Karakterisasi nosel dengan variasi sudut lubang baffle dan jarak tembak terhadap gaya impak untuk aplikasi gene gun = Characterisation of nozzle through baffle holes angle and shooting distance variations to impact force for application of gene gun

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Abstrak

ABSTRAK
Pengembangan gene gun sebagai instrumen administrasi vaksin intradermal memerlukan banyak penelitian di berbagai hal, salah satunya pada pengaplikasian teknologi nosel terhadap dampak yang ditimbulkan. Pengujian dilakukan untuk mendapatkan desain nosel yang memiliki keluaran gaya impak terendah dengan mengetahui karakteristik nosel melalui pengaruh sudut lubang baffle dan jarak tembak terhadap gaya impak. Variasi nosel yang diuji adalah nosel standar tanpa lubang baffle dan nosel dengan sudut lubang baffle sebesar 30o, 90o, dan 150o. Keempat nosel tersebut diuji pada tiga jarak tembak, yaitu 0 mm, 10 mm, dan 20 mm. Hasil eksperimen dan analisa secara statistik menunjukkan pola yang menyatakan adanya hubungan antara variasi sudut lubang baffle dan jarak tembak terhadap gaya impak dengan adanya indikasi titik jarak tembak optimal untuk tiap variasi nosel dan kecenderungan menurunnya gaya impak seiring dengan meningkatnya besar sudut lubang baffle. Adapun besar gaya impak terkecil dihasilkan oleh nosel dengan sudut lubang baffle 150o pada jarak tembak 0 mm. Metode simulasi komputasi memberikan hasil berupa profil kecepatan dan nilai dari beberapa parameter aliran di dalam dan luar nosel yang menunjukkan bahwa nosel yang digunakan termasuk kategori nosel supersonik.
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ABSTRACT
<i>There have been many researches in demand to develop gene gun as an intradermal vaccine administration instrument. One of those researches is in the application of nozzle technology with its implication. Tests to investigate nozzle characteristics in terms of baffle holes angle and shooting distance variation to impact force have been carried out. Nozzles under test were standard nozzle without baffle holes and nozzle with baffle holes angle 30o, 90 o, and 150 o. These four nozzles were tested at three shooting distances, which were 0 mm, 10 mm and 20 mm. Patterns that stated relationship between the baffle holes angle and shooting distance that generate the impact force have been found through experiments and statistical analysis. They indicated the existence of optimum shooting distance for each nozzles. In addition, the impact force trend is decreasing when the baffle holes angle is widened. It is also discovered that the lowest impact force was generated by nozzle with baffle holes angle 150o with

shooting distance 0 mm. Computational simulations were conducted to investigate the velocity profile and some fluid flow parameter values inside and outside the nozzles. From these, it can be concluded that the nozzles used for the application of gene gun as intradermal vaccine administration instrument should be considered as supersonic nozzle.</i>