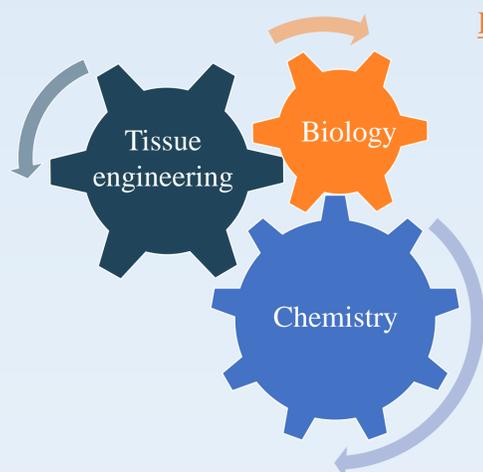


## 1. BACKGROUND



### DEFINITION

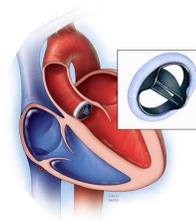
- **Biomaterial**  
"Material exploited in contact with living tissues, organisms, or microorganisms" - IUPAC
- **Origin**  
Synthetic or natural, from metallic components, polymers, ceramics or composite materials.

### WHY?

- Current synthetic biomaterials are not optimal for tissue repair due to lack of intrinsic biological properties.<sup>1,2</sup>
- Heart failure affects 64 million people globally.
- 14 million people will suffer a stroke this year.
- Need of potent biomaterials for tissue growth and repair.



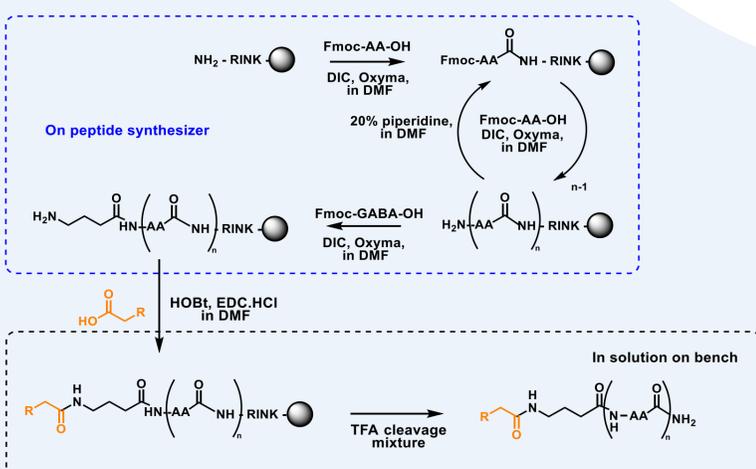
## HOW TO HAVE EFFICIENT BIOMATERIALS?



## 3. METHOD and

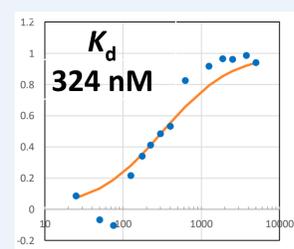
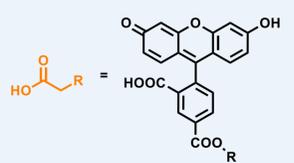
### SYNTHESIS OF PEPTIDES...

Peptides identified by phage display to bind to the protein of interest have been synthesized in-house on a solid-phase peptide synthesizer using Rink Amide MBHA to give C-amide terminus peptide.



Subsequent modification with a functionalised **carboxylic acid** (general R group in the scheme) was done on the N-terminus using an amidation reaction before an acid cleavage.

### A. Determination of binding



## 2. PROJECT

### GOAL OF THE PROJECT

- Modify growth factors (GFs) proteins - FGF, VEGF - in a highly specific manner.
- Tethering them to biomaterial to ensure their full activity within the biomaterial with the potent biological functionality required for cells to form functional new tissue.<sup>3,4</sup>

### Current methodology

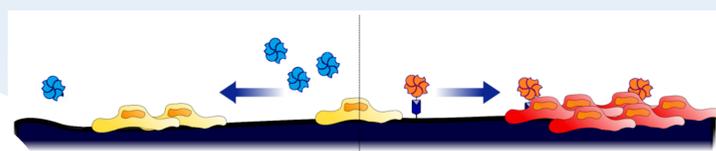
= use of soluble GFs

- ☑ Potent signalling
- ☑ Rapid degradation
- ☑ Supraphysiological loadings

### Our approach

= use of tethered GFs

- ☑ Prolonged receptor activity
- ☑ Can be coupled with rewritable tethering
- ☑ Control amount of protein



### HOW?

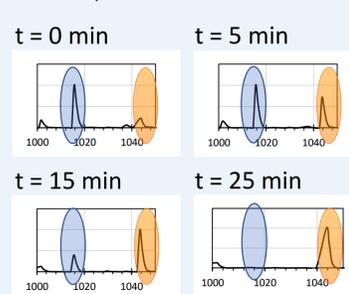
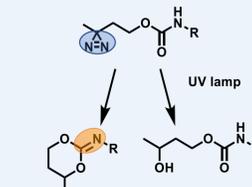
- Designing peptides that bind to proteins of interest and introducing specific groups for calculating the strength of the binding, determining the site of modification, and modifying the surface of the protein.

## RESULTS

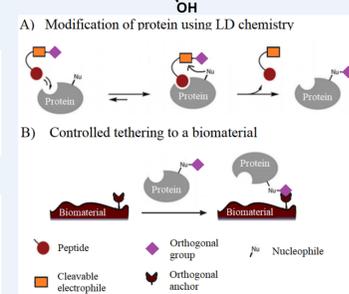
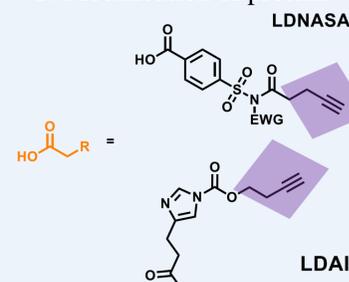
### ... FOR SPECIFIC MODIFICATION

Results depending on the functionalised **carboxylic acid**, fluorescein (part A), diazirine (part B), and ligand-directed such as *N*-acyl-*N*-alkyl sulphonamide (LDNASA) and *N*-acyl imidazole motifs (LDAI) (part C).

### B. Localisation of binding



### C. Modification of protein



## 4. CONCLUSIONS

### ACHIEVEMENTS

- Successful general method to develop high purity peptide as protein-binding ligand.
- Proof of peptides binding through FP assays.
- Organic synthesis underway to pursue further protein modification.

### FUTURE WORK

- Finalize organic synthesis.
- Modification of targeted protein.
- Cell study using HEK-293 cell to see the influence of the modified protein.

## 5. ACKNOWLEDGMENTS

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