BT 637 Genome Editing and Engineering (3-0-0-6)

Prerequisites: BT 208: Molecular Biology and Genetic Engineering or equivalent

Course contents:

Introduction to genetics and genetic engineering; limitations of genetic engineering; double stranded DNA breaks and repair; homologous and non-homologous recombination; knock-ins and knock-outs; Genome engineering using Zinc Finger Nuclease (ZFN) Technology; Transcription activator-like effector nuclease (TALEN) Technology; Clustered regularly interspaced short palindromic repeats (CRISPR)/Cas9 technology: target identification, gRNA design, donor design, screening and validation; Applications in treating human diseases: Human cell engineering-Thalassemia, SCID, Hemophilia, etc; Disease modeling-Cancer, iPSc and animal models; Engineered immune cells for cancer therapy; Personalized therapy; Challenges: safety and specificity; Ethical concerns: Germ line gene editing.

Texts:

1. Harber , J. E., Genome Stability: DNA Repair and Recombination , Garland Science, 2013.
2. Yamamoto, T. , Targeted Genome Editing Using Site-Specific Nucleases, Springer, 2015.
3. Zlatanova, J. and Holde, K. van, Molecular Biology: Structure and Dynamics of Genomes and Proteomes. Garland Science, 2015.
4. Yamamoto, T.(Ed.), Targeted Genome Editing Using Site-Specific Nucleases: ZFNs, TALENs, and the CRISPR/Cas9 System , Springer 2015.

References:

1. Barrangou , R. and Oost, J. van der, CRISPR-Cas Systems: RNA-mediated Adaptive Immunity in Bacteria and Archaea , Springer, 2013.
2. Addgene, CRISPR 101:A Desktop Resource , January 2016
3. Alberts , B. , Johnson , A., Lewis , J., Morgan, D., Raff, M., Roberts, K.and Walter, P., Molecular Biology of the Cell, 6th Edn., Garland Science, 2014.