



Repairing the lung: from single cells and tissue organisation to regenerative therapy – highlights of the Lung Science Conference 2025

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Here we provide a snapshot of the novel interdisciplinary concepts that were discussed at the Lung Science Conference 2025, focussing on the repair capacity of the lung to develop regenerative therapies for chronic lung diseases <https://bit.ly/3J8yAHO>

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The 23rd Lung Science Conference (LSC) took place in March 2025 in Estoril, Portugal, and focussed on the understanding of the repair and regenerative capacity of the lung and how our advanced knowledge on this topic might contribute to new regenerative therapies for chronic lung diseases. The 2025 conference was organised by a team of four programme coordinators. Janette Burgess, an expert on the extracellular matrix (ECM) in lung diseases from Groningen (the Netherlands) and Emma Rawlins, a specialist on human lung development from Cambridge (UK), were joined by Carla Kim from Harvard Children's Hospital (USA) with her strong expertise on stem cell biology of the lung. Sara Cuevas Ocaña represented the early career scientists with her expertise of stem cell therapy. As the European Respiratory Society (ERS) Conferences and Seminars Director, Silke Meiners set the topic and brought the team together. She passed this baton on to Didier Cataldo, the new ERS Conferences and Seminars Director and LSC organiser.

The LSC is the ERS's annual flagship conference for basic and translational science. The LSC is an interdisciplinary, interactive and participative platform for respiratory science. It focusses on excellent science and the intergenerational exchange of experiences, concepts and ideas with the best in scientific companionship. It has a strong reputation in advancing respiratory medicine with yearly changing research themes that cross the boundaries between several respiratory diseases. The unique setting in the Grand Hotel in Estoril (Portugal), the extensive time for scientific discussions, the extended occasions for poster presentations, the networking opportunities over lunch and dinner, as well as the award and mentoring opportunities make this conference the place to be as an early and established respiratory scientist. A dedicated Early Career Session further strengthens peer networking and career support.

The LSC is fostering translational science in the respiratory field. The original Latin meaning of the word "translation" is to "bring across" from one side to the other, thereby crossing a gap. In this sense, we imagine the LSC as a ferry boat that helps bring people from the basic science side to the clinical side, and back and forth. Our aim is to provide the vessel, *i.e.* the meeting space, where you feel comfortable and inspired by excellent science, established researchers in the field and striving young scientists to discuss your translational project, set up your network and progress your career. It is the interdisciplinary discourse and the different scientific backgrounds of the attendees that foster novel concepts and ideas to advance respiratory science. This places the LSC at the heart of the new translational science initiative of the ERS [1].



The 2025 topic provides an excellent example of how we envision translational science at the LSC. With its focus on “Repairing the lung: from single cells and tissue organisation to regenerative therapy” the conference was built around distinct aspects of regeneration with increasing levels of complexity. It started from the basic understanding of single lung cells, their fates and plasticity, and covered their interactions in cellular communities and adaptation to injury. It then addressed how these cells interact in the three-dimensional space where the mechanical forces of the lung add to tissue physiology. One of the most memorable moments of the conference was an engaging Pro/Con debate that explored the crucial question of whether a cell requires a support structure, such as the ECM scaffold, to facilitate its regeneration. All this basic and interdisciplinary science culminated in a session dedicated to clinical insights into regenerative therapies, where experts outlined approaches for stem cell therapy and probed their feasibility in the clinical setting. The discussion with patients’ representatives provided an important new perspective on the shaping and integration of research projects according to patients’ concerns. While these sessions provided a framework, *i.e.* the boat for crossing the translational gap, it is the unique background of each attendee that drives translation when discussing their projects at the posters, asking unexpected questions and bringing in interdisciplinary concepts that have not been integrated before. It is the setup of new collaborations, agreement on the future exchange of samples and ideas, and the personal mentoring that drives translation at its best.

In this issue of the *European Respiratory Review*, we have assembled three expert reviews that summarise “Cellular plasticity and regenerative mechanisms in the lung” [2] with the specific topic of “Neuroplasticity and neuroimmune interactions with type 2 inflammation in asthma” [3] together with “The importance of mechanical forces in chronic respiratory diseases” [4].

The technological advancements of single cell analysis has propelled the identification of novel cell types, their cellular niches and how they adapt to stress and injury. The review by ZARAGOSI *et al.* [2] summarises the most recent knowledge on the different lung cell types thereby focussing on the lung epithelium, its stem cell features and plasticity and how it is altered in disease. They also provide an overview of the experimental models used to study alveolar regeneration and stem cell plasticity. Despite major progress in the identification of novel and (possibly) transient cell types and their adaptation in health and disease, the questions of which molecular signals govern these states and whether they can be modulated in a therapeutic setting are still unresolved.

KOSTER *et al.* [3] address the specific topic of neuroplasticity and neuroimmune interactions and focus on its dysregulation in severe asthma and airway remodelling. This review summarises the latest research on the fascinating interplay between structural cells, the immune system and nerves, and explores the vast potential for new therapies that target these nerve-immune interactions thereby counteracting chronic cough, airway hyperresponsiveness and inflammation in asthma.

The cell does not act alone, it requires other cells not only to communicate and form communities but also to create a scaffold to guide them and shape its function. The mechanical interplay of different lung cell types located in various compartments is dysregulated in chronic lung diseases. A detailed understanding of the mechanical niches is crucial to interfere therapeutically with aberrant mechanical environments in chronic respiratory diseases. This topic has been covered by BURGESS *et al.* [4] in their review on “The importance of mechanical forces in chronic respiratory diseases”.

We believe that these reviews showcase the spirit and provide a snapshot of the novel interdisciplinary concepts that were discussed at the 2025 LSC. Providing a mechanistic understanding of cellular plasticity and regeneration, neuroimmune interactions and mechanical signals and forces has the potential to drive regenerative therapies for chronic lung diseases.

Provenance: Commissioned article, peer reviewed.

This editorial introduces a series of commissioned reviews from the ERS Lung Science Conference “Repairing the lung: from single cells and tissue organisation to regenerative therapy” held in 2025.

Conflict of interest: S. Meiners reports support for attending meetings from LSC 2025, from ERS, ERS annual meeting and JRS annual meeting. D. Cataldo has nothing to disclose.

References

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