

# HOW DO CELLS RESPOND TO A TREATMENT (DRUG) OR A STRESS?



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## RESEARCH QUESTION

How do **breast** cancer cells respond to drug-induced stress and treatment, specifically **doxorubicin treatment**, and how does it affect cancer survival in the cell?

## HYPOTHESIS

**Null:** If cancer cells are put under cancer treatment, then there will be no change in the way the cells respond to the drug or treatment.

**Alternative:** If breast cancer cells are put under doxorubicin, a cancer treatment, then the cells would go through apoptosis and cell viability will decrease compared to untreated cells.

## METHODS

In a MTT Assay, we will use two 24 well plates and put a breast cancer cell of  $5 \times 10^4$  cells in each well, except four.

In 4 wells, they are left untreated serving as the negative control, 4 wells were used for each drug concentration of 1  $\mu\text{M}$ , 2  $\mu\text{M}$ , 4  $\mu\text{M}$ , and 8  $\mu\text{M}$ , and 4 wells without cells served as the blank control for Plate A and B.

Plate A will be incubated for 24 hours and Plate B will be incubated for 48 hours at  $37^\circ\text{C}$ .

MTT is a soluble powder reagent that is then added to the cells at 2 mg/mL and incubated for 4 hours at  $37^\circ\text{C}$ , which will result in the formation of purple formazan, insoluble crystals.

The MTT solution will be aspirated and 200  $\mu\text{l}$  of DMSO will be added to each well to dissolve the formazan crystals until they are solubilized.

Then, we compare the cell viability between the various concentrations of doxorubicin after 24 hours and 48 hours of incubation, by measuring it at 570 nm using a microplate reader. Having a lower absorbance value and less crystals formed means fewer metabolically active cells, which represents a lower percentage of viability in the cells. This is calculated by subtracting the mean blank optical density from all wells which results in the percent viability of the breast cancer cells.

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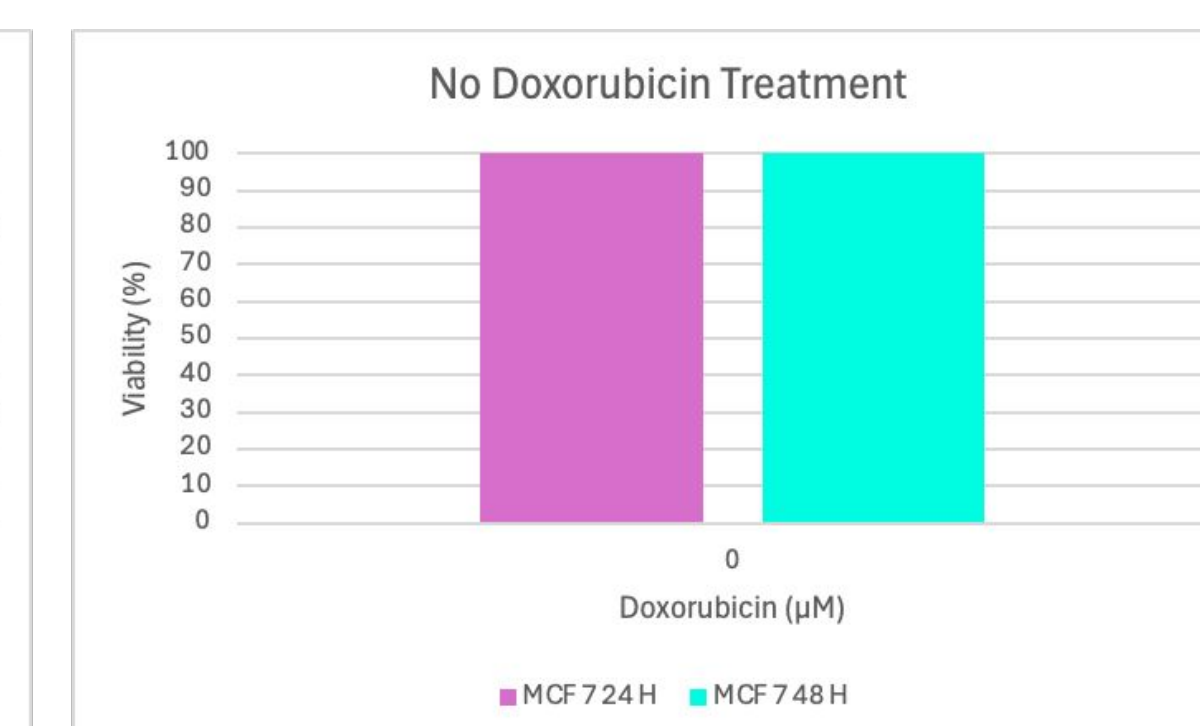
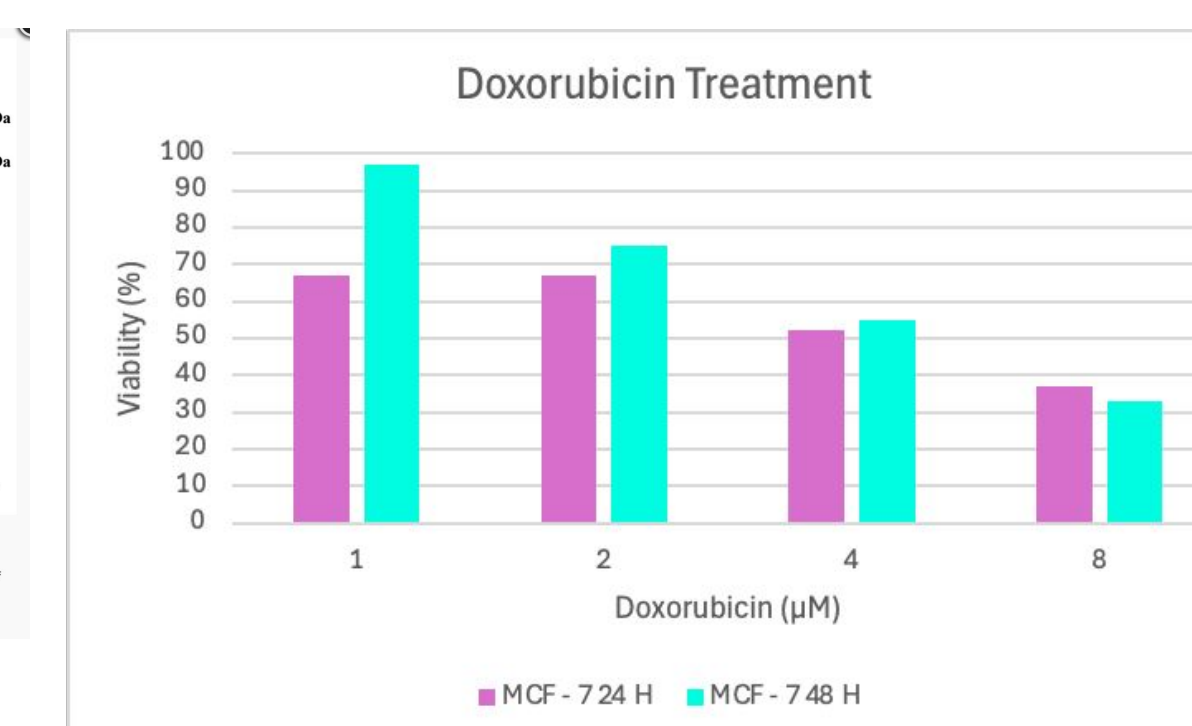
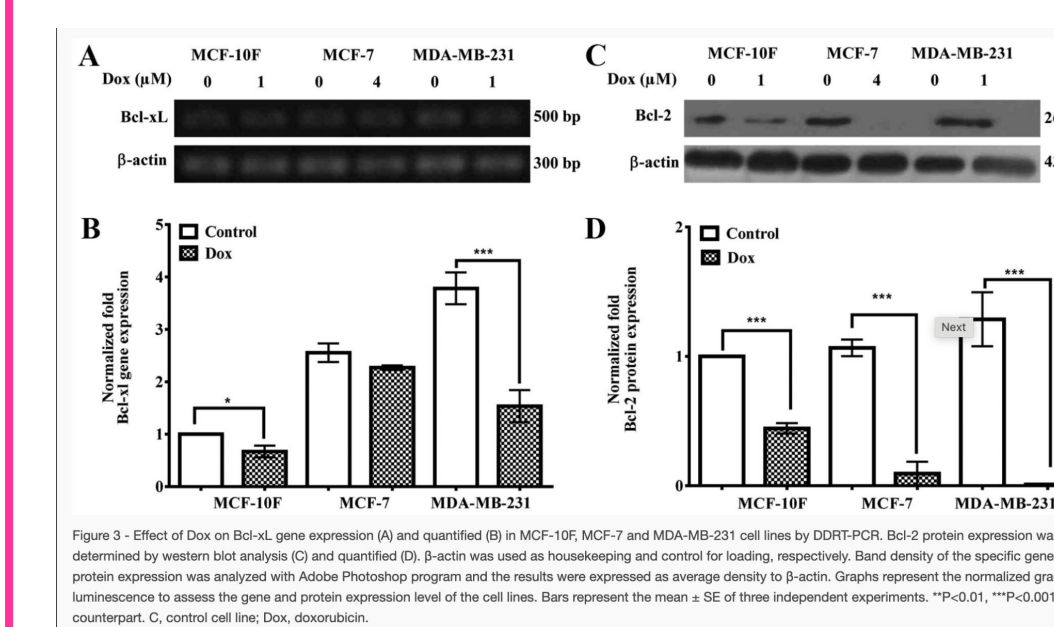
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## BACKGROUND

Breast cancer is one of the most common forms of cancer, with almost 32% of women being diagnosed with breast cancer last year. Cancer cells, specifically breast cancer cells, typically undergo apoptosis when faced with cancer treatments because they interfere with cell division. Apoptosis occurs when a cell self destructs due to a problem with one of more of the steps in cell division. In our experiment, we are looking at how doxorubicin treatment affects the cell viability of breast cancer cells.

Breast cancer cells have cell lines which are targeted by the doxorubicin treatment, allowing the drug to cause apoptosis in the cells. In addition, the drug can cause damage in the cancer cells by increasing reactive oxygen species in the cells, damaging the cells' protein and DNA structure necessary for further cell division.

## EXPECTED OUTCOMES



**Outcome 1: Breast Cancer cells will have a lower viability overtime with the treatment of Doxorubicin**  
One possible reason why breast cancer cells have a lower viability is because it reduces Bcl-2 protein within the cell and that protein prevents cells from undergoing apoptosis.

**Outcome 2: Breast cancer cells are 100% viable without the treatment of Doxorubicin**  
One possible reason why breast cancer cells are 100% viable without the treatment is because there is no reduction in Bcl-2 protein, which prevents cancer cells from undergoing apoptosis.

## FUTURE DIRECTIONS

In the future, we can look into the effects other drugs such as paclitaxel, cisplatin, tamoxifen, etc have on breast cancer cell viability. We can also use different concentrations and exposure times like added lower/higher dosage to the wells and shorter/longer treatment periods. We can compare different types of breast cancer cells to show how doxorubicin affects different cancer subtypes.

## AUTHOR'S CONTRIBUTIONS

**Ineza Marekani:** Research Question, Hypothesis, Background

**Megan Nhan:** Research Question, Hypothesis. Possible Outcomes

**Kasey Wong:** Research Question, Hypothesis, Methods

**Cristal Cisneros:** Research Question, Hypothesis, Future Directions