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Jia Li and Beaumont researchers study lung damage from x rays

Sometimes medical advance comes through better **signal processing**. Assistant Professor **Jia Li**, of the **Electrical and Computer Engineering Department**, is an expert in signal processing of biomedical images. She recently published a study titled **A Simple Quantitative Method for Assessing Pulmonary Damage After X Irradiation** in a special issue of the journal **Radiation Research** (Volume 173, Pages 536-544). Her collaborators include lead author Laura Downing and team leader Brian Marples, both from the **Department of Radiation Oncology at William Beaumont Hospital**, OU's partner in the **Oakland University William Beaumont School of Medicine**. The aim of the study is to determine **the effect of radiation on lungs**, with an ultimate goal of developing methods of reducing normal tissue damage, thereby allowing more of the radiation dose to be targeted to the tumor in order to increase treatment efficacy. Below is the abstract of their study.

"Pulmonary damage after radiotherapy is typically characterized by an initial **alveolar** inflammation (**pneumonitis**) followed by chronic **fibrosis**. In the present study, changes in lung architecture were measured in the pneumonitis phase after whole-body low-dose **X irradiation of C57BL/6 mice**. Radiation damage was evaluated at 24 h and 1-8 weeks postirradiation. Three distinct scoring systems were used: (1) manually evaluating alveolar distortion and infiltration of inflammatory cells into the alveolar space using a continuous numerical scale across an entire lung section, (2) physically measuring the average thickness of the alveolar septa from multiple representative microscope fields, and (3) a new rapid automated mathematical algorithm based on image **segmentation** of alveolar space across an entire section. Each scoring method detected significant changes in alveolar architecture at the earliest times compared with **sham-treated controls** and gave comparable evaluations of injury. The results from the automated mathematical algorithm correlated significantly with both the manual evaluation method (**Spearman's correlation coefficient** $\rho = 0.044$) and the direct physical measurement of septa thickness ($\rho = 0.002$). These data demonstrate that evaluating alveolar space by segmentation analysis provides a reliable method for scoring early pulmonary radiation damage that is consistent with more established methodologies but is more rapid and is independent of potential operator and **selection bias**."

SUMMARY

Assistant Professor Jia Li, of the Electrical and Computer Engineering Department, and a team of Beaumont Hospital researchers study how the lungs respond to x rays.

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