# VAPG peptide density gradient and its influence on selective adhesion and directional migration of smooth muscle cells

Shan Yu, Tao Shen, Zhengwei Mao*, Changyou Gao*

**MOE Key Laboratory of Macromolecular Synthesis and Functionalization, Department of Polymer Science and Engineering, Zhejiang University, Hangzhou 310027, China**

zwmao@zju.edu.cn; cygao@mail.hz.zj

Selective adhesion and directional migration of smooth cells (SMCs) over fibroblast cells (FIBs) plays a significant role in the wound healing after blood-contacting implants, in particular for the scar formation. In this study, a uniform cell-resistant layer of polyethylene glycol (PEG) was firstly immobilized on the glass slides surface. Then a density gradient of alkynyl functionalized Val-Ala-Pro-Gly (VAPG) peptide was immobilized onto the PEG layer via click chemistry.

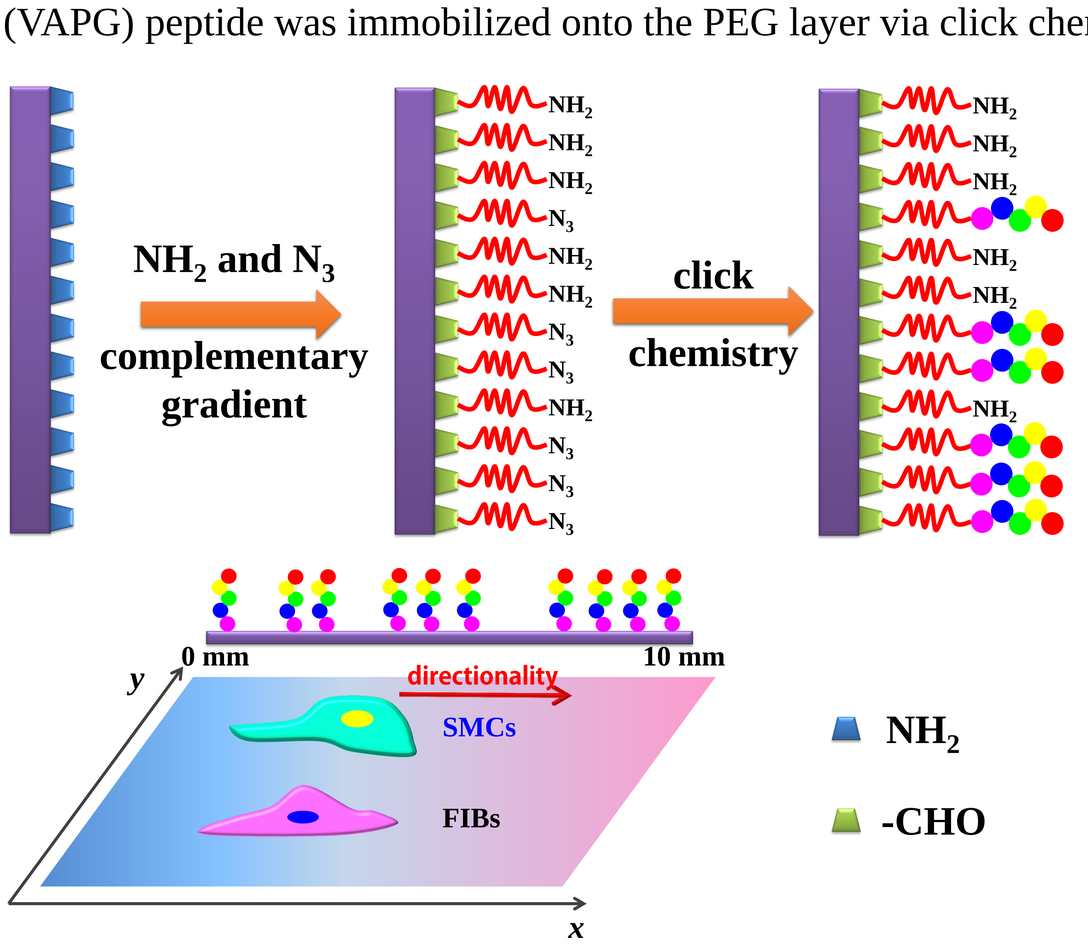


**Figure 1.** Schematic illustration to show the structure of the SMCs selective peptide (VAPG) density gradient on a uniform PEG brush layer. VAPG peptides were grafted onto cell-resistant layer through click chemistry.

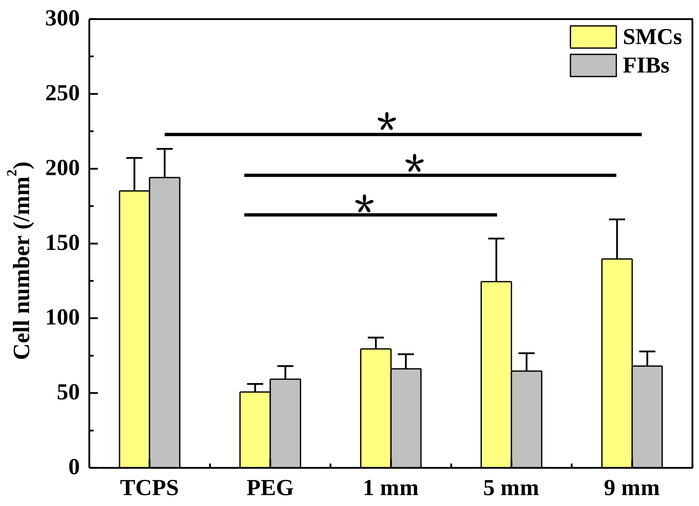


**Figure 2.** Numbers of SMCs and FIBs being cultured for 8 h on TCPS and different positions of VAPG density gradient.

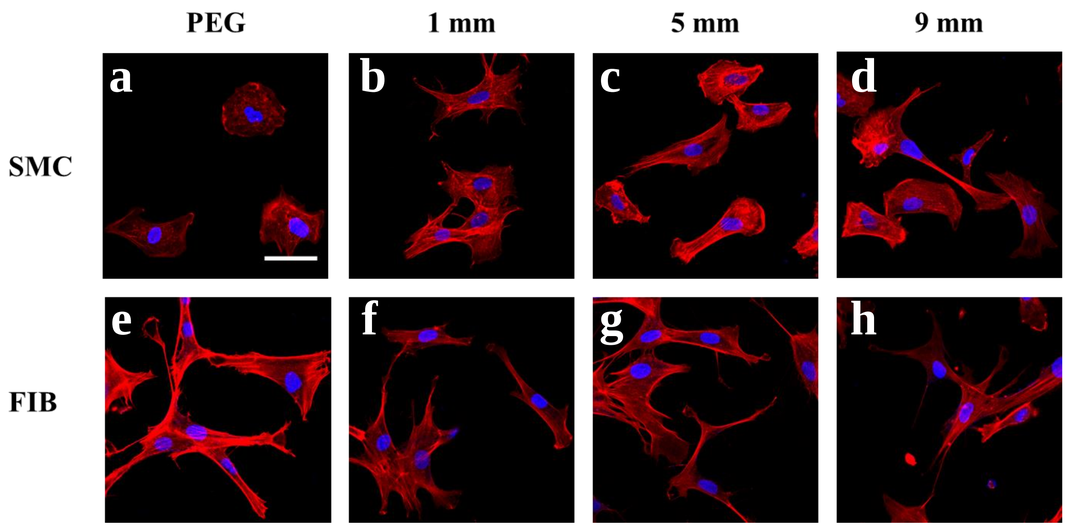


**Figure 3.** CLSM images of SMCs (a-d) and FIBs (e-h) on VAPG density gradient at (a,e) PEG, (b,f) 1 mm, (c,g) 5 mm and (d,h) 9 mm positions.

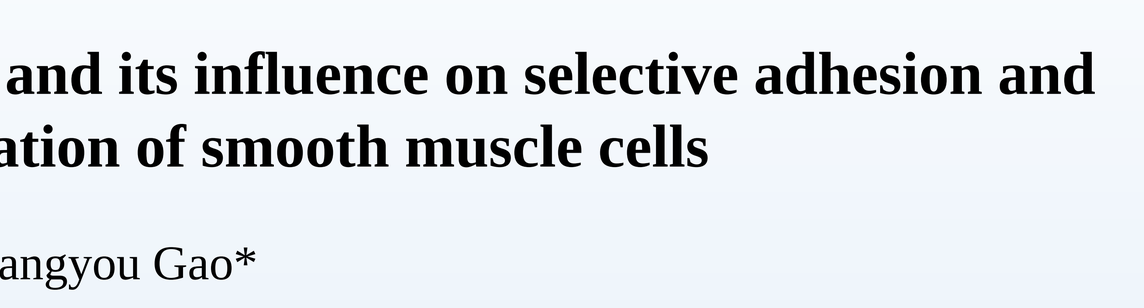


Figure 7

**Figure 4.** Migration trajectories SMCs and FIBs on PEG, 1 mm , 5 mm , 9 mm on VAPG density gradient. The numbers represent percents of cells migrated toward +X direction.

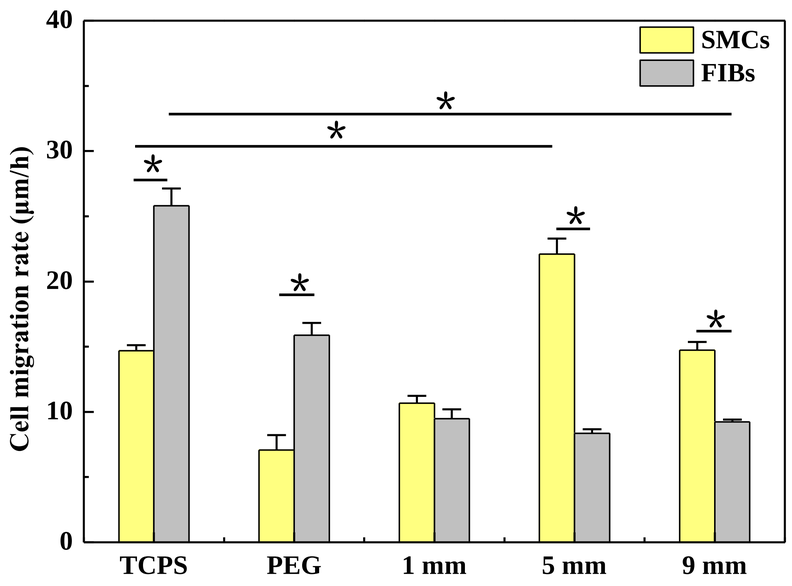


**Figure 5.** Migration rates of SMCs and FIBs on TCPS , PEG and 1 mm, 5 mm and 9 mm on VAPG density gradient.

## Conclusion

The gradient surface selectively enhanced the SMCs adhesion, preferential orientation and directional migration. The migration rate of SMCs was enhanced to 1.5-folds compared to that on TCPS. The gradient significantly weakened the adhesion of FIBs to 33% of that on TCPS, but had no obvious impact on the migration rate and directionality of adherent SMCs. The success of the gradient relies on the appropriate interplay between the cell-resistant layer and the cell-specific ligands, enabling the selective guidance of adhesion and migration of SMCs.

## Acknowledgement

Financially supported by the Natural Key Research and Development Program of China (2016YFC1100400).

## Reference

[1] Ren T, Yu S, Mao Z, Gao C. Biomaterials. 2015; 56: 58-67.
[2] Yu S, Gao Y, Mei X, Mao Z, Gao C. ACS Applied Materials & Intefaces. 2016; 8: 29280-29288.