
UNIVERSITY OF TWENTE. | TECHMED CENTRE
THE TECHMED EVENT | SHAPING A HEALTHY FUTURE
Organ-on-a-chip: Better Designs, Better Health | Anne van der Does

Technical Innovation - Clinical biomedical research as alternative for animal testing

“The Dark Side of the Lung”

dr. Anne van der Does – PulmoScience Lab, Leiden University Medical Center

LONG FONDS

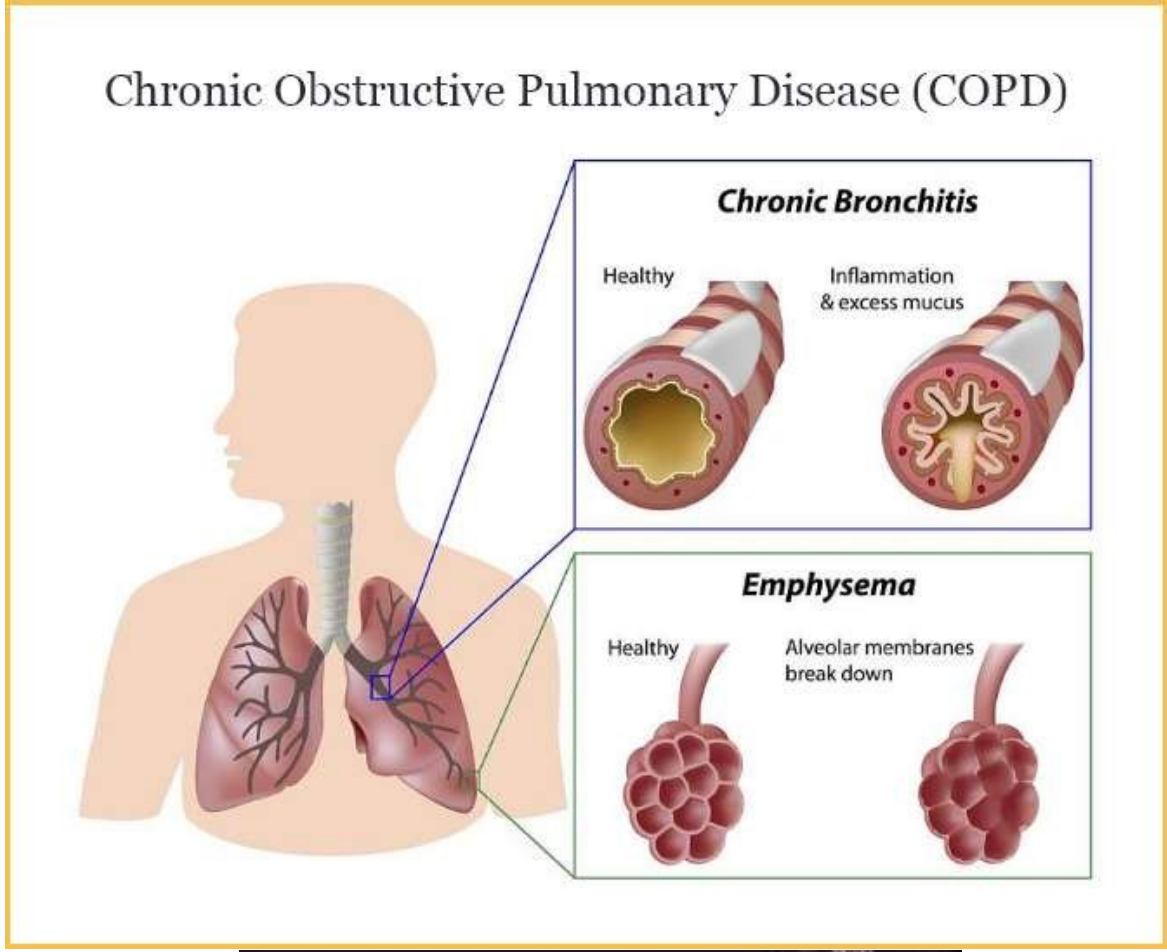
LUMC Leiden University Medical Center

DISCLOSURE SLIDE

No disclosures

Chronic Obstructive Pulmonary Disease

- Third cause of death worldwide
- >500.000 patients in The Netherlands
- Characterized by two conditions: emphysema and chronic bronchitis
- Emphysema is progressive: loss of gas exchange capacity

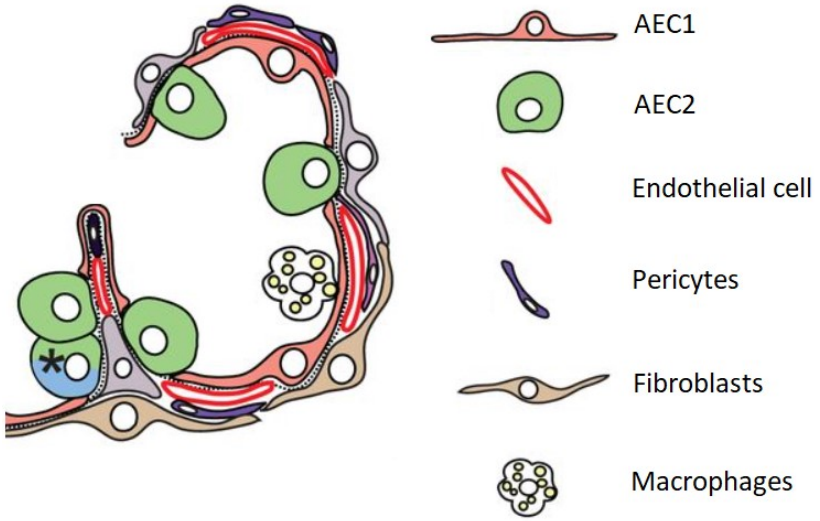


Defect in (micro)vascular compartment associated with emphysema

Cellular make up of the alveoli includes a close interaction of the type-1 alveolar epithelial cells and the (micro)vascular endothelial cells

Dysfunction of the alveolar capillary network in emphysema was first described over 60 years ago.
The loss of capillaries were not studied at that time and remain to be disclosed in detail to date.

Is the loss of capillaries a consequence of emphysema or is it driving the disease?



The Dark Side of the Lung consortium

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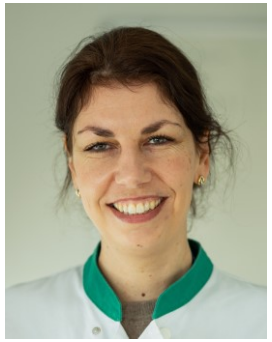
RuG

Prof. Andries v/d Meer
TU Twente

Dr. Jill Johnson
Aston University

Prof. Pieter Hiemstra
LUMC



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Prof. Marco Harmsen
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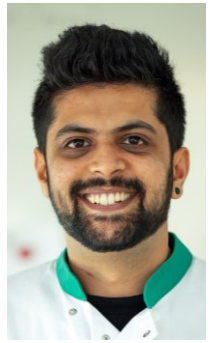

Dr. Abilash Ravi
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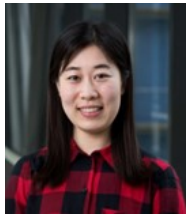
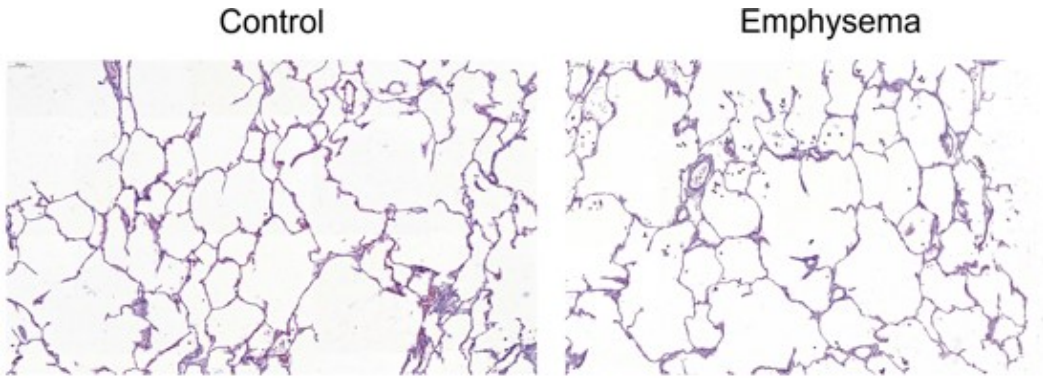
Dr. Xinhui Wu
RuG

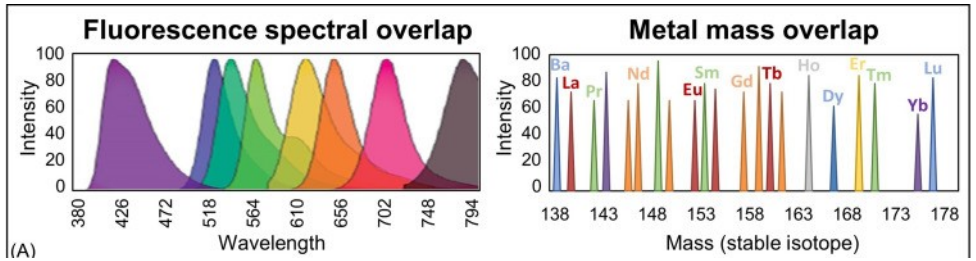
Severe emphysema: from Patiënt to Chip



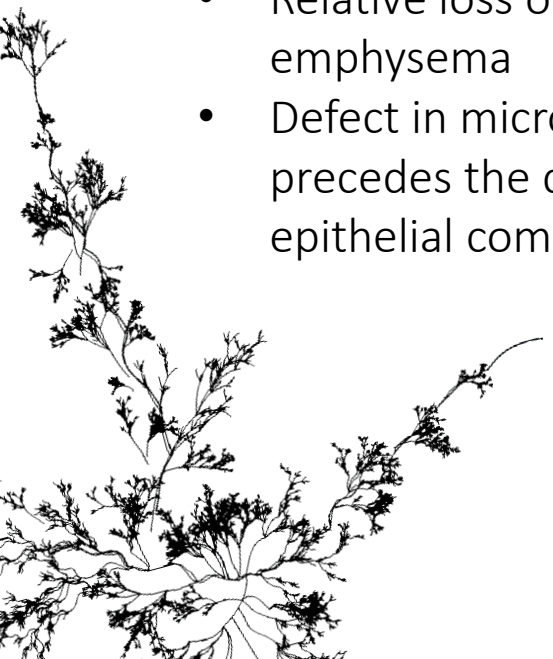
Jia Li

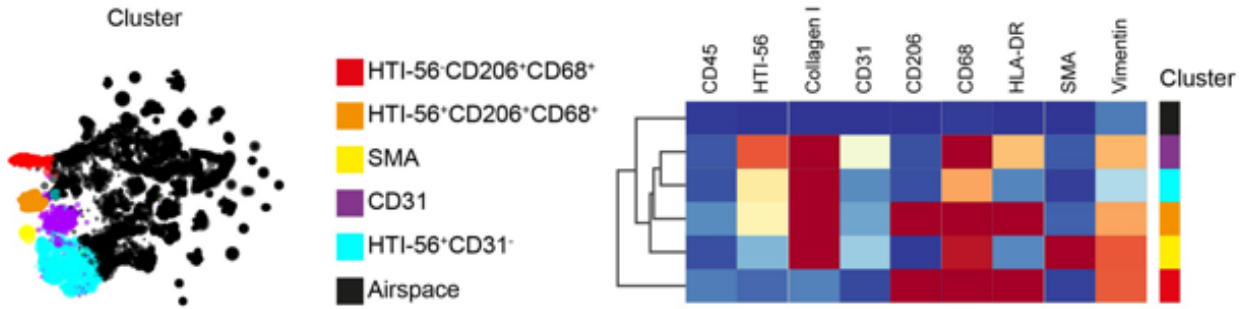
Padmini Khedoe

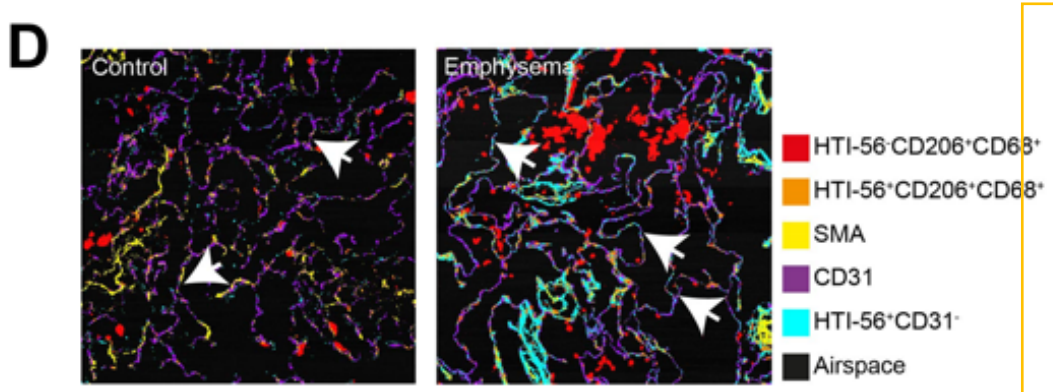




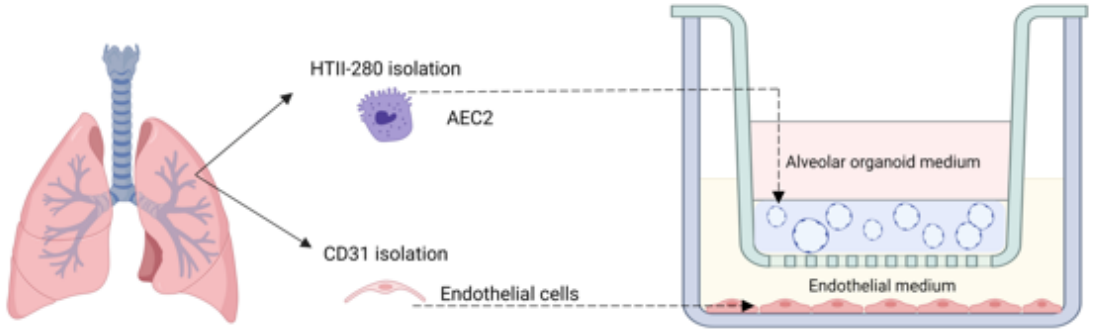
- Relative loss of microvasculature in emphysema
- Defect in microvascular compartment precedes the defect in the alveolar epithelial compartment



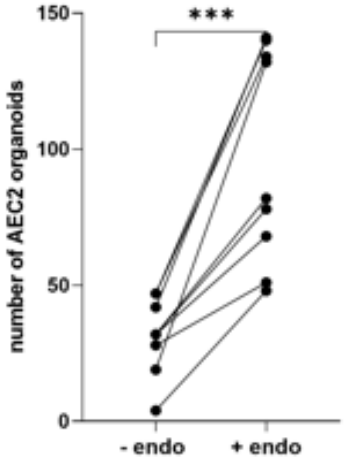


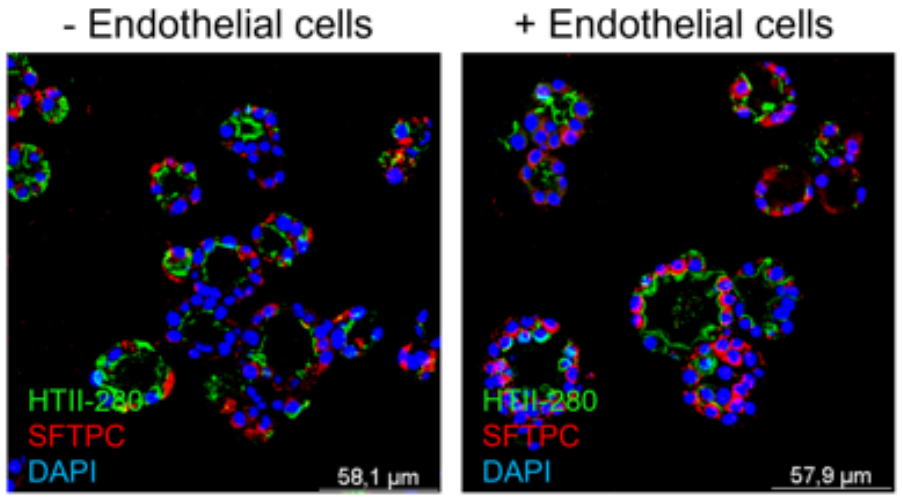


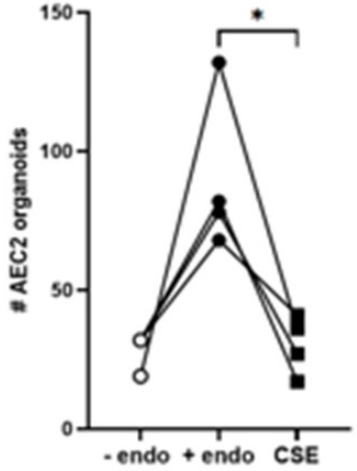
Severe emphysema: from patiënt to chip



Evidence for a supporting role of endothelial cells for epithelial cells

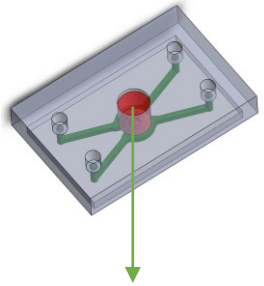


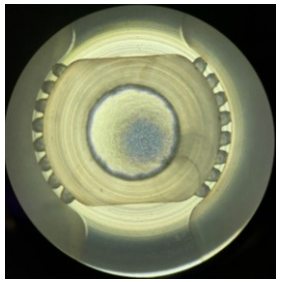


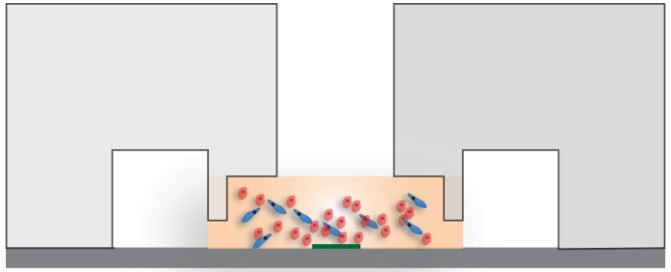


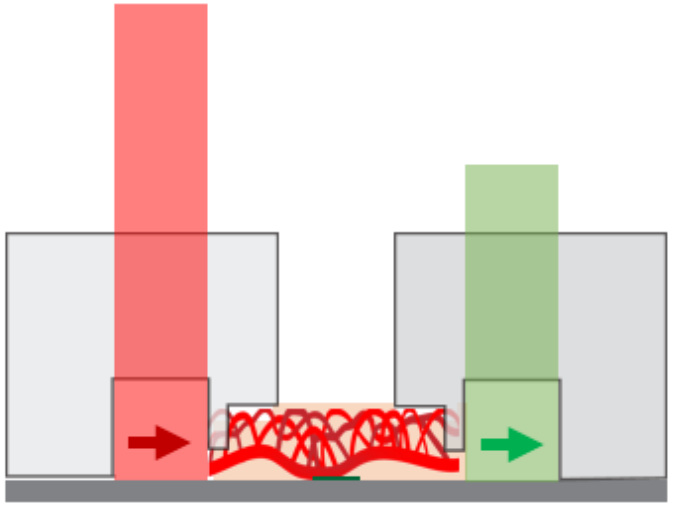
Development of the chip

Open-top; Membrane free









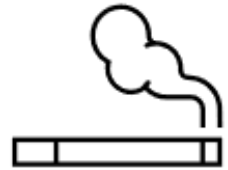
Prof. Andries v/d Meer
Tarek Gensheimer
TU Twente

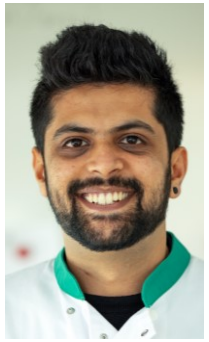
Alveolar type II epithelial cells (AEC2)

Lung microvascular endothelial cells

Pericytes

Hydrogel





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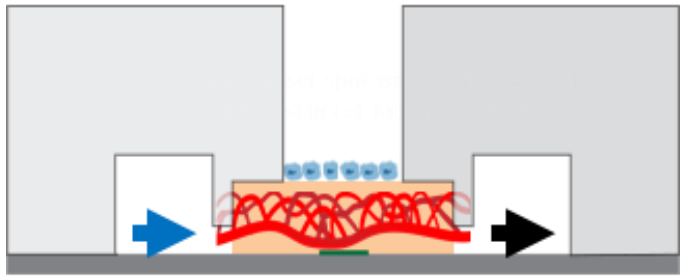
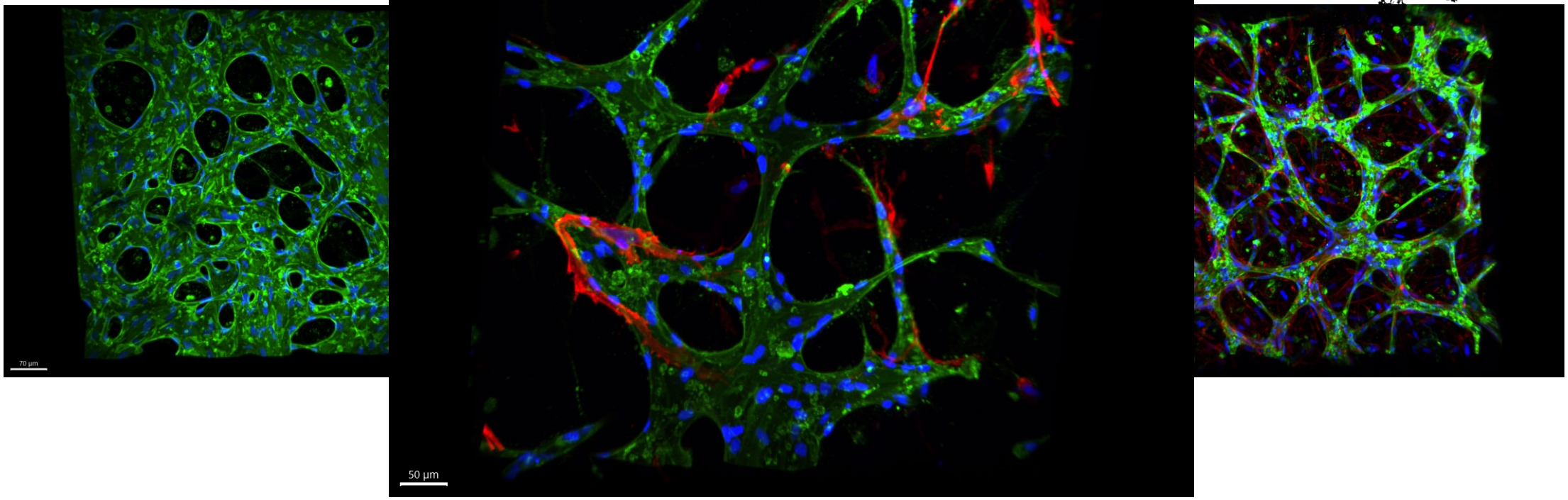


Control of the vessels size by combination with pericytes

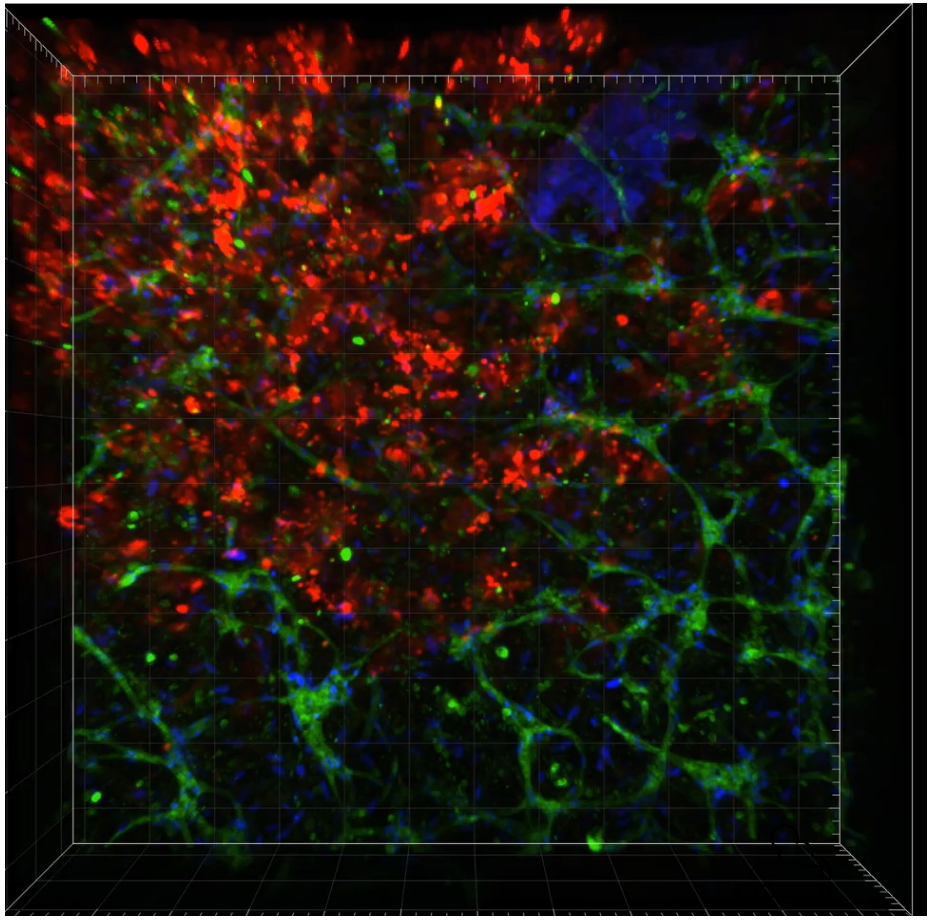
Endothelial cells without pericyte

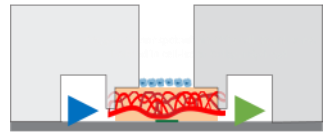


Endothelial cells – CD31
Pericytes – NG2

Day 12

Vascularized endothelial cells co-cultured with primary AEC2





- Delineate the supportive function of endothelial cells
- Immune cell recruitment

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[TIME SESSION] | [SESSION TITLE] | [SPEAKER]