J Matern Fetal Neonatal Med. 2017 Mar 21:1-9.

Preclinical evaluation of cell-based strategies to prevent or treat bronchopulmonary dysplasia in animal models: a systematic review.

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Abstract: Bronchopulmonary dysplasia (BPD) remains the most common complication of extreme prematurity as no effective treatment is available to date. This calls for the exploration of new therapeutic options like cell therapy, which is already effective for various human (lung) disorders. We systematically searched the MEDLINE, Embase, and Web of Science databases from the earliest date till January 2017 and included original studies on the perinatal use of cell-based therapies (i.e. cells and/or cell-derivatives) to treat BDP in animal models. Fourth publications describing 47 interventions were retrieved. Newborn mice/rats raised in a hyperoxic environment were studied in most interventions. Different cell types - either intact cells or their conditioned medium - were administered, but bone marrow and umbilical cord blood derived mesenchymal stem cells were most prevalent. All studies reported positive effects on outcome parameters including alveolar and vascular morphometry, lung function, and inflammation. Cell homing to the lungs was demonstrated in some studies, but the therapeutic effects seemed to be mostly mediated via paracrine modulation of inflammation, fibrosis and angiogenesis.

CONCLUSION: Multiple rat/mouse studies show promise for cell therapy for BPD. Yet careful study of action mechanisms and side effects in large animal models is imperative before clinical translation can be achieved.