INTISARI

Stabilitas obat protein seperti *Human Serum Albumin* (HSA) merupakan aspek krusial dalam praktik klinis, karena protein bersifat labil dan mudah mengalami degradasi akibat perubahan lingkungan fisikokimia. HSA banyak digunakan dalam terapi pasien dengan kondisi hipoalbuminemia, syok, atau gangguan volume plasma, sehingga kestabilan sediaan sangat menentukan efektivitas klinisnya. Meskipun HSA diketahui relatif stabil pada suhu di bawah 30°C, perbedaan kondisi penyimpanan antara suhu dingin dan suhu ruang tetap perlu dievaluasi untuk memastikan stabilitas konformasi tiga dimensi, tingkat agregasi, dan kadar protein. Selain itu, proses administrasi melalui selang infus juga berpotensi menyebabkan stres mekanik dan interaksi dengan permukaan plastik yang dapat memengaruhi kestabilan protein. Penelitian ini bertujuan mengevaluasi perubahan struktur konformasi, agregasi, dan kadar HSA setelah simulasi pemberian melalui selang infus dan penyimpanan pada suhu 4 ± 2°C serta 25 ± 2°C hingga 72 jam. Sampel terdiri dari HSA liofilisasi yang dilarutkan dalam *Phosphate Buffered Saline* (PBS) pH 7,4 dan produk infus HSA komersial. Evaluasi dilakukan menggunakan spektrofotometri UV-Vis turunan kedua dan spektrofluorometri untuk mengamati perubahan lingkungan mikrokimia asam amino aromatik tirosin dan triptofan, serta pengukuran turbiditas, indeks agregasi, dan kadar protein secara kuantitatif. Hasil menunjukkan bahwa penyimpanan pada kedua suhu tidak menyebabkan perubahan signifikan terhadap konformasi protein dan kadar HSA. Namun, agregasi lebih cepat terjadi pada suhu 25 ± 2°C. Simulasi administrasi selama 4 jam juga menunjukkan HSA relatif stabil dan proses administrasi tidak mengubah stabilitas secara signifikan. Selain itu, HSA komersial menunjukkan penurunan stabilitas setelah vial dibuka dan disimpan selama 4 jam. Temuan ini menekankan pentingnya pengaturan suhu dan durasi penggunaan untuk menjaga kestabilan HSA dalam praktik klinis.

Kata kunci : *Human Serum Albumin* (HSA), Stabilitas in-use, Setting klinis, Agregasi Protein, Konformasi 3 Dimensi.

ABSTRACT

The stability of protein-based drugs such as Human Serum Albumin (HSA) is a critical aspect in clinical practice, as proteins are inherently labile and prone to degradation due to physicochemical environmental changes. HSA is widely used in the treatment of patients with hypoalbuminemia, shock, or plasma volume disturbances, making the stability of its preparation essential for clinical efficacy. Although HSA is known to be relatively stable at temperatures below 30°C, the differences in storage conditions between cold and room temperature need to be evaluated to ensure the stability of its three-dimensional conformation, degree of aggregation, and protein content. Additionally, the administration process through infusion tubing may introduce mechanical stress and interactions with plastic surfaces that can compromise protein stability. This study aims to evaluate the changes in conformation, aggregation, and HSA concentration following simulated administration through infusion tubing and storage at $4 \pm 2°C$ *and* $25 \pm 2°C$ *for* up *to 72 hours. The samples consisted of lyophilized HSA reconstituted in Phosphate Buffered Saline (PBS) pH 7.4 and commercial HSA infusion product. Evaluation was conducted using second derivative UV-Vis spectrophotometry and spectrofluorometry to observe microenvironmental changes in aromatic amino acids tyrosine and tryptophan, along with quantitative measurements of turbidity, aggregation index, and protein concentration. Results showed that storage at both temperatures did not cause significant changes in protein conformation or HSA concentration. However, protein aggregation occurred more rapidly at* $25 \pm 2°C$*. The 4-hour administration simulation also demonstrated that HSA remained relatively stable, and the administration process did not significantly affect its stability. Furthermore, commercial HSA product exhibited reduced stability after the vial was opened and stored for 4 hours. These findings underscore the importance of temperature control and time-of-use management to maintain the stability of HSA in clinical settings.*

Keywords*: Human Serum Albumin (HSA), In-use Stability, Clinical Settings, Protein Aggregation.*