

**VALIDASI DAN OPTIMASI PENAMBATAN SENYAWA KO-KRISTAL  
PADA *MATRIX METALLOPROTEINASE-9* (4H3X.PDB)  
MENGUNAKAN AUTODOCK VINA**

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**ABSTRAK**

Ulkus kaki merupakan salah satu komplikasi penyakit diabetes mellitus yang disebut Diabetic Foot Ulcer (DFU). Proses penyembuhan luka pada pasien DFU tidak dapat berjalan normal karena adanya peningkatan ekspresi dan aktivitas *Matrix Metalloproteinase* (MMP) (terutama MMP-9), berfungsi dalam mendegradasi *Extracellular Matrix* (ECM) yang berperan dalam *remodeling* sel selama prose penyembuhan luka. Penghambatan aktivitas MMP-9 dapat membantu proses penyembuhan luka bagi penderita DFU. *N-2-(biphenyl-4-ylsulfonyl)-N-2-(isopropoxy) acetohydroxamic acid* (CC27) memiliki aktivitas penghambatan terhadap MMP-9 dan telah diko-kristalkan dengan MMP-9 menjadi kristal 4H3X.pdb. Validasi dan optimasi penambatan ulang ko-kristal CC27 pada kantong ikatan MMP-9, menggunakan *software* AutoDock Vina, dilakukan untuk mendapatkan protokol penambatan ulang yang valid dengan parameter nilai RMSD  $\leq 2 \text{ \AA}$ . Hasil penambatan ulang 1000 kali dengan *exhaustiveness* 4, menghasilkan 98,4% pose dengan nilai RMSD  $\leq 2 \text{ \AA}$ , dianalisis statistik *one-sample t-test*. Setelah itu didapatkan *p-value* sebesar 1 dengan selang kepercayaan 95% sehingga dapat dikatakan bahwa hasil penambatan ulang telah *valid*. Selain itu, dilakukan uji statistik kecepatan penambatan dengan *two sample one-tailed t-test* dan didapatkan *p-value* = 0,04763 sehingga dapat disimpulkan bahwa penambatan dengan *exhaustiveness* 4 lebih cepat daripada *exhaustiveness* 8.

**Kata Kunci:** Validasi; Optimasi; DFU; MMP-9; 4H3X.pdb

## ABSTRACT

Foot ulcer is one of the diabetes mellitus complications called as Diabetic Foot Ulcer (DFU). The wound healing process in DFU patients cannot proceed normally due to an increase in Matrix Metalloproteinase (MMP) expression and activity (especially MMP-9), used in degrading Extracellular Matrix (ECM) which plays a role in cell remodeling during the wound healing process. Inhibiting MMP-9 activity can help the wound healing process for DFU patients. *N*-2-(biphenyl-4-ylsulfonyl)-*N*-2-(isopropoxy) acetohydroxamic acid (CC27) inhibits MMP-9 and has been co-crystallized with MMP-9 into 4H3X.pdb crystal. Validation and optimization of CC27 co-crystal in MMP-9 binding pocket, using AutoDock Vina software, were carried out to obtain a valid protocol with RMSD value parameter  $\leq 2 \text{ \AA}$ . The 1000 times redocking with exhaustiveness 4, resulting in 98.4% poses with RMSD values  $\leq 2 \text{ \AA}$ , analyzed by one-sample t-test statistics. Then, obtained p-value of 1 with a 95% confidence interval so that it can be defined that the redocking results have been valid. In addition, statistical test of the redocking speed using two samples one-tailed t-test were carried out and then obtained p-value = 0.04763 so that it can be concluded that the redocking with exhaustiveness 4 is faster than exhaustiveness 8.

**Keywords:** Validation; Optimization; DFU; MMP-9; 4H3X.pdb

