



Deteksi Biomarker Koagulase *Staphylococcus aureus* dan Korelasinya dengan Enterotoksin

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INTISARI

Staphylococcus aureus yang diisolasi dari kasus klinis hewan maupun manusia memiliki faktor virulensi koagulase. Koagulase dapat digunakan sebagai biomarker infeksi *S. aureus* yang terjadi pada kaskade koagulasi. Selain itu, *S. aureus* mampu menghasilkan *Staphylococcal Enterotoxin* (SE), yang merupakan superantigen dan eksotoksin gastrointestinal kuat. Toksin ini menjadi salah satu penyebab utama keracunan makanan. Dalam penelitian dilakukan deteksi koagulase secara fenotipik maupun genotipik sebagai biomarker mekanisme infeksi *S. aureus* serta hubungan pola keterkaitan gen penyandi koagulase (gen *coa*) dan gen penyandi *Staphylococcal Enterotoxin* (gen *se*). Sebanyak 49 sampel asal susu mastitis pada sapi dan kambing dan 49 sampel isolat yang berasal dari kasus medis manusia di daerah Yogyakarta telah diidentifikasi berdasarkan gen 23S rRNA dan gen *thermonuclease nuc* sebagai *S. aureus*. Deteksi koagulase dilakukan secara fenotipik dengan uji koagulasi tabung dengan menggunakan plasma kelinci dan secara genotipik dengan teknik *polymerase chain reaction* (PCR). Tipe polimorfisme koagulase *S. aureus* dan identifikasi gen *se* dilakukan dengan cara multipleks PCR menggunakan primer spesifik. Pengujian koagulase secara fenotipik pada 98 isolat, 67 isolat (68%) teridentifikasi sebagai koagulase positif. *Staphylococcus aureus* koagulase positif ditemukan paling banyak pada isolat asal sapi (88%;28/32) diikuti isolat asal kambing (76%;13/17) dan isolat asal manusia (53%;26/49). Deteksi koagulase secara molekuler menunjukkan seluruh 98 isolat memiliki gen *coa* (100%) menunjukkan akurasi pengujian secara molekuler. Berdasarkan deteksi polimorfisme gen *coa* pada 98 isolat *S. aureus* terdeteksi 7 jenis tipe gen *coa* (I, II, III, V, VI, VII, VIII). Tipe koagulase isolat *S. aureus* asal manusia paling tinggi adalah tipe II (61%;30/49), sedangkan isolat asal sapi adalah tipe VII (44%;14/32) dan tipe V (35%;6/17) pada isolat asal kambing. Strain *S. aureus* tipe gen *coa* II asal manusia memiliki satu atau lebih gen *se* (*sea*, *seb*, *sec*, *seh*) dengan presentase tertinggi pada gen *sec* tunggal (33,4%;10/30). Pada isolat *S. aureus* tipe gen *coa* VII asal sapi ditemukan gen *sea*, *sec* dan *seh* dalam bentuk tunggal maupun kombinasi dengan presentase tertinggi kombinasi gen *sea*, *sec*, *seh* dan gen *seh* tunggal (masing-masing 36 %;5/14). Dari 17 isolat asal kambing terdapat 6 isolat (35%) memiliki gen *se*, diantaranya terdapat 2 isolat dengan tipe gen *coa* VII mempunyai kombinasi gen *sea*, *sec*, dan *seh* mirip pada isolat sapi. Hasil korelasi antara tipe koagulase dengan enterotoksin, mengindikasikan bahwa genotipe *coa* II dan *coa* VII mempunyai kemungkinan sebagai strain *S. aureus* yang berpotensi menyebabkan enterotoksikosis.

Kata kunci: Biomarker, Koagulase, Enterotoksin, *Staphylococcus aureus*



Detection of *Staphylococcus aureus* Coagulase Biomarkers and its Correlation with Enterotoxin

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ABSTRACT

Staphylococcus aureus isolated from clinical cases of animals and humans can secrete coagulase. Coagulase can be used as a biomarker of *S. aureus* infection that occurs in the coagulation cascade. In addition, *S. aureus* can produce Staphylococcal enterotoxin (SE), a potent gastrointestinal superantigen, and exotoxin. This toxin is one of the leading causes of food poisoning. The detection of coagulase, both phenotypic and genotypic, as a biomarker of the mechanism of *S. aureus* infection and the relationship between the pattern of association of the coagulase coding gene (*coa* gene) and the gene encoding staphylococcal enterotoxin (*se* gene) will be carried out in this study. Forty-nine samples from mastitis milk in cows and goats and 49 isolates from human medical cases in Yogyakarta were identified based on the 23S rRNA gene and the *nuc* gene as *S. aureus*. Coagulase detection was carried out phenotypically by coagulase test tube using rabbit plasma and molecular detection of coagulase by amplifying the *coa* gene using the polymerase chain reaction (PCR) technique. The type of *S. aureus* coagulase polymorphism and identification of the *se* genes was performed by multiplex PCR using specific primers. Among 98 isolates, 67 (68%) were identified as coagulase-positive *S. aureus* by tube test. The most common coagulase-positive *S. aureus* strains were found in cattle isolates (88%;28/32), followed by goat isolates (76%;13/17) and human isolates (53%;26/49). Molecular detection of coagulase showed that all 98 isolates had the *coa* gene. Based on the *coa* gene polymorphism detection in 98 isolates of *S. aureus*, seven types of *coa* genes were detected (I, II, III, V, VI, VII, VIII). The highest coagulase type in *S. aureus* isolates from humans was type II (61%), while isolates from cattle were type VII (44%;14/32) and type V (35%;6/17) in isolates from goats. *S. aureus* strain *coa* II gene type of human origin has one or more *se* genes (*sea*, *seb*, *sec*, *seh*), with the highest percentage being a single *sec* gene (33,4%;10/30). In isolates of *S. aureus* gene type *coa* VII from cattle, *sea*, *sec*, and *seh* genes were found singly or in combination with the highest percentage of combinations of *sea*, *sec*, *seh*, and single *seh* genes (36%; 5/14 respectively). Six (35%) of the 17 goat isolates possessed the *se* gene, and two *coa* VII gene isolates exhibited a mix of *sea*, *sec*, and *seh* genes resembling those found in bovine isolates.. The results of the correlation between coagulase and enterotoxin types indicate that *coa* II and *coa* VII genotypes have the possibility of being *S. aureus* strains that have the potential to cause enterotoxigenesis.

Keywords: Biomarkers, Coagulase, Enterotoxin, *Staphylococcus aureus*