇA R. FILHO<sup>5</sup>, GILBERTO ORIVALDO CHIERICE<sup>3</sup> and DURVANEI AUGUSTO MARIA<sup>1,2</sup>

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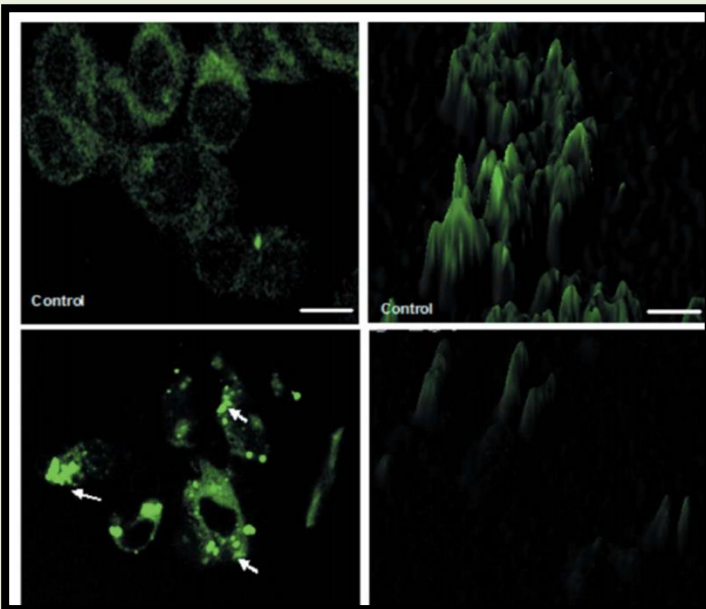
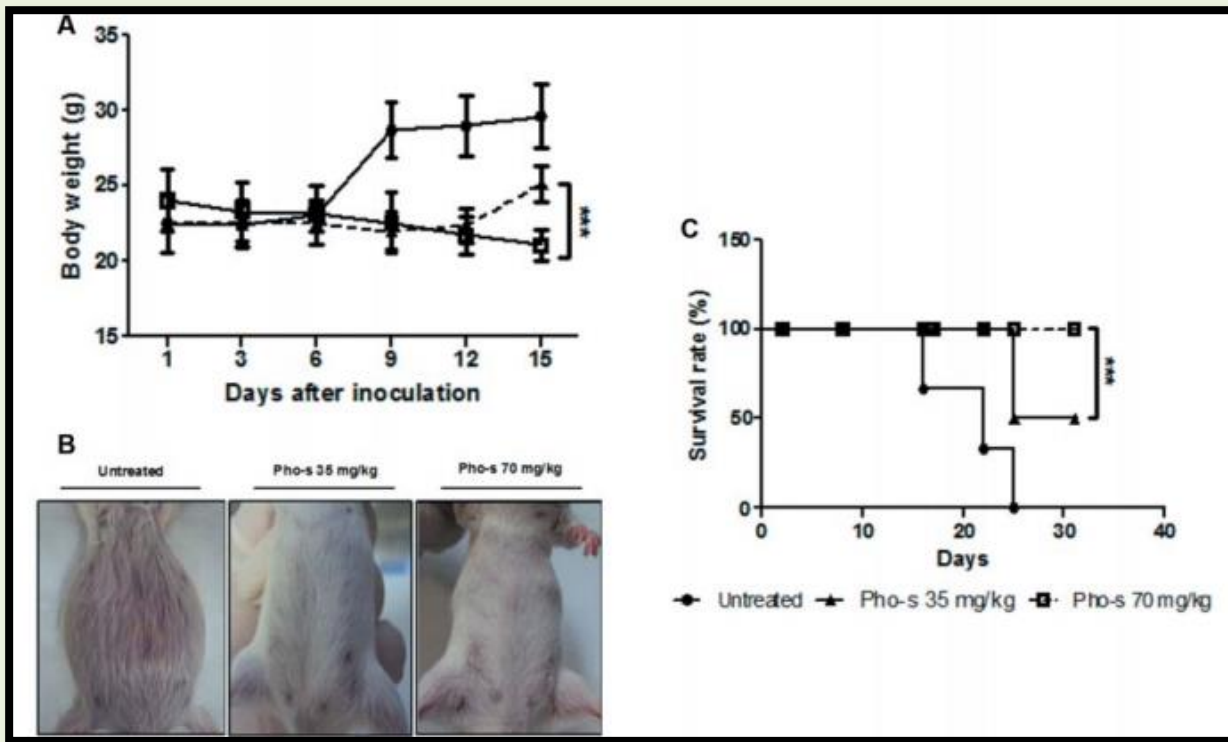
*<sup>3</sup>Department of Chemistry and Polymers Technology, University of Sao Paulo, Sao Carlos, Brazil;*

*<sup>4</sup>Laboratory of Genetics, Butantan Institute, Sao Paulo, Brazil;*

*<sup>5</sup>University of Uberaba, Belo Horizonte, Minas Gerais, Brazil*

Foram avaliados os efeitos da citotoxicidade da fosfoetanolamina em diversos tipos de células tumorais e normais.

Finalidade determinar a IC50% ou seja concentração inibitória , capaz de matar 50% das células, para a condução dos testes de tratamento in vivo em animais de laboratório portadores de tumores



Redução do volume tumoral e aumento da probabilidade de sobrevivência em tumores de mama

Avaliação da ativação das mitocôndrias promovida pela fosfoetanolamina em tumores de mama



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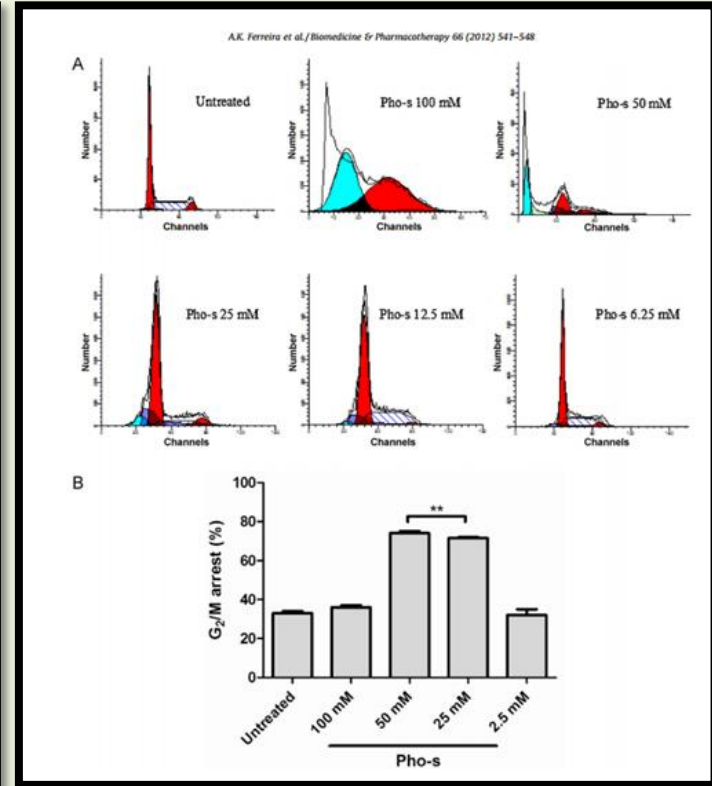
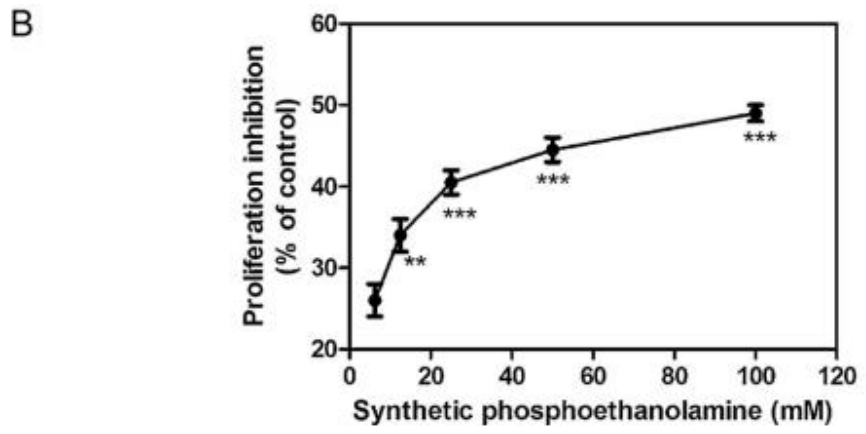
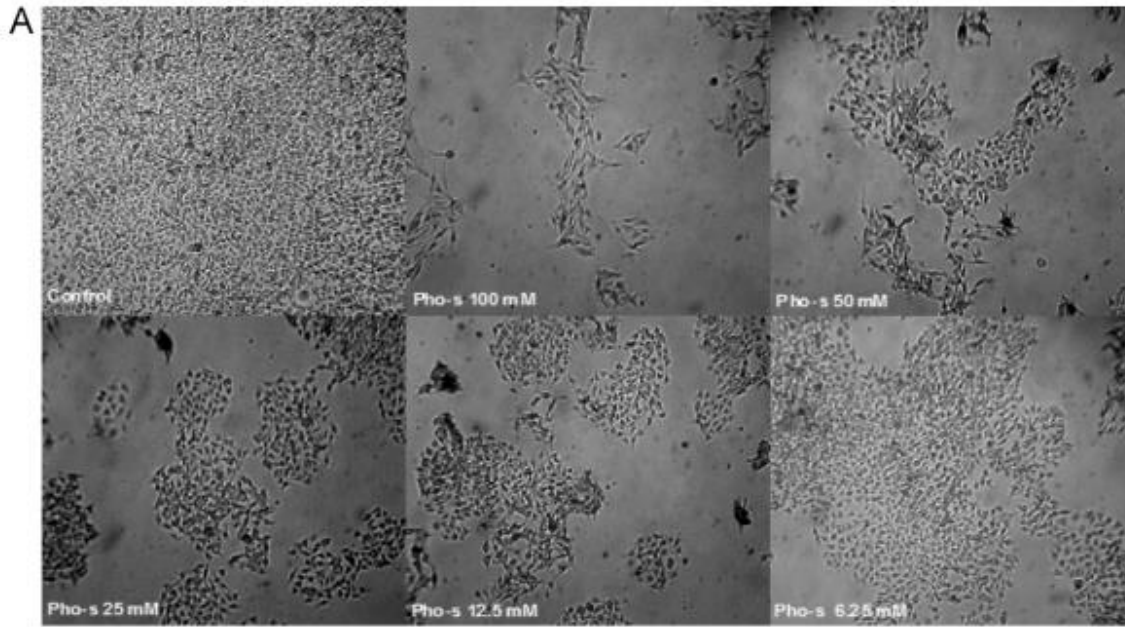


Original article

## Synthetic phosphoethanolamine a precursor of membrane phospholipids reduce tumor growth in mice bearing melanoma B16-F10 and in vitro induce apoptosis and arrest in G2/M phase

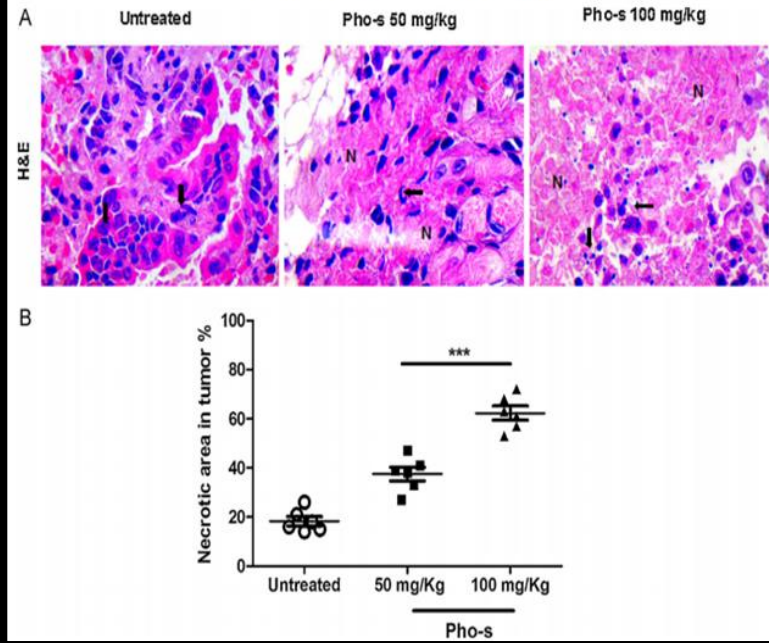
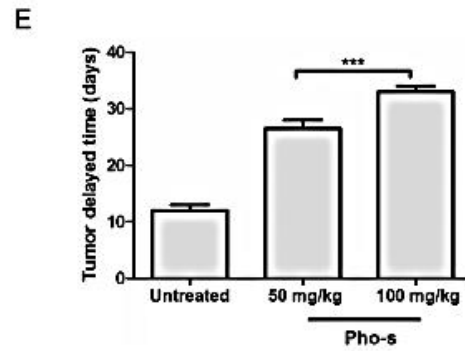
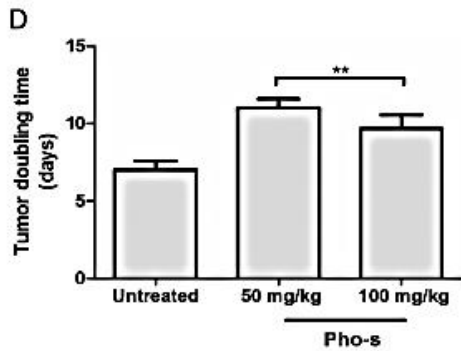
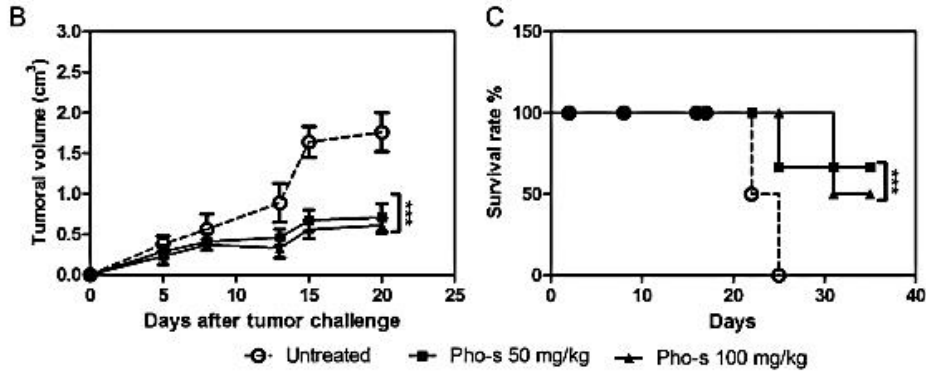
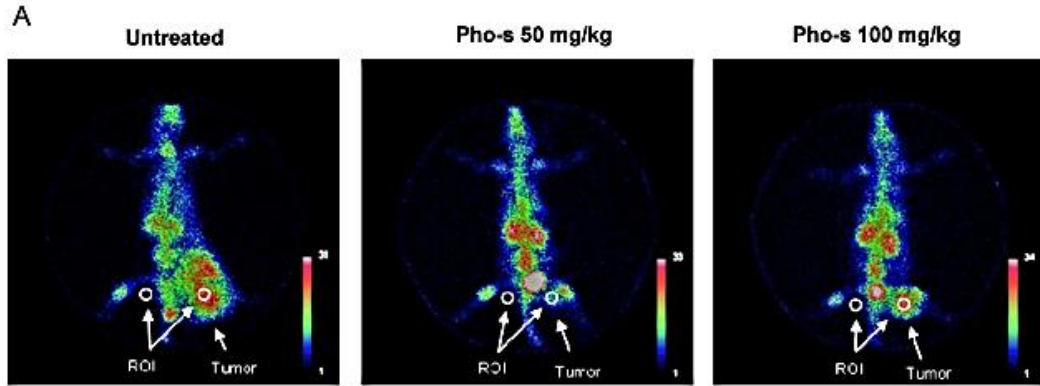
Adilson Kleber Ferreira <sup>a,b</sup>, Renato Meneguelo <sup>c</sup>, Fabio Luiz Navarro Marques <sup>d</sup>, Adriano Radin <sup>d</sup>, Otaviano Mendonça R. Filho <sup>e</sup>, Salvador Claro Neto <sup>c</sup>, Gilberto Orivaldo Chierice <sup>c</sup>, Durvanei Augusto Maria <sup>a,\*,b</sup>

# Aspecto da citotoxicidade em células de melanoma e a IC50%



A fosfoetanolamina redução a capacidade de proliferação celular





Keywords: phosphoethanolamine; acute promyelocytic leukaemia; malignant clone expansion

## Synthetic phosphoethanolamine has *in vitro* and *in vivo* anti-leukemia effects

A K Ferreira<sup>\*,1,2</sup>, B A A Santana-Lemos<sup>3</sup>, E M Rego<sup>3</sup>, O M R Filho<sup>4</sup>, G O Chierice<sup>5</sup> and D A Maria<sup>\*,1,2</sup>

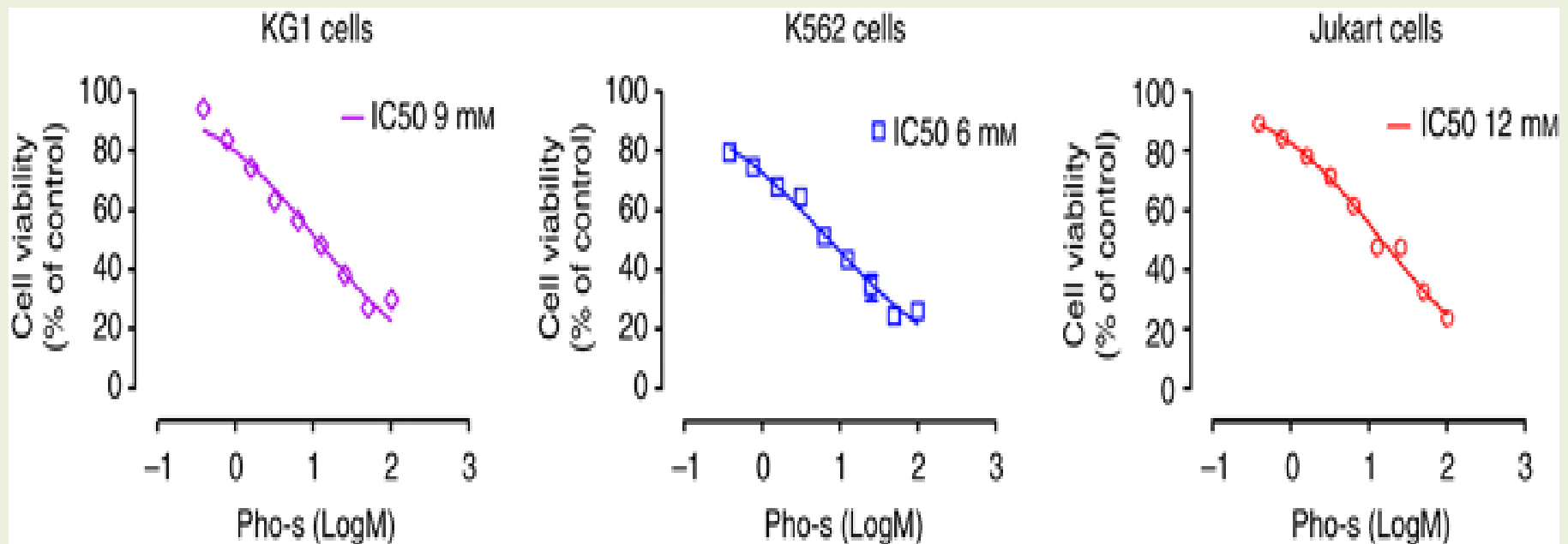
<sup>1</sup>Biochemistry and Biophysical Laboratory, Institute Butantan, São Paulo, Brazil; <sup>2</sup>Experimental Physiopathology, Faculty of Medicine, University of São Paulo, São Paulo, Brazil; <sup>3</sup>Hematology Division, Department of Internal Medicine, Medical School of Ribeirão Preto, University of São Paulo, São Paulo, Brazil; <sup>4</sup>University of Uberaba, Minas Gerais, Brazil and <sup>5</sup>Department of Chemistry and Polymers Technology, University of São Paulo, São Carlos, Brazil



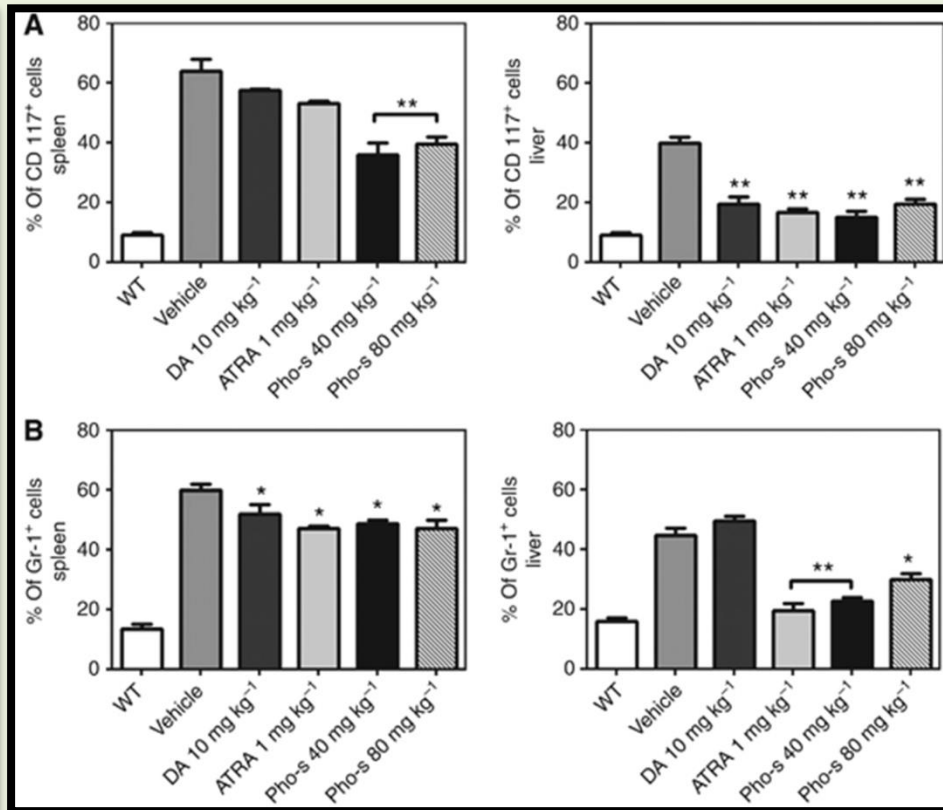
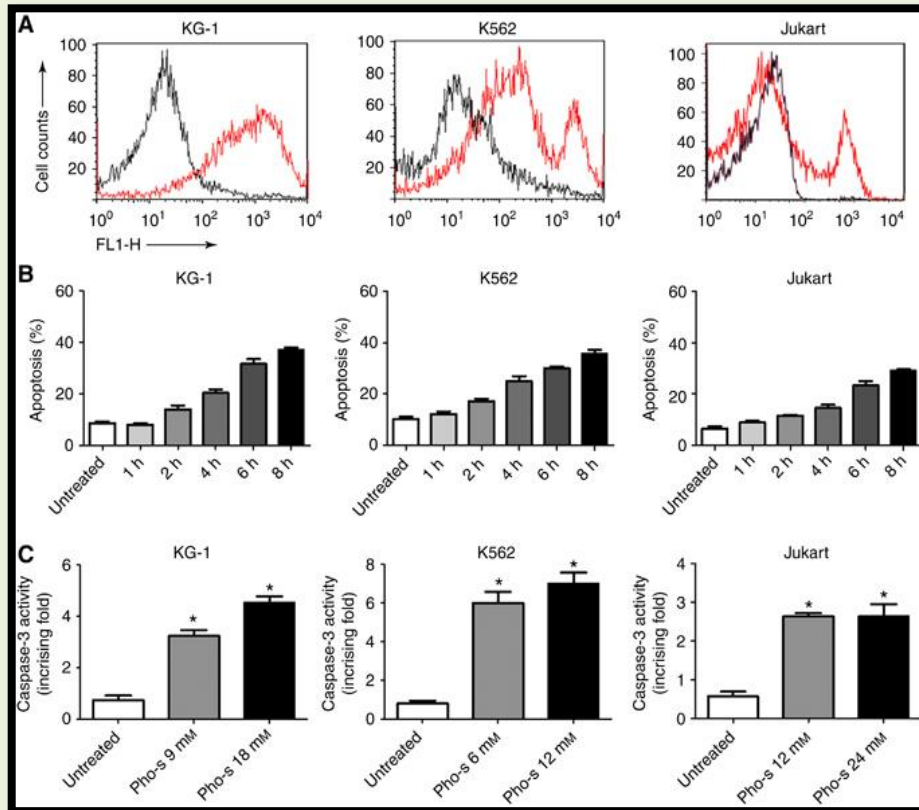
## Células de Leucemia HUMANA

KG-1 (human myeloid), K562 (human erythromyeloblastoid leukaemia and Jurkat (human T-Cell leukaema.

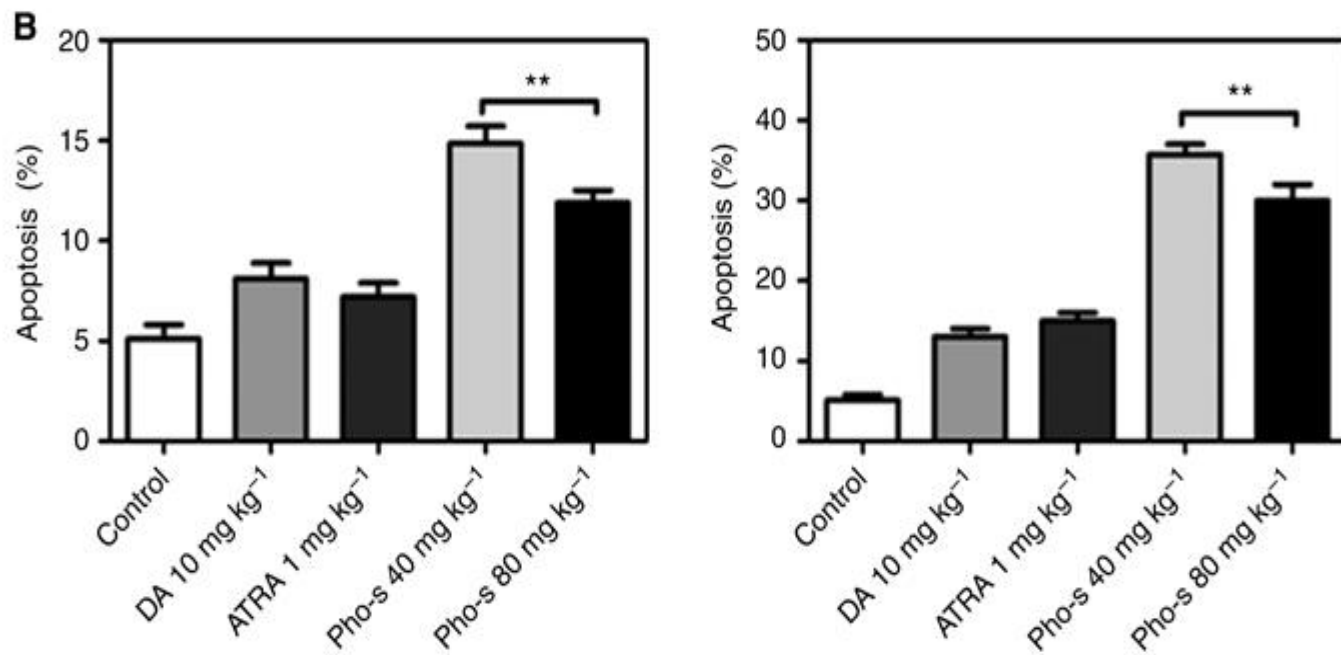
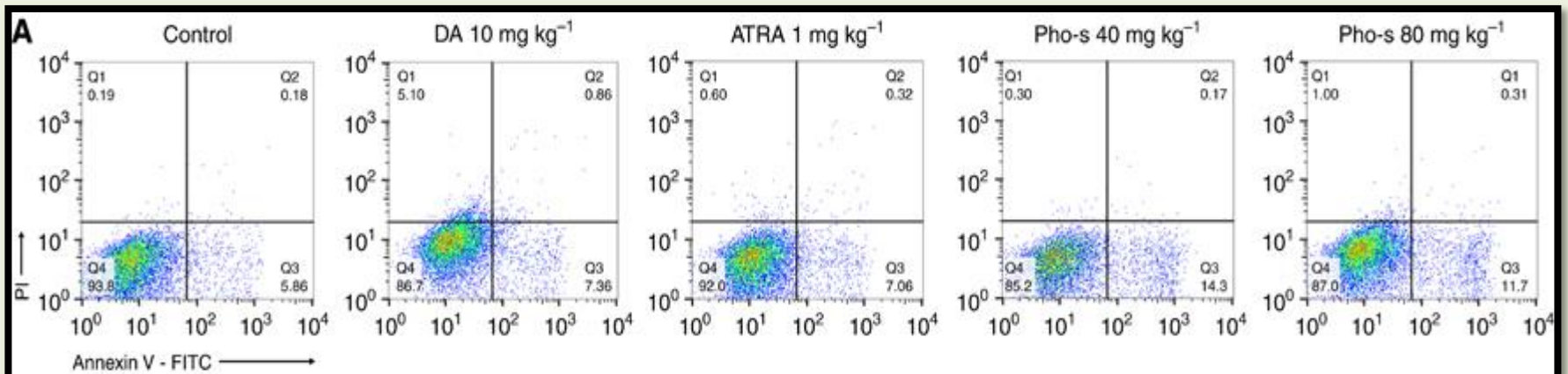
Fonte: American Type Culture Collection (ATCC, Manassas, VA, USA).



IC50% em leucemias



Indução de morte celular do tipo apoptose em leucemias mediadas pela mitocondria, comparação com os quimioterápicos





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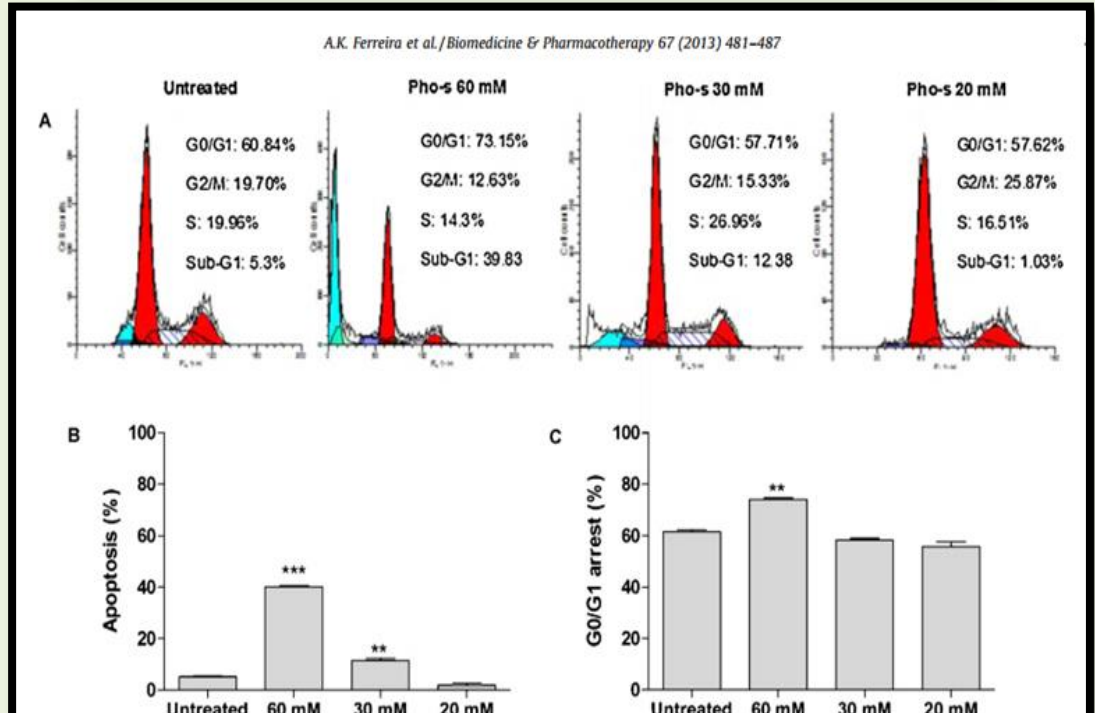
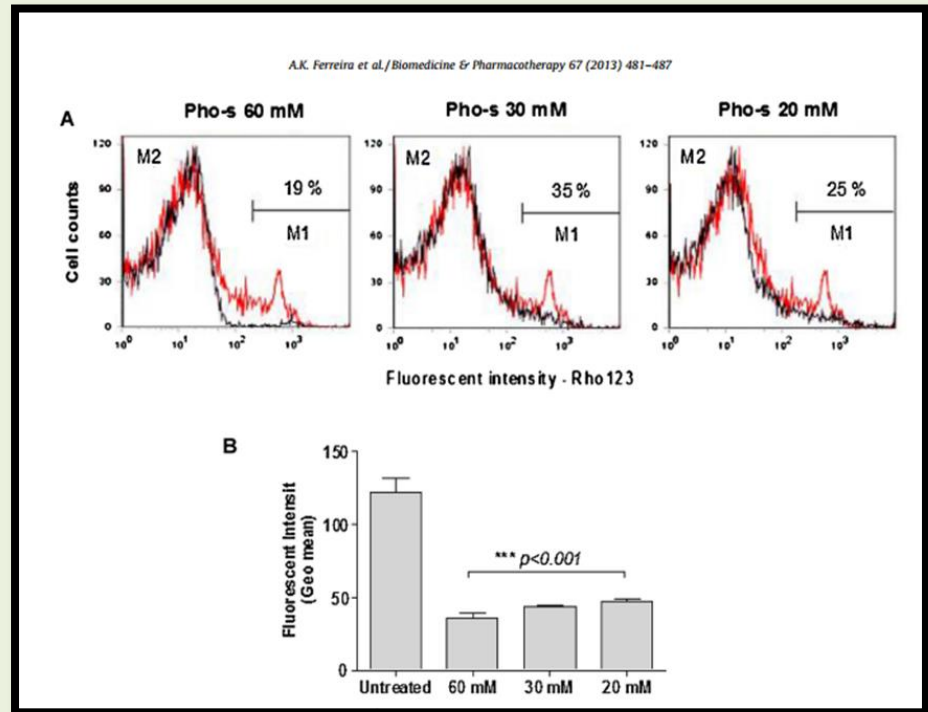
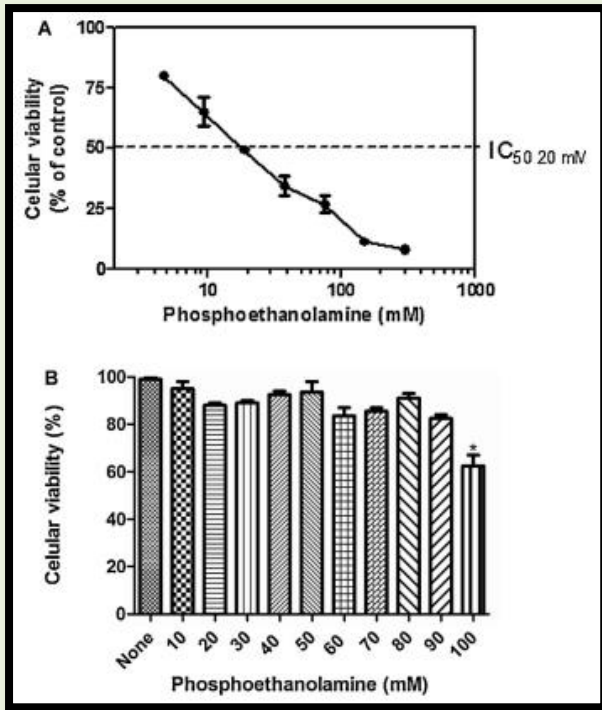
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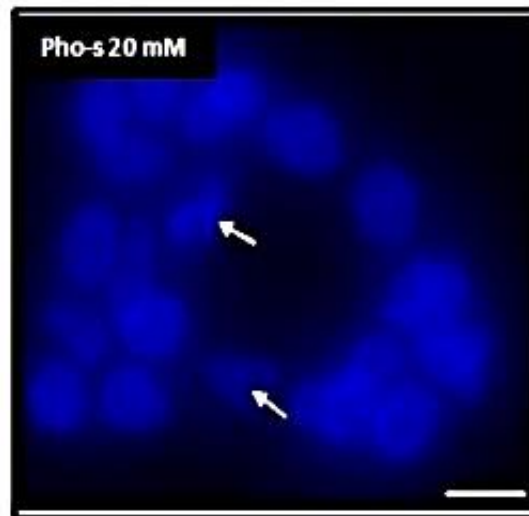
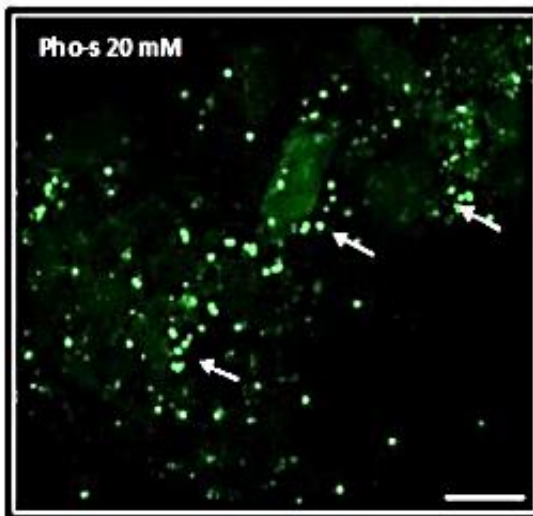
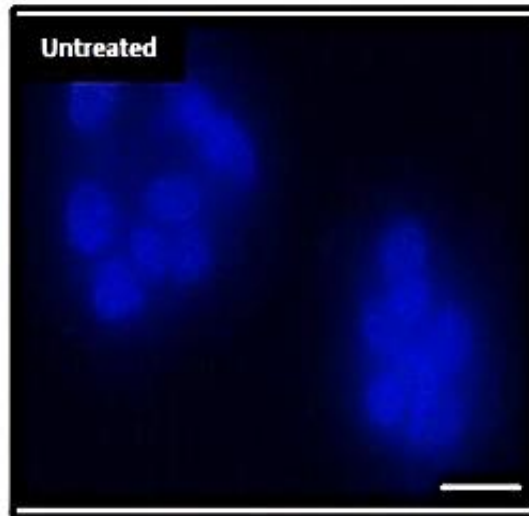
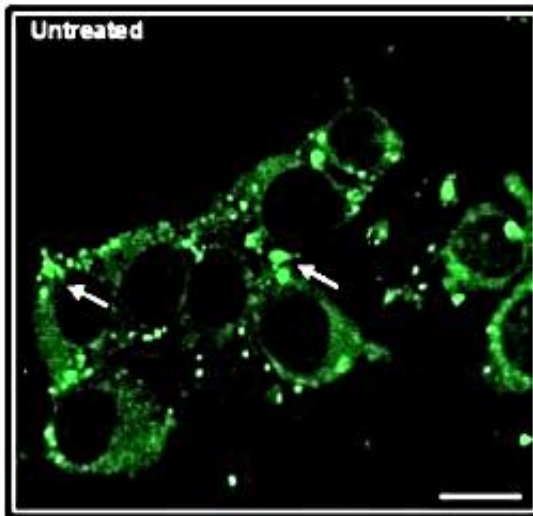
## Synthetic phosphoethanolamine induces cell cycle arrest and apoptosis in human breast cancer MCF-7 cells through the mitochondrial pathway

Adilson Kleber Ferreira<sup>a,b</sup>, Renato Meneguelo<sup>c</sup>, Alexandre Pereira<sup>d</sup>, Otaviano Mendonça R. Filho<sup>e</sup>, Gilberto Orivaldo Chierice<sup>c</sup>, Durvanei Augusto Maria<sup>a,b,\*</sup>



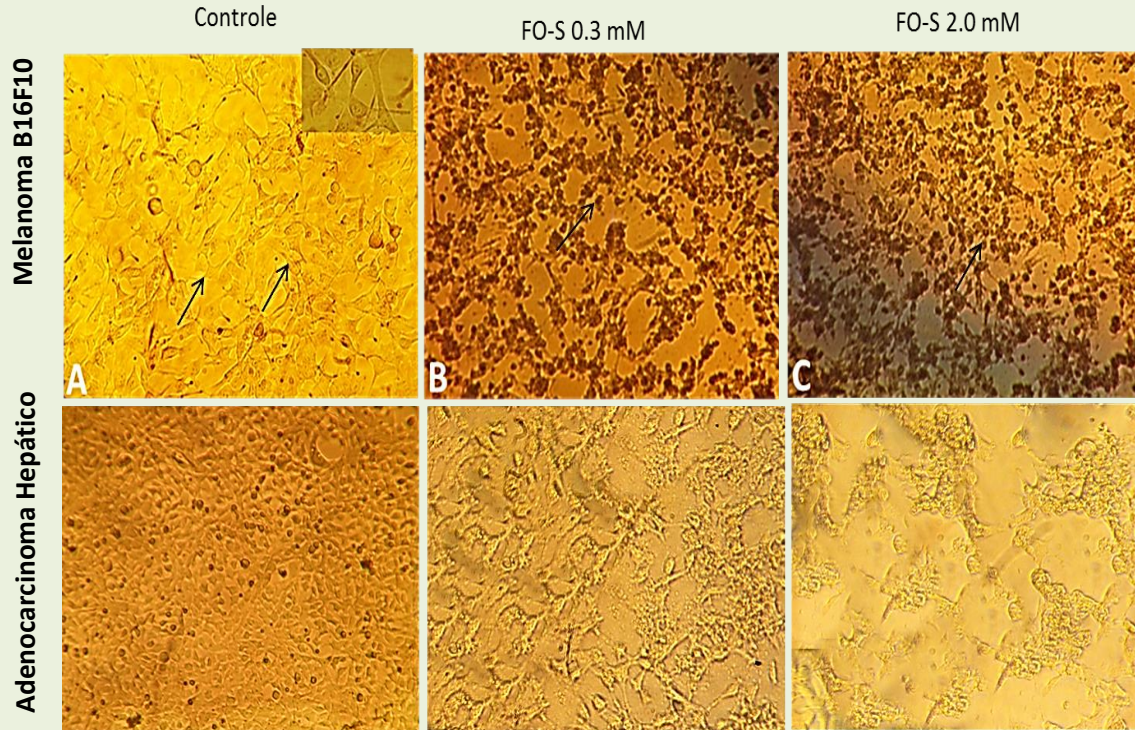
# Mitocôndria e Fragmentação do núcleo da célula

*A.K. Ferreira et al. / Biomedicine & Pharmacotherapy 67 (2013) 481–487*





# ESTUDO DA CITOTOXICIDADE DA FORMULAÇÃO LIPOSSOMAL DODAC/FOSFOETANOLAMINA SINTÉTICA EM LINHAGENS DE CÉLULAS TUMORAIS



**ARTHUR CÁSSIO DE LIMA LUNA**  
BOLSISTA FAPESP 13/05251-1 E 15/02950-1  
DOUTORANDO DO PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS MÉDICAS DA FACULDADE DE MEDICINA DA USP

LUNA, A. C. L. ; D AGOSTINO, L. G ; SARAIVA, G. K. V. ; CLARO NETO, S. ; CUCCOVIA, I. M ; MARIA, D. A.

The new potential pharmacological of liposomal formulation in tumors.

In: A. Méndez-Vilas. (Org.). Microscopy: advances in scientific research and education. 1ed.Espanha: Formatex, 2014, v. 1, p. 348-355.

LUNA, A. C. L. ; SARAIVA, G. K. V. ; R. FILHO, O. M. ; CHIERICE, G. O. ; CLARO NETO, S. ; CUCCOVIA, I. M ; MARIA, D. A.

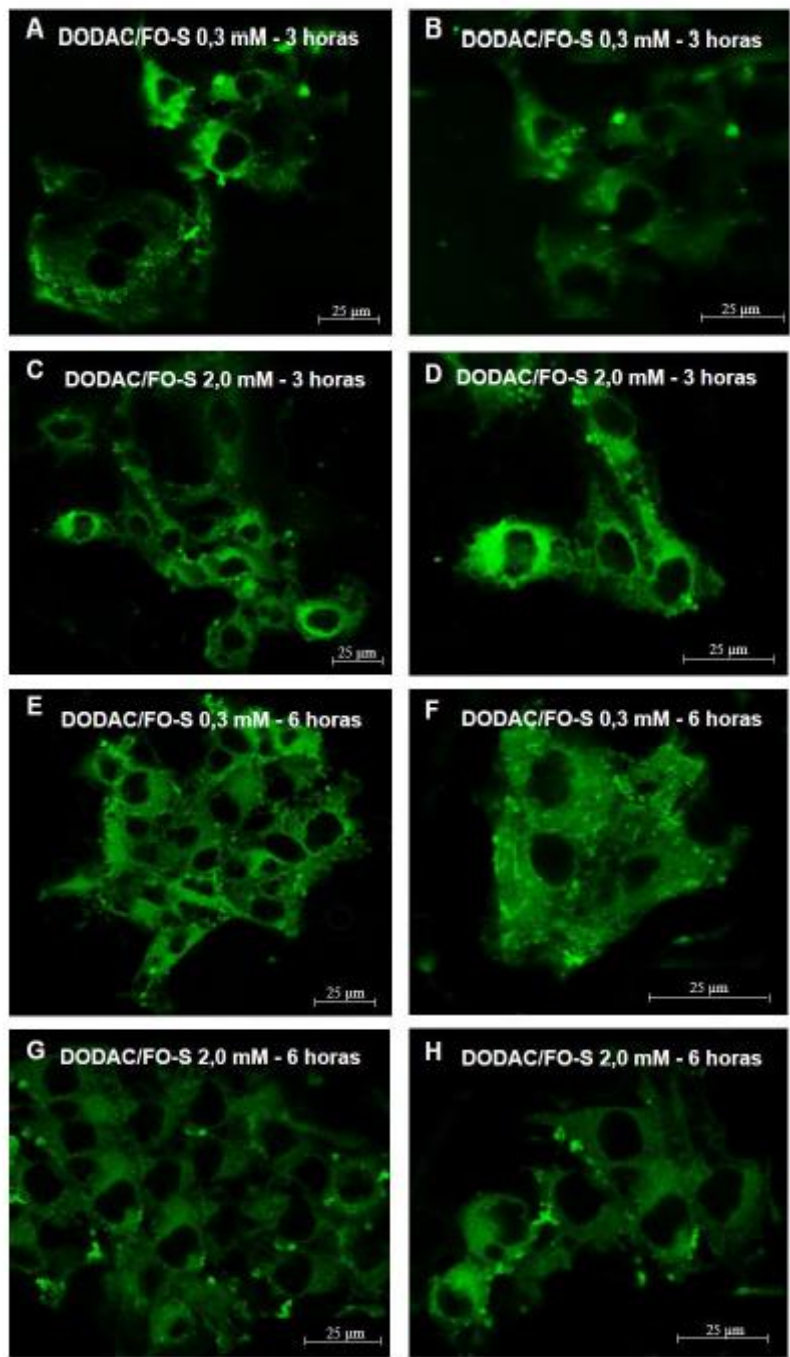
Potential antitumor activity of novel DODAC/PHO-S liposomes. International Journal of Nanomedicine (Print), 2015.

Prêmio

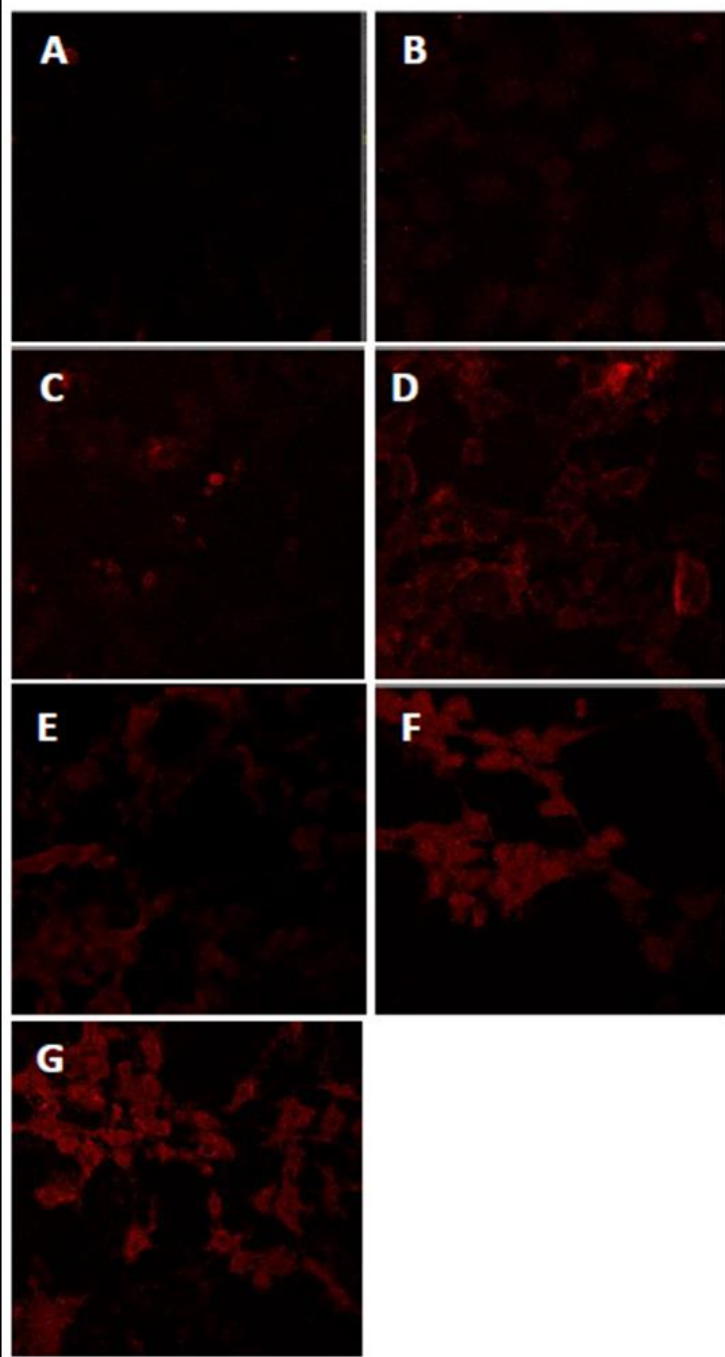
Menção Honrosa pelo trabalho Potencial Antitumoral da nova formulação lipossomal DODAC/FO-S

Federação de Sociedades de Biologia Experimental – FeSBE/2015

## Biodistribuição lipossomas e mitocôndrias

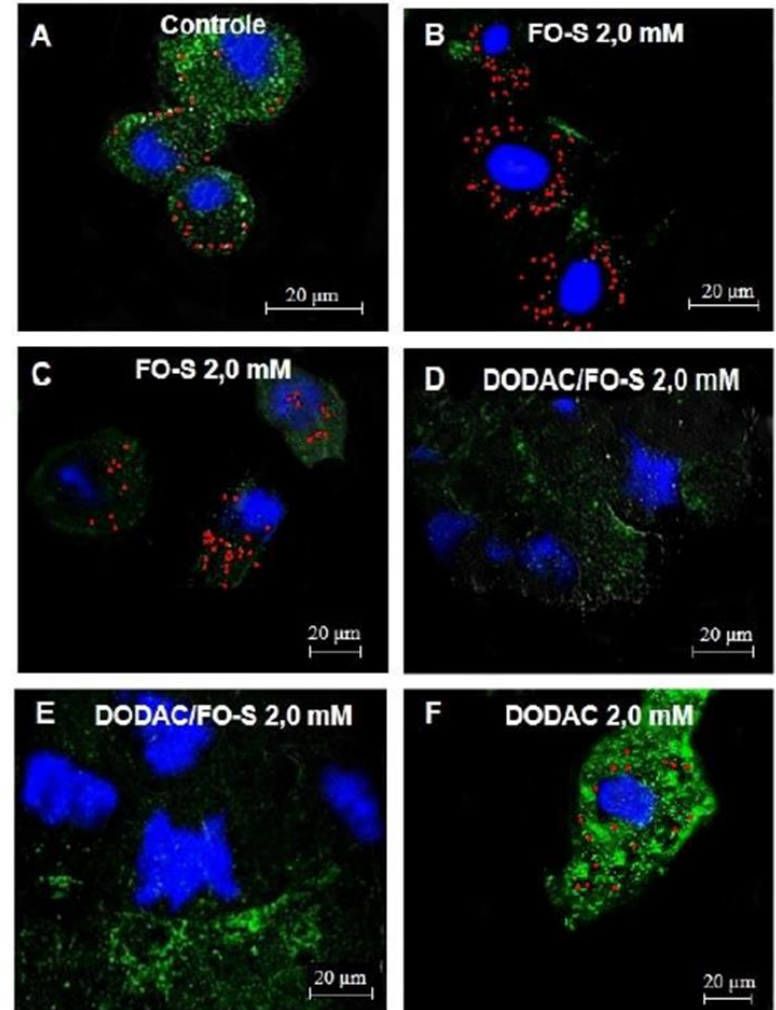
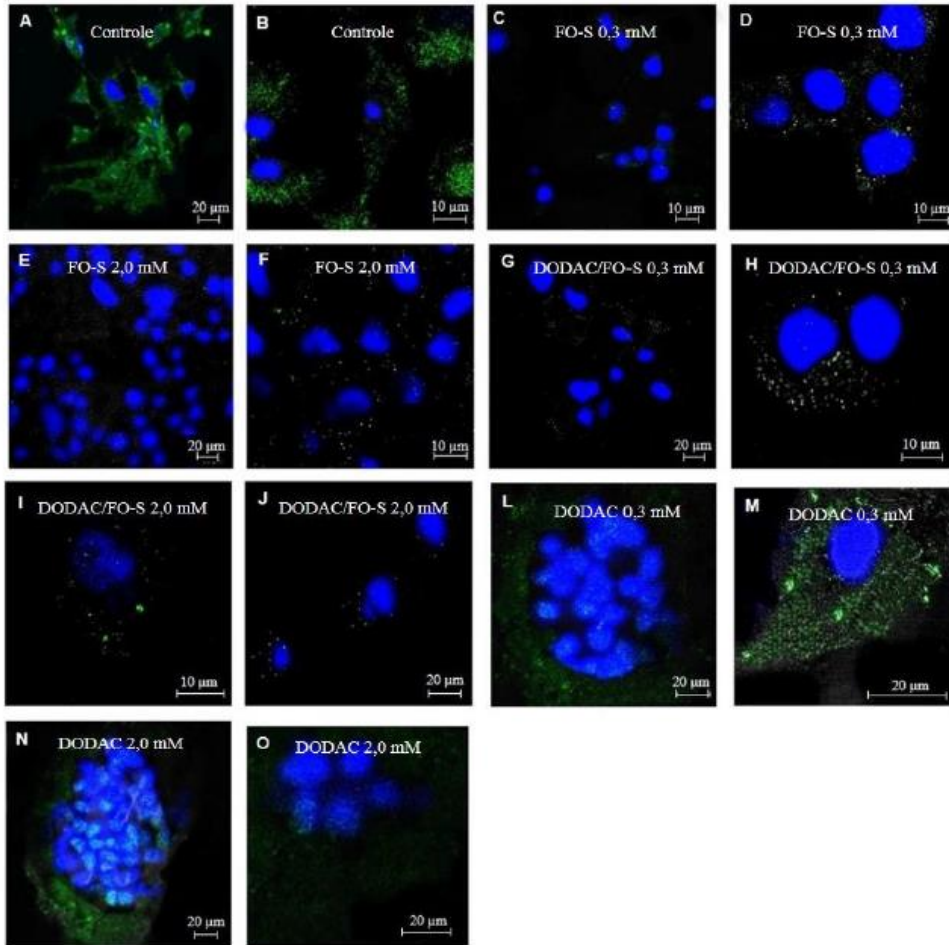


## Ativação da caspase -3 - Morte celular por Apoptose

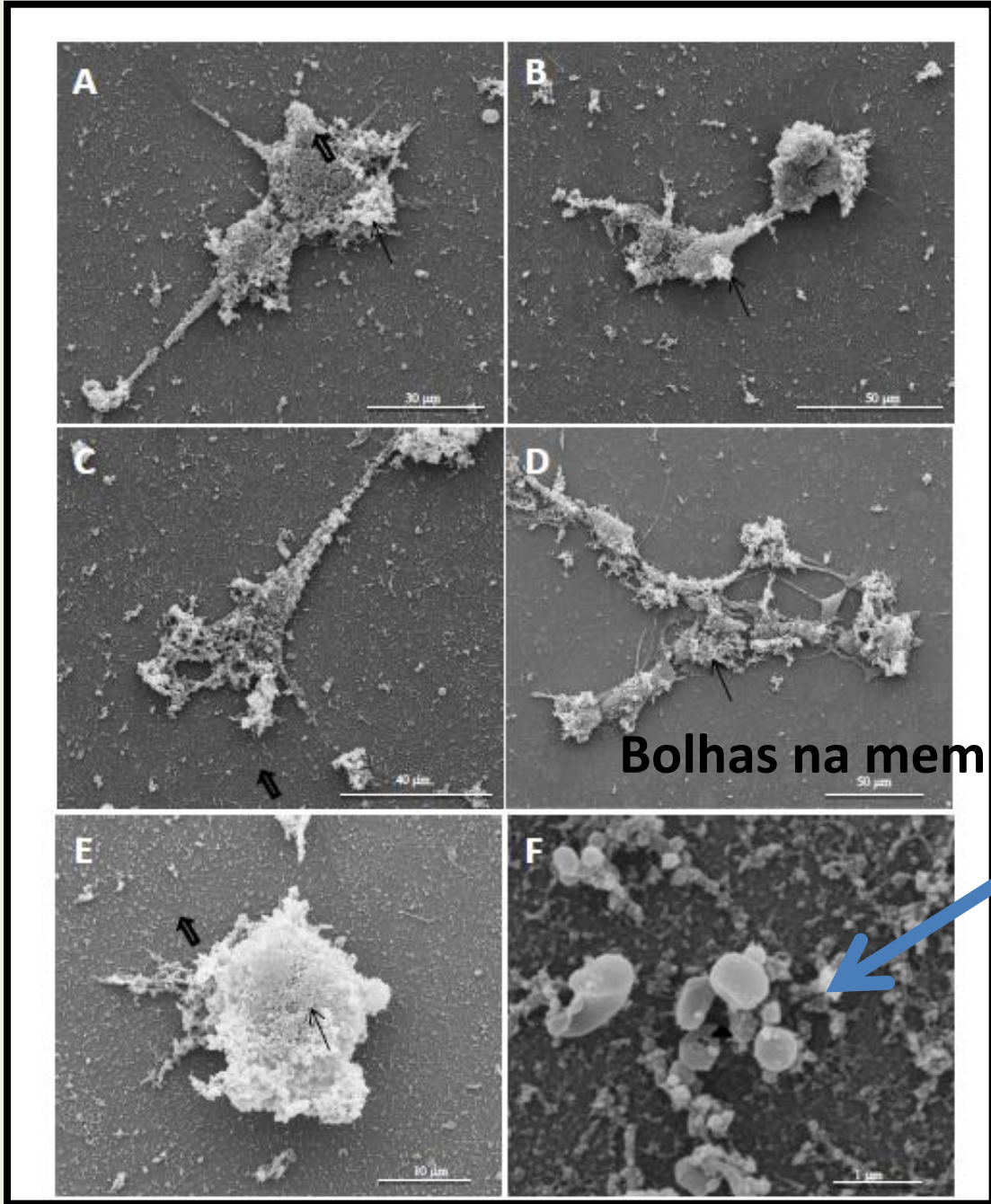




# Ativação das mitocôndrias, núcleos fragmentados e digestão por lisossomos



Ultraestrutura - Fosfoetanolamina na superfície em Melanoma



Bolhas na membrana celular

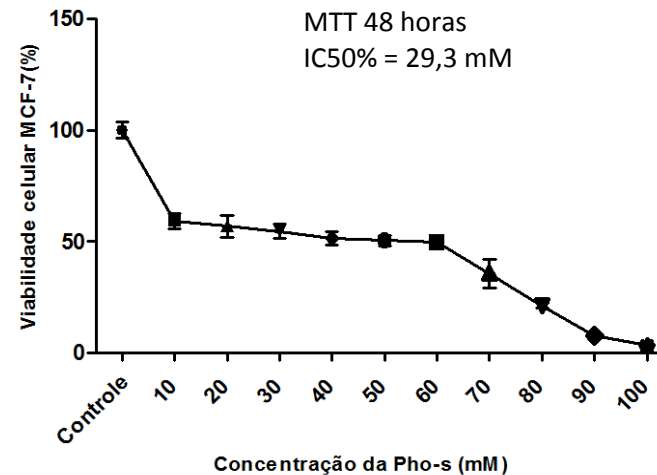
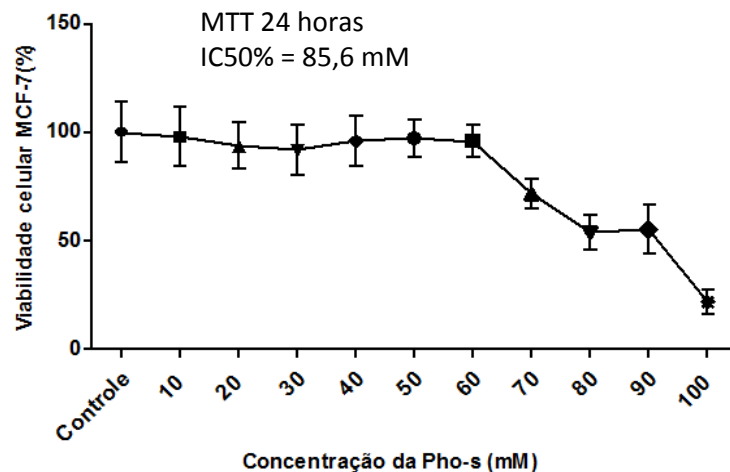
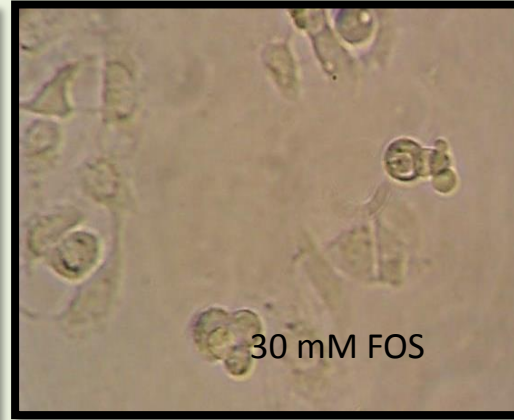
# AVALIAÇÃO ANTITUMORAL DA FORMULAÇÃO LIPOSSOMAL DODAC COM O COMPOSTO FOSFOETANOLAMINA SINTÉTICA EM CÉLULAS TUMORAIS DE MAMA HUMANA



Manuela Garcia Laveli da Silva

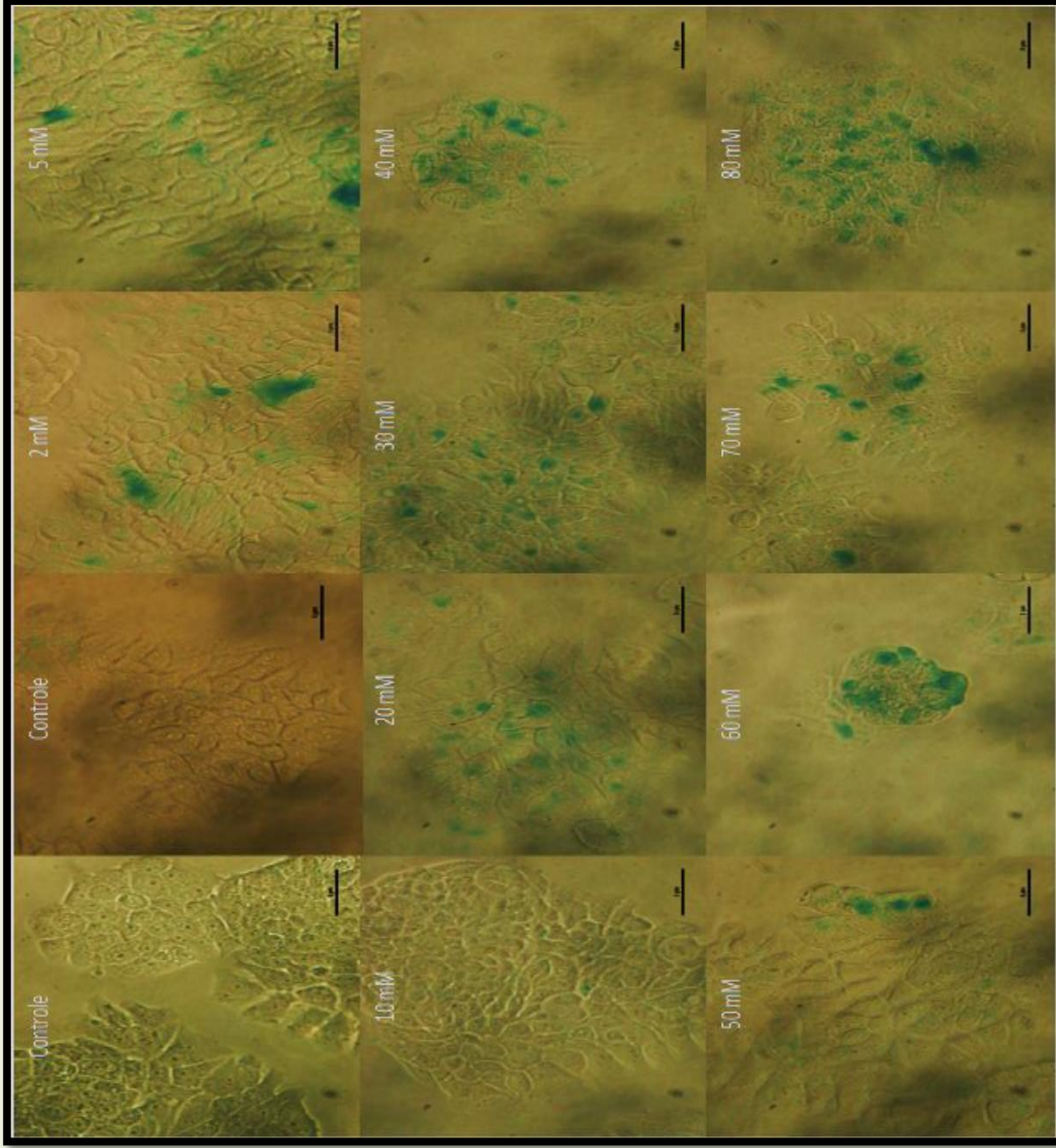
FAPESP : 2014/02344-1. Nº USP 8647524

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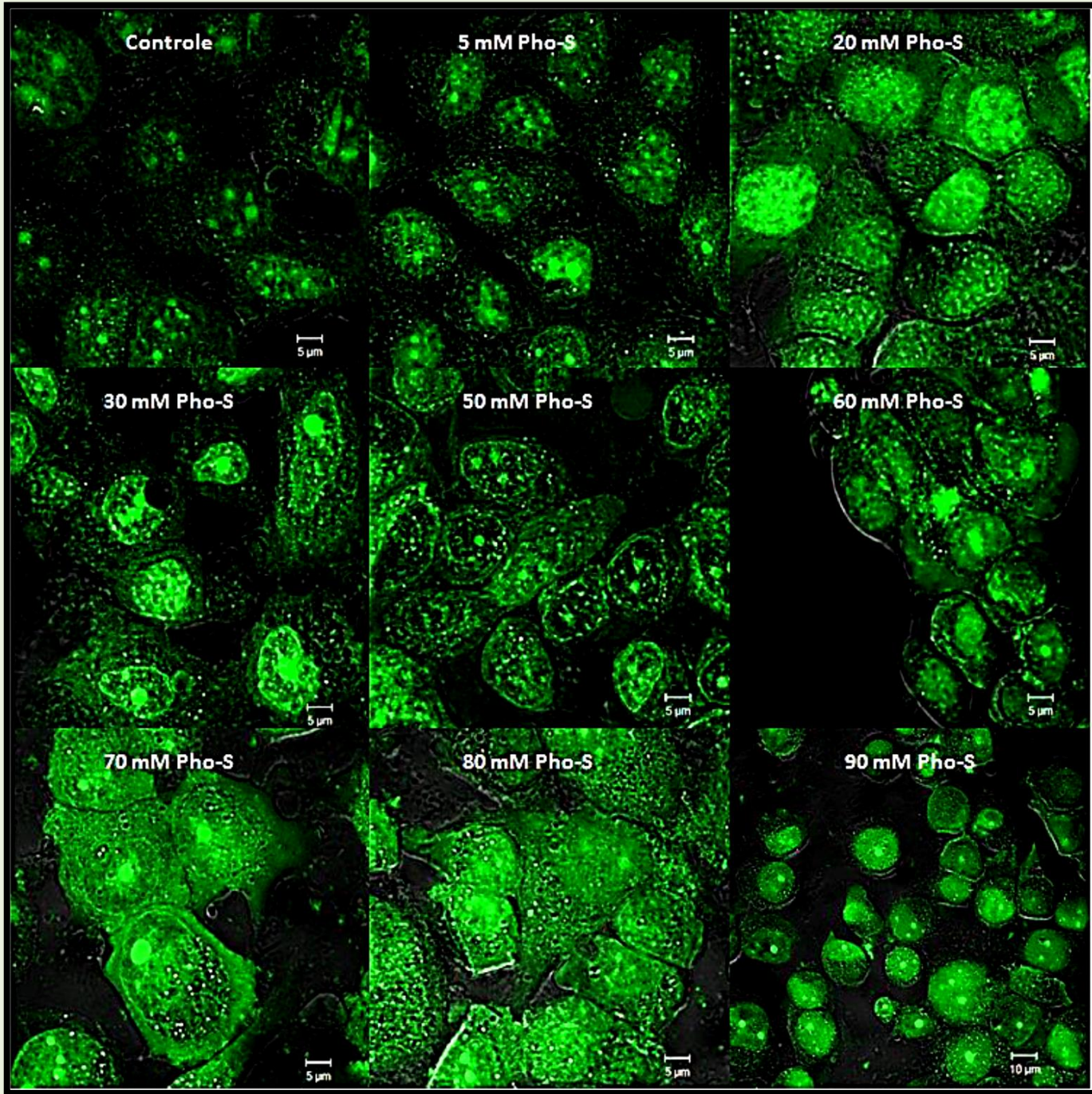
## Senescência em carcinoma de mama



**A fosfofetanolamina inibe a proliferação das células tumorais de mama humana**

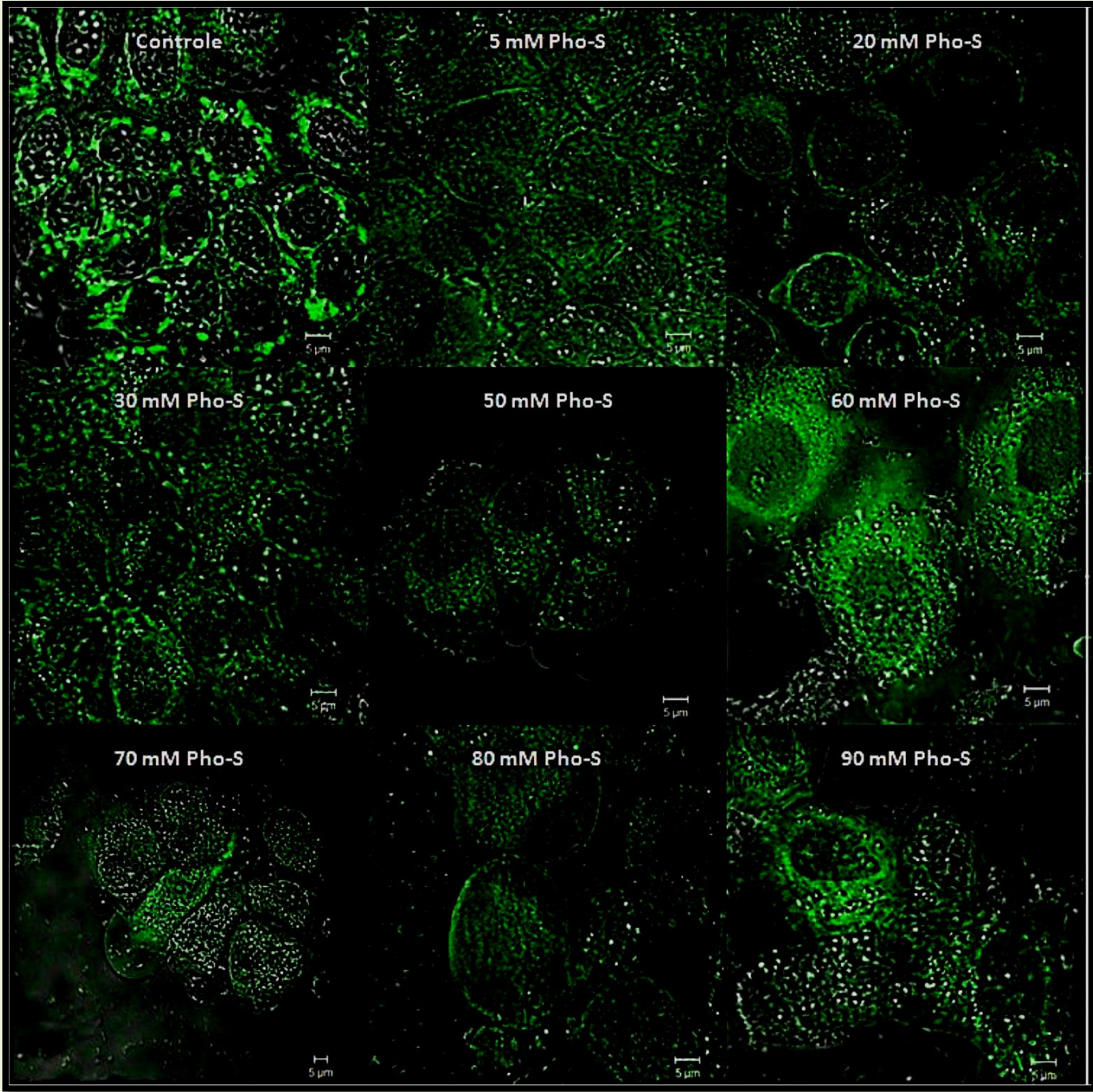


# Distribuição dos lisossomos em carcinoma de mama

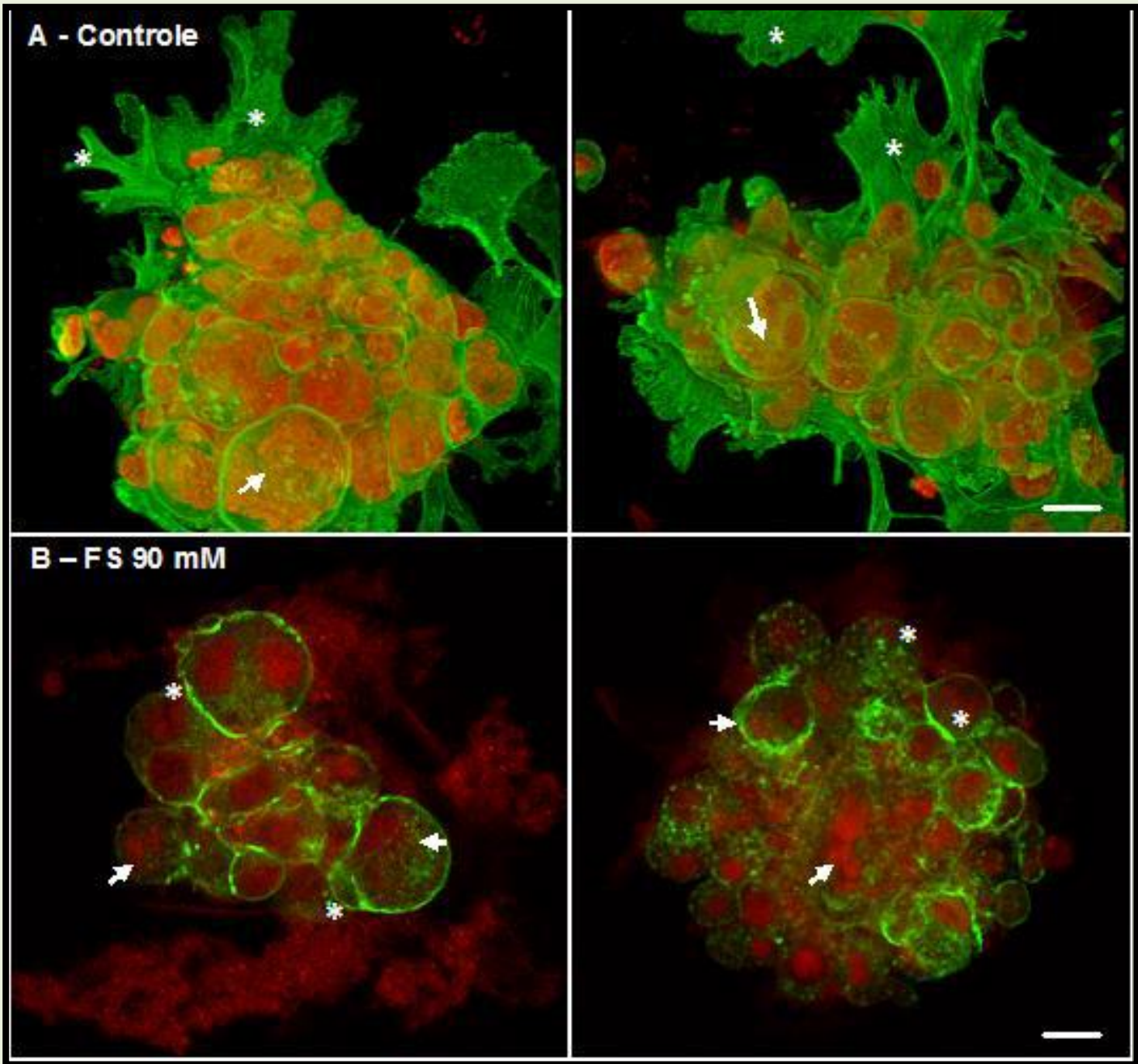




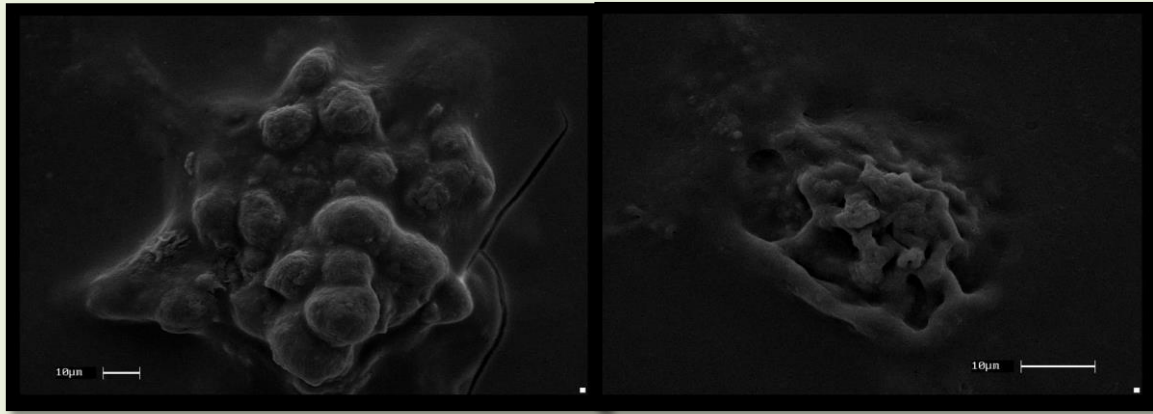
# Distribuição das mitocôndrias em carcinoma de mama



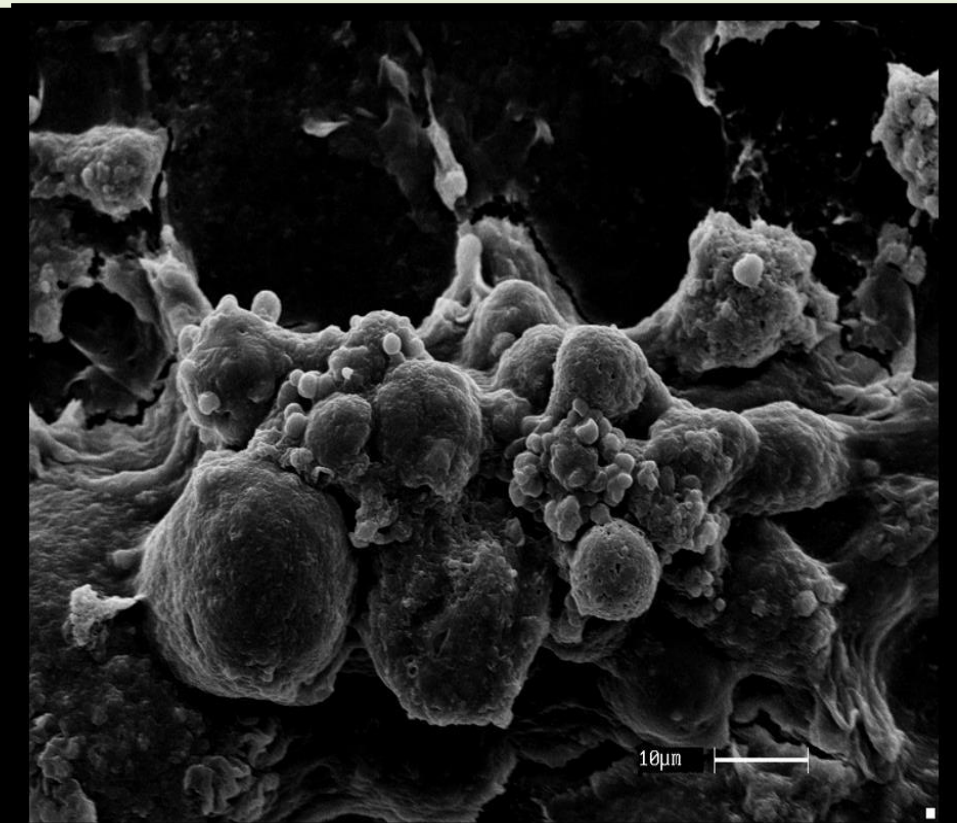
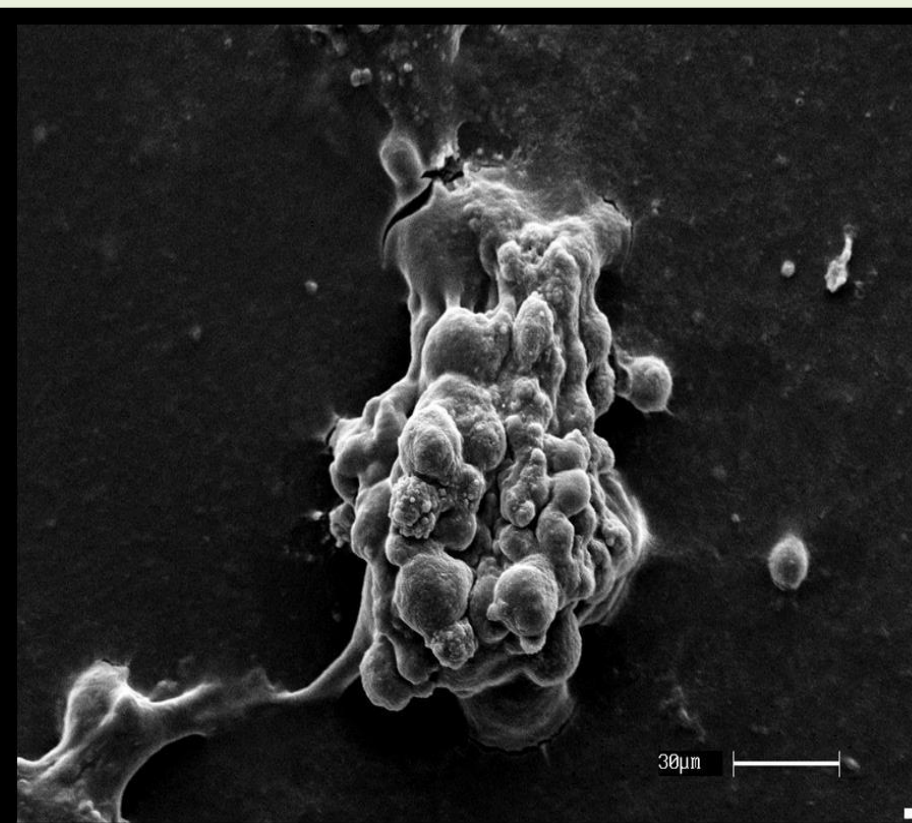
# CARCINOMA DE CÉLULAS RENAIS



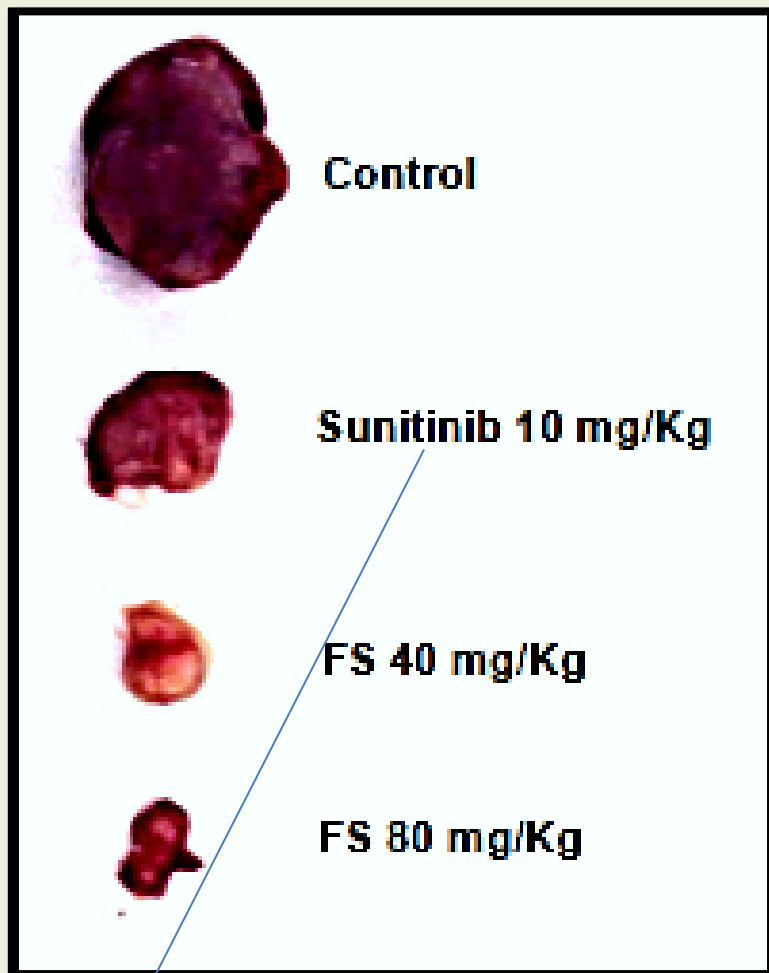




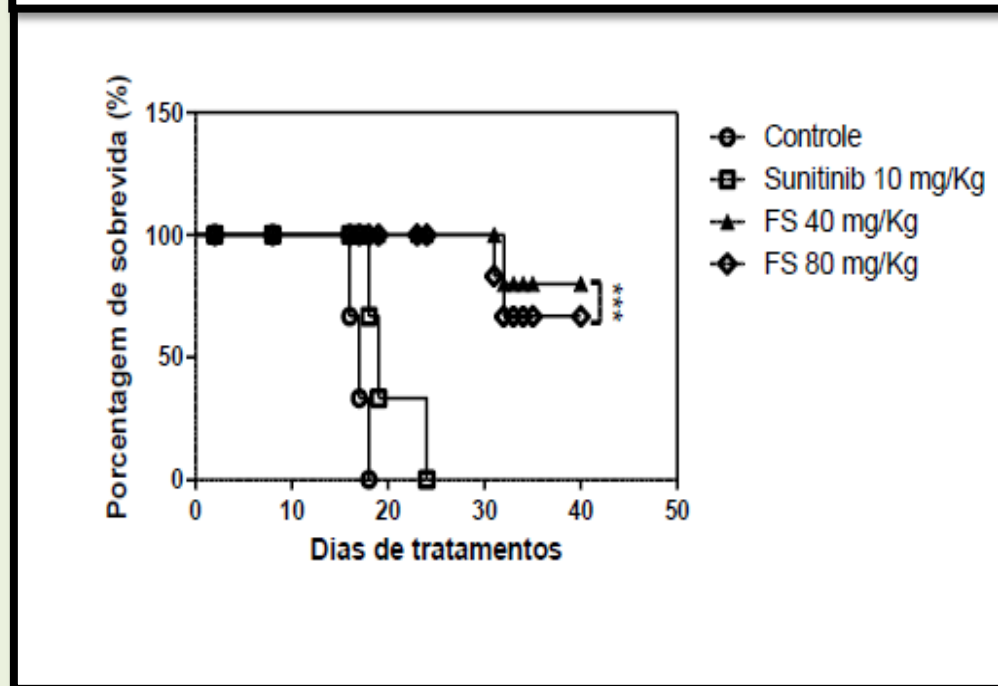
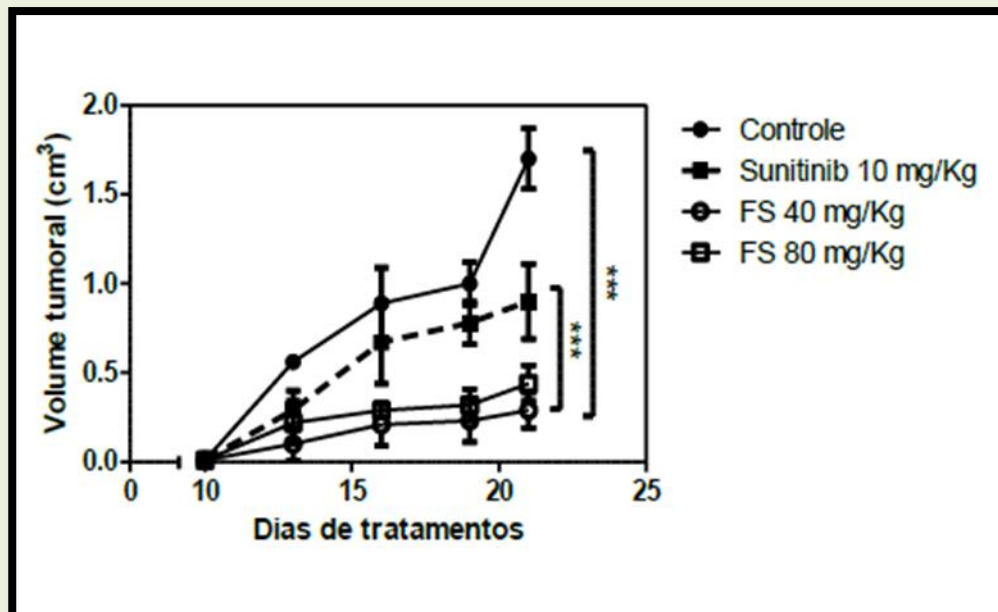
**Apoptose e bolhas da  
membrana celular**



# Redução do tumor renal



quimioterápico

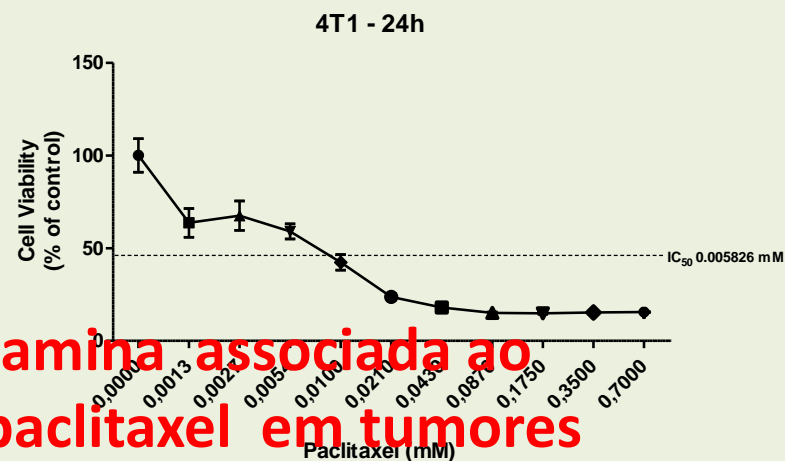
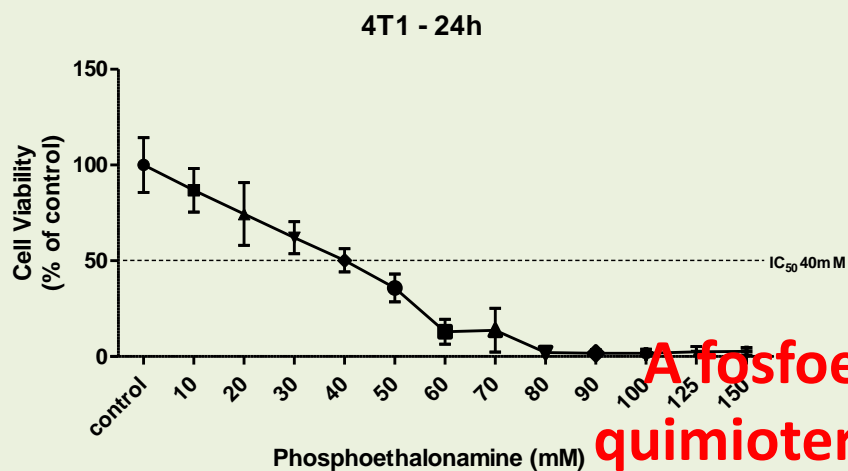


# O PAPEL PRÓ-APOPTÓTICO DA FOSFOETANOLAMINA SINTÉTICA NA FORMULAÇÃO LIPOSSOMAL DODAC EM TUMORES EXPERIMENTAIS DE CANCER DE MAMA.

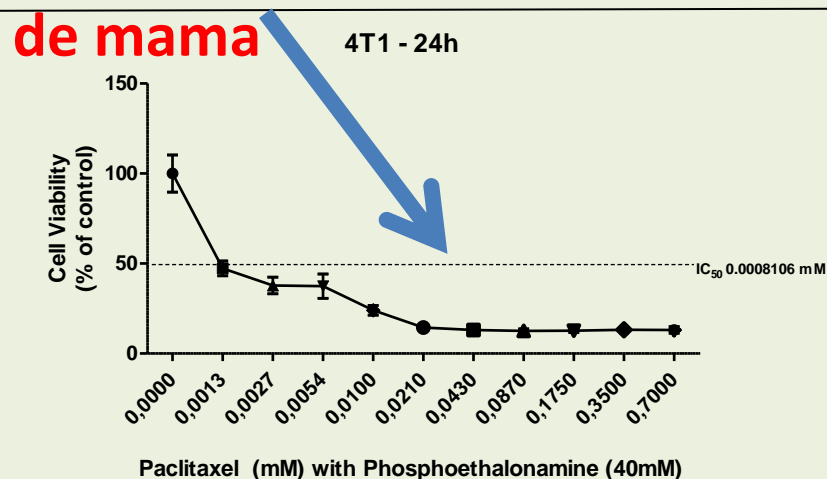
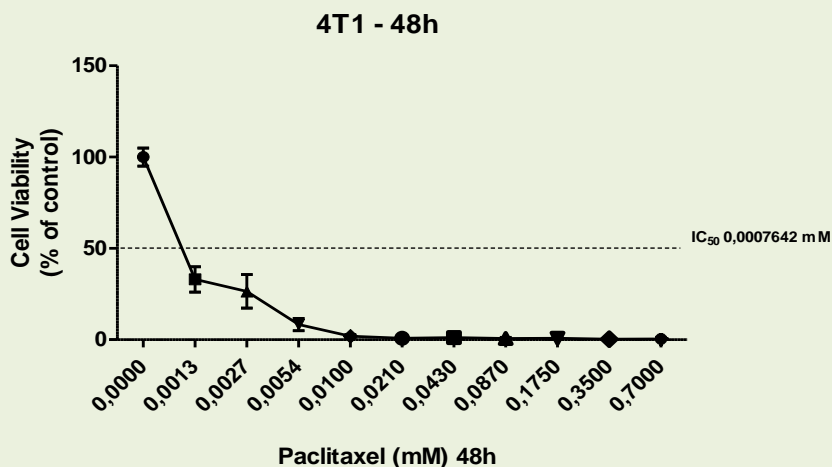


Antenor Pereira Bonfim Neto Bolsista CAPES USP: 7919150  
Programa de Pós Graduação: Ciências Médicas FMUSP

<http://lattes.cnpq.br/0117753573693450>



**A fosfoetanolamina associada ao quimioteráico paclitaxel em tumores de mama**





- **A fosfoetanolamina induz citotoxicidade em tumores da cavidade oral**

# Avaliação dos efeitos antiproliferativos e de apoptose da formulação lipossomal dodac associado à fosfoetanolamina sintética em células de carcinoma espinocelular de cavidade oral

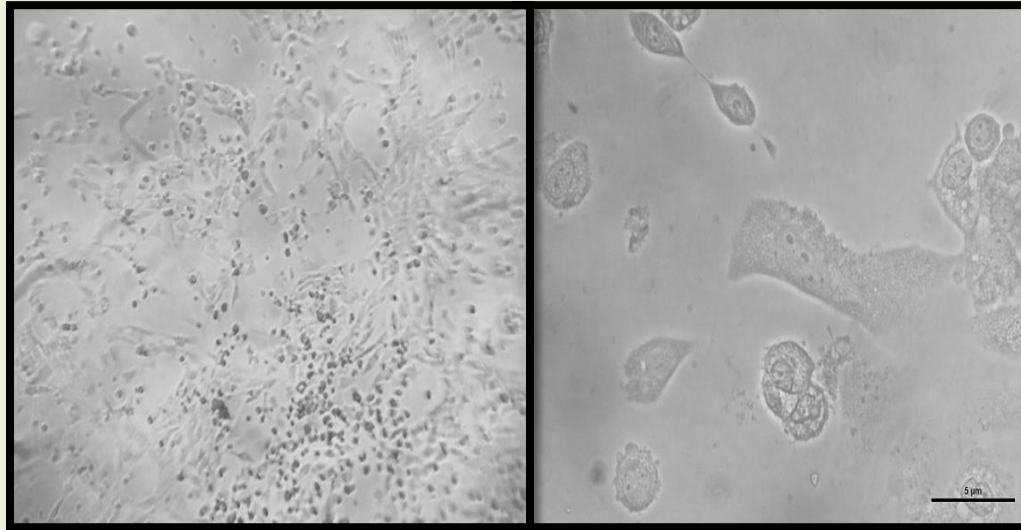


Larissa Kim Higashi de Carvalho

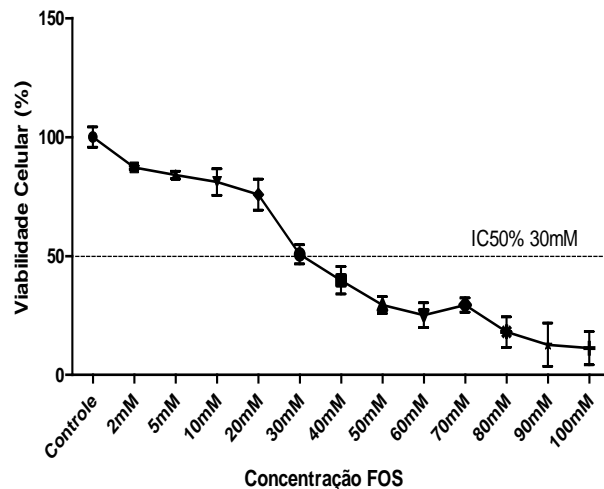
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Nº USP: 9069876

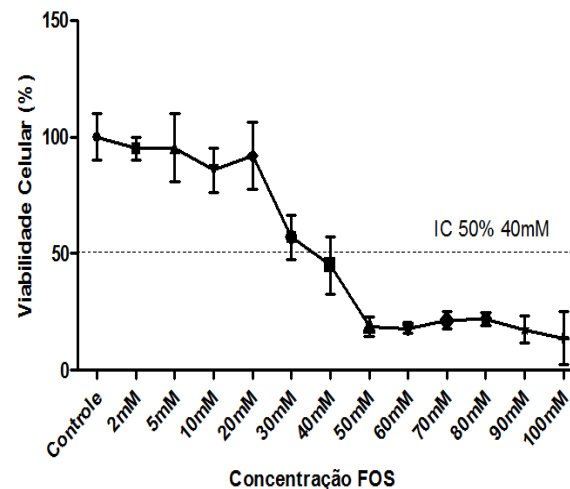
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SCC 25 48h



SCC 9 48h



- **Toxicidade aguda em dose única**
- **Sem efeitos colaterais**
- **Não ocorreu inibição da maturação das células hematopoiética (sangue) na medula óssea e no baço**

# ESTUDOS DA TOXICIDADE AGUDA DA FOSFOETANOLAMINA SINTÉTICA SOBRE A MEDULA ÓSSEA DE CAMUNDONGOS



Aline Vieira Pinheiro de Araujo  
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