AUTOMATED ANALYSIS OF ALVEOLARIZATION IN HYPEROXIA-INDUCED RAT MODELS OF BRONCHOPULMONARY DYSPLASIA

Andrea Porzionato[1], Diego Guidolin[1], Veronica Macchi[1], Maria M. Sfriso[1], Arben Dedja[2], Eugenio Baraldi[2], Patrizia Zaramella[2], and Raffaele De Caro[1]

[1] Section of Human Anatomy, University of Padova, Padova, Italy;

[2] Department of Women's and Children's Health, University of Padova, Padova, Italy

Many morphometric approaches have been proposed for quantitative evaluation of alveolarization in lung maturation and in experimental models of bronchopulmonary dysplasia. The aim of the present work was to evaluate a series of novel automatically-derived parameters (density, surface percentage and 'solidity factor' of closed areas; density of tips; tips per closed areas; Morisita's index), also in comparison with stereological (mean linear intercept (Lm), total volume of alveolar air spaces, total number of alveoli, mean alveolar volume) and fractal (fractal dimension (D) and lacunarity) parameters. Experimental groups included rats raised in: a) ambient air for 2 weeks; b) 60% oxygen for 2 weeks; c) normoxia for 6 weeks; d) 60% hyperoxia for 2 weeks and then room air for further 4 weeks. As it regards the novel parameters, 'solidity factor' of closed areas, density of tips and tips per closed areas were significantly different between 2-week and 6-week normoxic rats, demonstrating to be suitable to detect normal alveolarization. Solidity factor and density of tips were also able to reveal hyperoxia-induced changes in alveolarization. Detailed comparisons with the other fractal and stereological parameters also confirmed comparable efficiency in detecting changes in alveolarization, although the automated parameters proved less time-consuming.