

## Supporting Materials for

### Engineering Principles and Algorithmic Design Synthesis for Ultracompact Bio-Hybrid Perfusion Chip

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#### This PDF file includes:

Figure S1  
Captions for Movies S1 to S3  
Captions for Supplemental Design Files

#### Design naming convention:

AV\_#string1\_#num1\_#num2\_#num3.STL

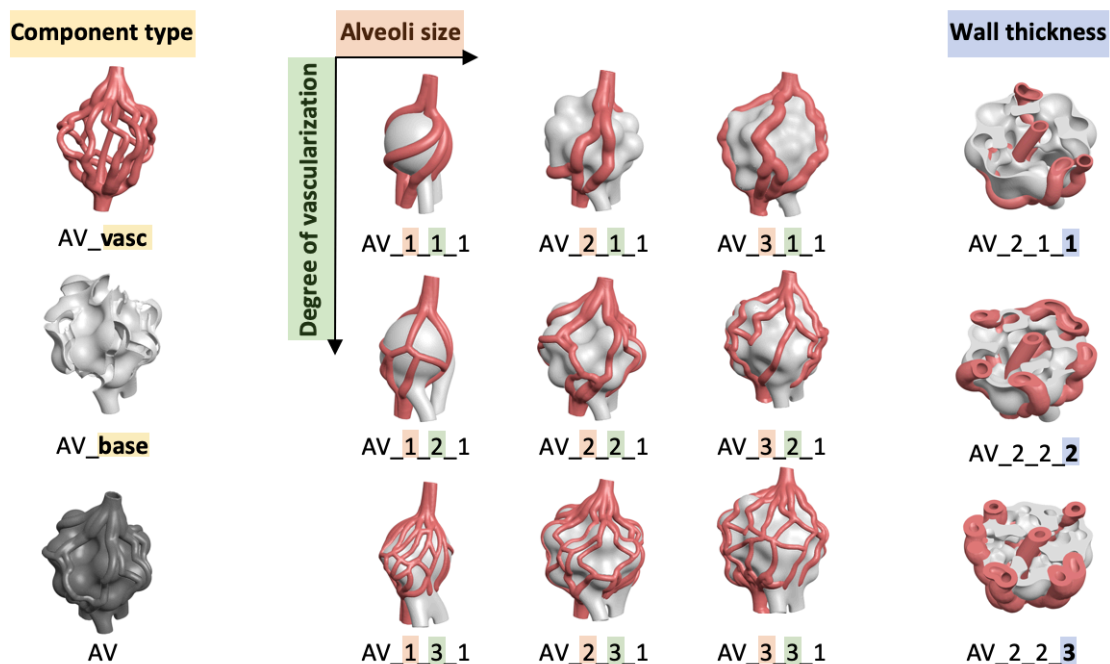


Figure S1: Vascularized alveoli designs generated from parametric design synthesis to realize context specific 3D design cues. Implemented variations include component type (#string1), alveoli size (#num1), degree of vascularization (#num2), and wall thickness (#num3) are available from University Stuttgart DaRUS data repository: <https://doi.org/10.18419/darus-2612>.

#### Movie Captions:

- Movie S1: Movie of 80  $\mu\text{m}$  diameter GM10 channel perfused with PBS via IP-S printed contact chip (Figure 3).  
Movie S2: A 3D view and a sliced computer representation of a algorithmically designed alveoli (Figure 7).  
Movie S3: Animated two-photon microscopy z-stack of an algorithmically designed alveoli printed in GM10 – rose bengal resin (Figure 7E, scale bar 100  $\mu\text{m}$ ).

#### Designs files:

- Design S1: Contact Chip Template used for IP-S printing (Figure 1).  
Design S2: Channel Template used to print from hydrogel GM10 resin (Figure 1).  
Algorithmic Design files: AV\_#string1\_#num1\_#num2\_#num3.STL as annotated in Figure S1 available from <https://doi.org/10.18419/darus-2612>.