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Research Interests

Cancer Immunology, In Vivo Imaging, Single-Cell Genomics, Vascular Biology, Drug Development

Education

2005	B.S. in Biological Sciences, KAIST, Korea
2010	Ph.D. in Biological Sciences and Biomedical Science & Engineering Program, KAIST, Korea

Professional Career

2010 -2013	Research Fellow at Wellman Center (In Vivo Imaging), Harvard Medical School / MGH
2013 -2018	Research Fellow at Steele Laboratories for Tumor Biology, Harvard Medical School / MGH
2018- present	Assistant Professor, Seoul National University

Honors

2018	Milstein Award, International Cytokine & Interferon Society (ICIS)
2018 -2027	Creative- Pioneering Researchers Program, Seoul National University
2017	Speaker Award, Gordon Research Conference - Angiogenesis
2016	Bristol-Myers Squibb (BMS) Award, Tumor Immunology and Immunotherapy Meeting
2016	AACR-GYRIG Scholar-in-Training Award, AACR Annual Meeting

Publications

1. Choo YW, Jeong J, Jung K. Recent advances in intravital microscopy for investigation of dynamic cellular behavior in vivo. BMB Reports, (2020).
2. Jeong J, Suh Y, Jung K. Context drives diversification of monocytes and neutrophils in orchestrating the tumor microenvironment. Frontiers in Immunology (2019).
3. Jung K. et al., Targeting CXCR4-dependent immunosuppressive Ly6C(low) monocytes improves antiangiogenic therapy in colorectal cancer. Proc Natl Acad Sci USA (2017).
4. Jung K. et al., Ly6C(lo) monocytes drive immunosuppression and confer resistance to anti-VEGFR2 cancer therapy. J Clin Invest (2017).

Real-time intravital characterization of non-classical monocytes in cancers

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Colorectal cancer (CRC) is the leading cause of cancer-related deaths worldwide. However, current anti-VEGF therapies for CRC provide limited survival benefit as tumors rapidly develop resistance to these agents.
We have developed a miniaturized confocal endomicroscopy technique for spontaneous CRC models in mice. We recently also established a novel abdominal imaging window. These unique systems enable us to monitor the CRC and its immune microenvironment longitudinally with a video-rate intravital multi-photon microscope. Using these in vivo imaging methods and CRC models, we have uncovered an immunosuppressive role for non-classical Ly6Clow monocytes that mediates resistance to anti-VEGFR2 treatment. We found that the chemokine CX3CL1 was upregulated in both human and murine tumors following the VEGF signaling blockade, resulting in recruitment of CX3CR1+ Ly6Clow monocytes into the tumor. We also found that treatment with VEGF-A reduced expression of CX3CL1 in endothelial cells. Intravital microscopy revealed that CX3CR1 is critical for Ly6Clow monocyte transmigration across the endothelium in tumors. Moreover, Ly6Clow monocytes recruit Ly6G+ neutrophils via CXCL5 and produce IL-10, which inhibits adaptive immunity. Preventing Ly6Clow monocyte or Ly6G+ neutrophil infiltration into tumors enhanced inhibition of tumor growth with anti-VEGFR2 therapy. Furthermore, we developed a gene therapy using a nanoparticle formulated with a siRNA against CX3CL1, which reduced Ly6Clow monocyte recruitment and improved outcome of anti-VEGFR2 therapy in mouse CRCs.
Taken together, we identified immunosuppressive non-classical Ly6Clow monocytes as key players in tumor resistance to anti-angiogenic therapy in CRCs. We also revealed molecular mechanisms underlying anti-angiogenic treatment resistance, suggesting potential immunomodulatory strategies to enhance the long-term clinical outcome of anti-VEGF therapies, proven by state-of-the-art in vivo imaging modalities.

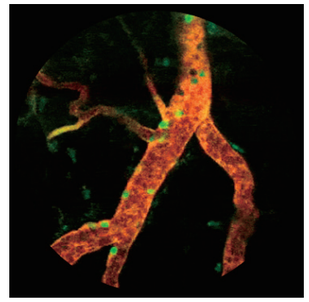

Fig. 1. Non-classical monocytes flow through blood vessels as they infiltrate tumors.

References

[1] Choo YW, Jeong J, Jung K. Recent advances in intravital microscopy for investigation of dynamic cellular behavior in vivo. BMB Reports, (2020).
[2] Jeong J, Suh Y, Jung K. Context drives diversification of monocytes and neutrophils in orchestrating the tumor microenvironment. Frontiers in Immunology (2019).
[3] Jung K. et al., Targeting CXCR4-dependent immunosuppressive Ly6C(low) monocytes improves antiangiogenic therapy in colorectal cancer. Proc Natl Acad Sci USA (2017).
[4] Jung K. et al., Ly6C(lo) monocytes drive immunosuppression and confer resistance to anti-VEGFR2 cancer therapy. J Clin Invest (2017).
[5] Jung K. et al., Endoscopic time-lapse imaging of immune cells in infarcted mouse hearts. Circ Res (2013).