CHEMOTHERAPEUTIC CYTOTOXICITY IN 2D VS 3D HEAD AND NECK CANCER MODELS

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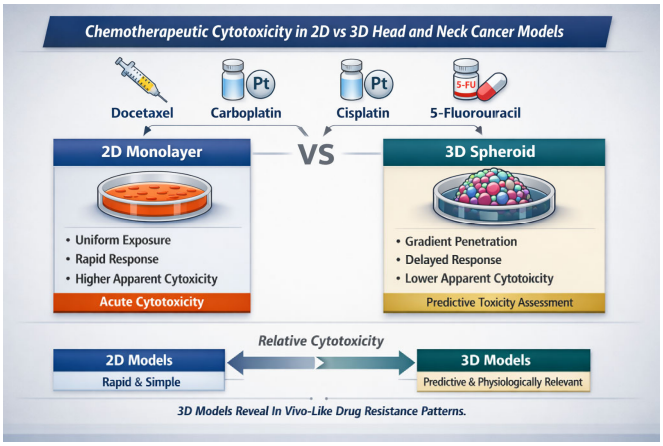
INTRODUCTION

Head and neck cancers are the sixth most common cancers worldwide. Although these sites are easily accessible, the disease is generally diagnosed at advanced stages (III, IV). Standard clinical practice involves a combination of radiotherapy and chemotherapy using the following agents: docetaxel, carboplatin or cisplatin, and 5-fluorouracil (5-FU). The aim of this study was to examine the antitumour effects of these chemotherapeutic agents on head and neck squamous cell carcinoma (HNSCC) cell lines using two cell models: a classic 2D monolayer culture model and a 3D spheroid culture model.

METHODOLOGY

The MTT assay was used to assess the sensitivity of cell lines from the HNSCC group: salivary gland (A253), hypopharyngeal (Detroit 562), and metastatic pharyngeal (FaDu). A normal cell line (MRC-5) was also included in the study. Four chemotherapeutics (cisplatin, Cis Pt; 5-fluorouracil, 5-FU; carboplatin, Carb Pt; docetaxel, DOCA) were applied at concentrations ranging from 10^{-4} M to 10^{-9} M in 2D cytotoxic evaluation. A 3D cytotoxic assay was conducted with the IC_{50} concentration for each chemotherapeutic, obtained from the 2D cell assay.



RESULTS

Table 1 : Cytotoxic Sensitivity (IC_{50}) of HNSCC Cell Lines to Chemotherapeutic Agents – 2D results

Cell Line	Docetaxel (IC_{50}, nM)	Cisplatin (IC_{50}, µM)	Carboplatin (IC_{50}, µM)	5-Fluorouracil (IC_{50}, µM)
Detroit 562	6.3	12.4	> 100	60.6
FaDu	15.8	4.1	> 100	45.1
A253	22.7	1.8	> 100	> 100
MRC-5	71.9	3.8	> 100	> 100

IC_{50} - concentration which reduces cell growth by 50 %

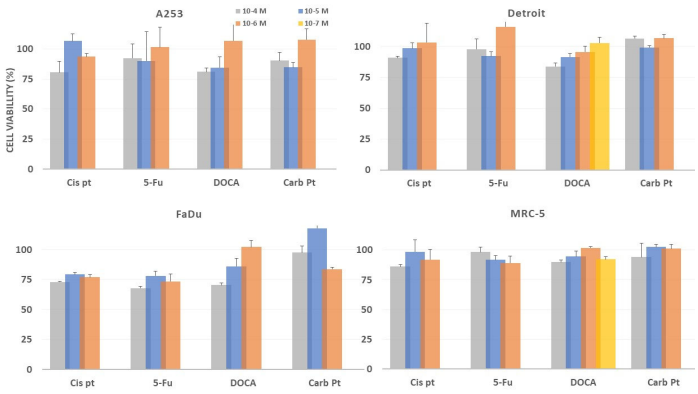


Figure 1: 3D cytotoxicity on HNSCC cell lines. MTT assay.

Cells in the 3D cytotoxicity model were exposed to specific IC_{50} values for each chemotherapeutic, resulting in very high survival rates (73–104 %).

CONCLUSION

The results suggest that cells cultured in a 3D model, which more closely resembles *in vivo* conditions, are a superior choice for predicting the effects of known and unknown compounds compared with 2D models.

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