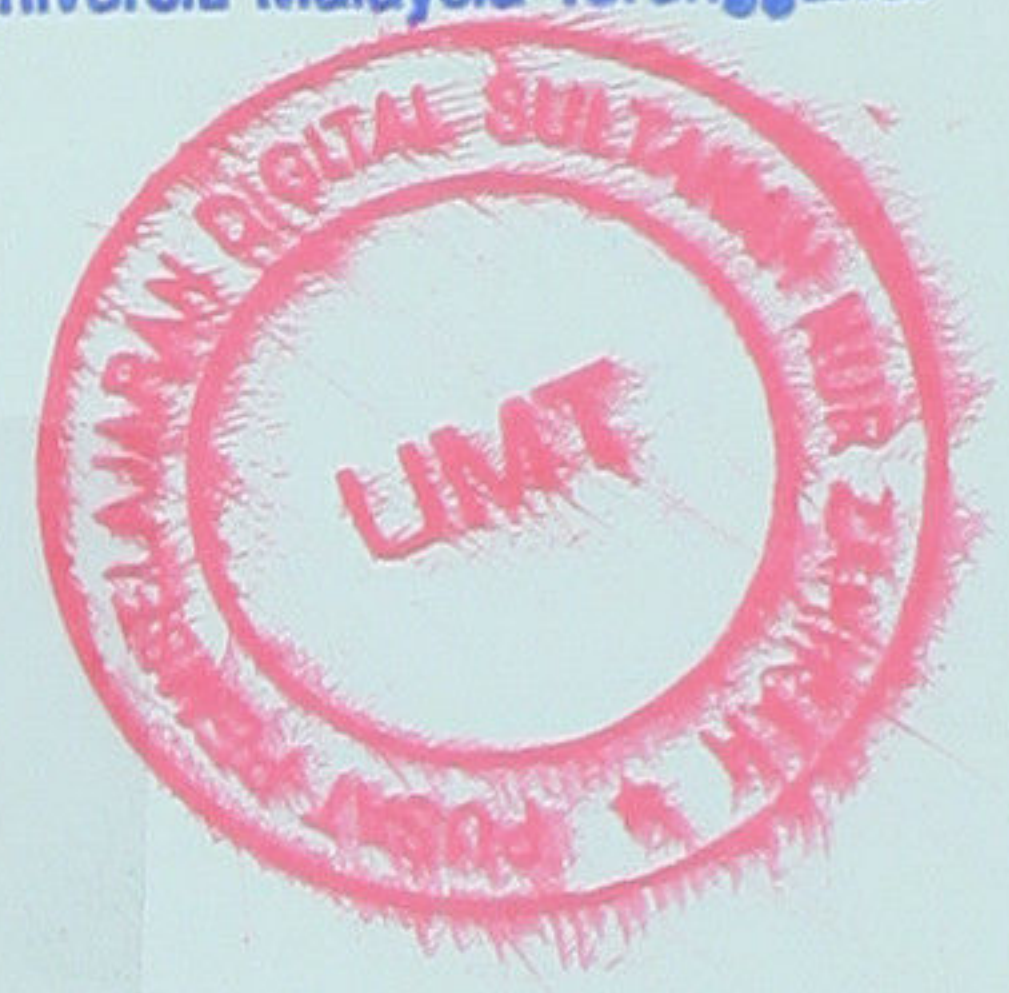


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Pemencilan, pengenalpastian dan risiko Staphylococcus aureus
dan toksinnya dalam makanan sedia dimakan, bahan mentah dan
pengendali makanan / Radhiatul Mardhiah binti Hassan.

PUSAT PEMBELAJARAN DIGITAL SULTANAH NUR ZAHIRAH
UNIVERSITI MALAYSIA TERENGGANU (UMT)
21030 KUALA TERENGGANU

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ISOLATION, IDENTIFICATION AND RISK OF *Staphylococcus aureus*
AND ITS TOXINS IN READY TO EAT FOOD, RAW
INGREDIENTS AND FOOD HANDLERS

RADHIATUL MARDHIAH BINTI HASSAN

PEMUSYKATAN SULTANAH NUR ZAHIRAH
THESIS SUBMITTED IN FULFILMENT FOR THE
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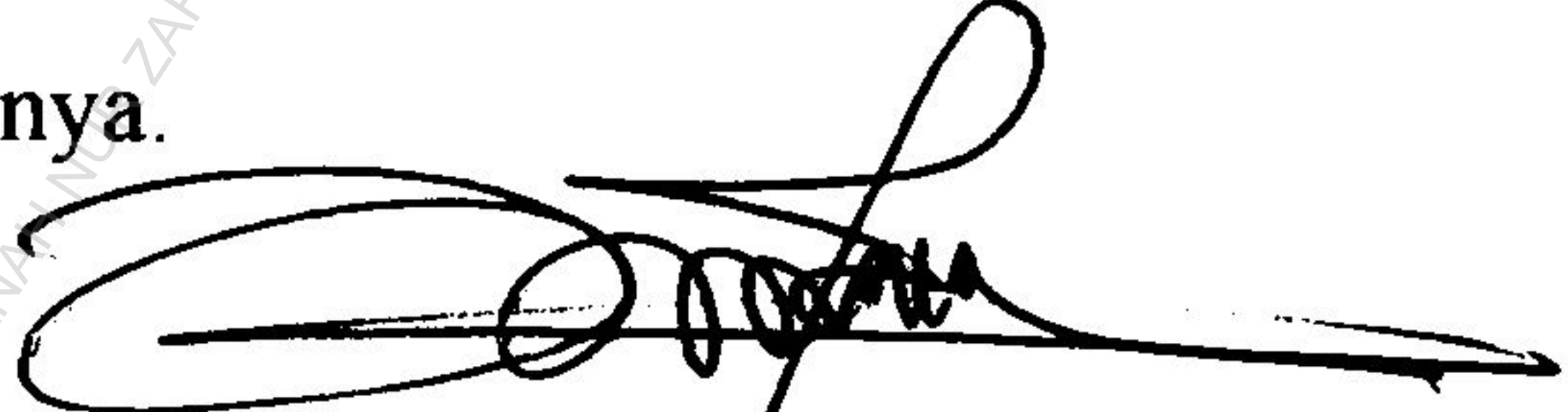
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PENAKUAN

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17 Jun 2013



RADHIATUL MARDHIAH BINTI HASSAN
P31402

ABSTRAK

Kajian ini dijalankan bertujuan untuk memencil, mengenalpasti dan menganggarkan risiko *Staphylococcus aureus* dan toksinnya dalam makanan sedia dimakan (RTE), bahan mentah dan pengendali makanan. Penentuan kualiti mikroorganisma (TPC) dan mikroorganisma penunjuk (koliform, *Escherichia coli*) serta patogenik (*S. aureus*, *Bacillus cereus*, *Listeria monocytogenes*, *Clostridium perfringens* dan *Salmonella* spp.) dilakukan ke atas bahan mentah berprotein ayam, ikan, daging dan udang yang diperolehi dari pasar basah Bangi. Perubahan beban mikroorganisma di sepanjang pemrosesan juga dikenalpasti. Penentuan kualiti mikroorganisma bagi makanan RTE berprotein dari premis gerai, restoran dan katering juga dilakukan. Data sokongan dari swab peralatan dan pengendali makanan turut diambil berserta dengan pemantauan kebersihan premis. Soal-selidik mengenai pengetahuan, sikap dan amalan pengendali makanan dari premis katering masak sejuk juga dijalankan. Risiko jangkitan *S. aureus* di kalangan penumpang penerbangan yang dihidangkan sandwich berinti bahan berprotein ditentukan. Sejumlah 810 pemencilan MPN-PCR yang terdiri daripada 531 sampel sandwich, 207 bahan inti sandwich dan 72 pengendali makanan ditentukan kehadiran *strain S. aureus* yang mempunyai gen termotoleran (*nuc*) dan gen enterotoksin (SE) A hingga E. *Strain* positif gen SE selanjutnya dikelaskan melalui perbandingan corak DNA menggunakan teknik RAPD-PCR dari 3 primer universal iaitu M13, T3 dan T7. Penilaian risiko dijalankan bagi menganggarkan risiko *S. aureus* di kalangan penumpang penerbangan akibat memakan sandwich tuna, sandwich ayam lyoner dan sandwich daging. Beban mikrobiologi dalam bahan mentah berprotein adalah sangat rendah. Semua mikroorganisma patogenik dapat dikesan kecuali *Cl. perfringens*. Proses pemotongan dan pembasuhan tidak menunjukkan perubahan signifikan ke atas beban mikroorganisma kecuali proses perlakuan dapat menurunkan sehingga 4-5 log CFU/g. Premis gerai mempunyai status kualiti mikroorganisma dan skor markah pemantauan premis yang paling rendah, manakala premis katering pula mempunyai status kualiti yang paling baik. Hampir keseluruhan responden (98%) dari katering masak-sejuk mempunyai pengetahuan, sikap dan amalan yang tinggi terhadap pengendalian makanan yang betul. Pengetahuan pengendalian makanan amat mempengaruhi amalan mereka di dapur, manakala sikap tidak mempengaruhi amalan mereka. Keputusan MPN-PCR mengesahkan sebanyak 59.7% daripada 810 pemencilan mempunyai gen termonukleas (*nuc*), manakala 112 pemencilan (13.8%) pula positif gen SE. Produk sandwich mempunyai paling banyak pencilan positif gen SE, manakala bahan mentah dan pengendali makanan masing-masingnya adalah 12 dan 10 *strain*. Keputusan RAPD-PCR dari primer M13 menghasilkan 34 kumpulan *strain* yang dipencilkan daripada pelbagai sumber (sandwich, bahan inti dan pengendali makanan). RAPD-PCR dari primer T7 dan T3 masing-masingnya menghasilkan 13 dan 15 kumpulan *strain*. Setiap tahun dianggarkan seramai 1-4 orang penumpang penerbangan akan mengalami keracunan *S. aureus* akibat memakan sandwich ayam lyoner. Manakala sandwich tuna pula ialah seramai 13-18 orang, sementara sandwich daging pula ialah seramai 7-19 orang. Hasil kajian merumuskan bahawa terdapat kebarangkalian tinggi di mana patogen dipindahkan ke makanan melalui pengendali, bahan mentah dan peralatan yang kurang bersih. Sandwich boleh membawa risiko penyakit bawaan makanan kerana penyediaannya dilakukan terlebih awal dari waktu makan dan dihidangkan tanpa melalui proses rawatan haba. Oleh itu, amalan pengendalian makanan yang bersih dan selamat serta pemantauan suhu dan penambahbaikan yang berterusan adalah penting agar makanan yang dihasilkan mempunyai tahap risiko bahaya yang rendah.

ISOLATION, IDENTIFICATION AND RISK OF *Staphylococcus aureus* AND ITS TOXINS IN READY TO EAT FOOD, RAW MATERIALS AND FOOD HANDLERS

ABSTRACT

A study was conducted to isolate, identify and estimate the risk of *Staphylococcus aureus* and its toxins in ready-to-eat food (RTE), raw materials and food handlers. Determination of microbiological quality (TPC), isolation of indicator (coliforms, *Escherichia coli*) and pathogenic (*S. aureus*, *Bacillus cereus*, *Listeria monocytogenes*, *Clostridium perfringens* and *Salmonella* spp.) microorganisms was done on protein based raw materials of chicken, fish, meat and shrimp obtained from wet markets, Bangi. Changes in the microbiological burden during processing steps were also identified. Determination of microbiological quality in protein based RTE food from stall, restaurant and catering premises was also undertaken. Data supporting from the swabbed equipments and food handlers as well as premises observation were also included. Questionnaire regarding knowledge, attitude and practice was carried out on food handlers in cook-chilled catering. The risk of *S. aureus* among airline passengers that are served with protein based filling sandwiches were determined. A total of 810 isolates from MPN-PCR, consisted of 531, 207 and 72 isolates from sandwich products, sandwich filling and food handlers respectively, were determined for the presence of *S. aureus* with thermotolerant gene (*nuc*) and enterotoxin genes (SEA-SEE). *S. aureus* strains with positive SE genes were further classified by comparing the DNA pattern using RAPD-PCR technique from 3 universal primers of M13, T3 and T7. Risk assessment was carried out to estimate the risk of Staphylococcal infection among airline passengers as a result of consuming tuna, chicken lyoner and tuna sandwiches. The microbiological quality of protein based raw materials were very low. All pathogenic microorganisms were detected except for *Cl. perfringens*. The process of cutting and washing did not show significant changes in the microbiological load except for the cooking process that enable to reduce to 4-5 log CFU/g. The stall premises have the lowest microbiological quality and monitoring scores. Catering premises showed the best microbiological quality status. Most of food handlers (98%) in cook-chilled catering possessed high knowledge, attitude and practice in handling correct food. Food handlers' knowledge were influenced by their practice in the kitchens, although not for their attitude. MPN-PCR results confirmed that 59.7% of 810 isolates have thermonucleas gene (*nuc*), while 112 (13.8%) isolates were positive for SE gene. Sandwich products contained the highest positive strains for SE genes, while the raw materials and the food handlers were having 12 and 10 strains respectively. RAPD-PCR results from M13 primer produced 34 groups of strains, while RAPD-PCR from T7 and T3 primers resulted in 13 and 15 groups of strains respectively. Each year approximately 1-4 airline passengers suffer as a result of eating *S. aureus* contaminated chicken lyoner sandwich. As for tuna sandwich, about 13-18 airline passengers experience staphylococcal poisoning, while meat sandwich may cause about 7-19 passengers to become sick. There is a high probability that the pathogen may transfer to food via unclean operators, raw materials and equipments. Sandwiches will give risk to food borne illness because of advance preparation and serving without heat treatment process. Therefore, safe and hygienic food handling practices as well as temperature monitoring and continuous improvement are important in order to produce food at a low level of hazard risk.