

**Seminar 2**

 **The impact of fusion tags on improving recombinant protein production**

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**Fusion tags are protein or peptide sequences that can be used to improve protein expression levels or enhance the protein solubility. The focus of this seminar is to briefly introduce some of the common tags that are used for improving the production of proteins, and highlight the advantages and disadvantage of their use. A variety of tags have been used as fusion motifs, including maltose-binding protein (MBP), glutathione S-transferase (GST), thioredoxin (TRX), NUS-A, and SUMO.**

**For instance, MBP is one of the most frequently used fusion tags to enhance the solubility of the expressed protein. MBP acts as a molecular chaperone to aid the accurate folding of a fusion protein. Another tag, SUMO enhances the expression and solubility of fused protein. Direct fusion of the recombinant protein to the C terminus of SUMO results in the production of protein with the desired N-terminal amino acid sequence. The SUMO protease recognizes the tertiary structure of SUMO, and cleaves the glycine-glycine motif and results in an authentic N-terminal sequence of the target protein. The Fh8 is a small antigen (8 kDa) revealed to be highly soluble. It has an unusual thermal stability, which is considered as a promising tag in enhancing protein expression and solubility. Superfolder green fluorescent protein (sfGFP) is a mutant of wild-type GFP, and is able to enhance solubility and improve the folding ability of a protein. Thioredoxin (Trx) is a thermostable protein that catalyzes dithiol disulfide exchange reactions. GST facilitates both expression and purification, however it is generally considered as a poor solubility enhancer tag. N-utilization substance A (NusA), is a transcription termination/antitermination factor in *E. coli*. Studies have demonstrated that NusA could effectively enhance solubility for a diverse set of targets proteins. Ultimately, TISIGNER will be briefly introduced as an online website for predicting protein solubility and expression levels.**

**Keys words: Fusion protein, SUMO, MBP, TRX, Fh8**