The coagulase-negative Staphylococcus (CoNS) is a group of bacteria that are gaining prominence as emerging pathogens of hospital-acquired infections. One such species is S. capitis, which is now the major cause of bloodstream infection especially in neonatal intensive units. The major virulence factor of S. capitis appears to be its ability to form a biofilm structure. A total of 200 local clinical isolates of CoNS was obtained from the Hospital Tuanku Ampuan Rahimah, Klang in between December 2010 to May 2011. Nine species of CoNS were identified with S. epidermidis, S. haemolyticus, S. hominis and S. capitis being the most prevalent strains. Identification of the isolates by biochemical tests using the Microgen Staph ID kit was less than 50% accurate while identification via the sodA gene sequence provided better discrimination and accuracy. The ERIC-PCR fingerprinting was then used to genotype the CoNS strains and the Discriminative Index (D) was calculated. At D = 0.949, ERIC-PCR can be used with confidence to discriminate between the S. hominis strains. However, low discriminative power (D < 0.9) was observed for S. capitis, S. epidermidis and S. haemolyticus implying that ERIC-PCR fingerprinting is not sufficient to genotype these strains. A multiplex PCR method was successfully developed to probe for the presence of icaABCD operon in a majority of the bacterial strains. At 88%, S. capitis showed the highest ability to form biofilm with a high percentage of these forming dense biofilm structures while the icaABCD operon was found to be present in all of the strains. Biofilm formation was however less frequent in other species, e.g. 39.2% in S. epidermidis, 16.7% in S. hominis and 3.3% in S. haemolyticus. Antimicrobial susceptibility test showed that for S. capitis, the formation of biofilm significantly increased the resistance of the biofilm cells to six types of antibiotics, similar to that reported for S. epidermidis. However, except for the case of ciprofloxacin, the thickness of biofilm did not appear to have any effect on the antibiotic resistance of the cells. Strain S. capitis B102 was selected for screening of novel biofilm-associated genes due to its ability to consistently form a very thick biofilm. Attempts to generate biofilm-defective mutants by transposon-mediated mutagenesis using the bursa aurealis system was however unsuccessful. Comparative genomics of B102 and three other S. capitis strains P27 (a non-biofilm former), B63 (moderate biofilm) and B145 (very strong biofilm) revealed that the S. capitis genome was dynamically shaped by horizontal gene transfer (HGT) via prophages, Staphyloccocal Chromosome Cassettes (SCC) and plasmids. Some mobile genetic elements (MGE) present only in B102 and B145 are found to carry genes implicated in biofilm formation e.g. the Atl autolysin. By comparing the SNP profiles in strains with different biofilm phenotype, a list of seven candidate biofilm-associated genes was obtained. The ability of S. capitis to acquire additional genetic elements via HGT, and its propensity to form robust biofilm which enhances its antibiotic resistance, points to the possibility of this organism evolving into a significant pathogen.

This study focused on the dimensional shrinkage, stability and strength properties of oil palm lumber in relation to sawing pattern and resin impregnation treatments. A total of 26 oil palm trees of high yielding tenera variety were obtained from Sungei Kahang Estate, which is located between latitude N 2°12'24" to N 2°12'55" and longitudines E 103°30'59" to E 103°31'05". The geographical position of oil palm tree in east and west directions was determined and its position was marked onto the trunk before felling. For basic properties, test samples in pith to periphery zone at different tree heights were analysed by using various analytical techniques. All tests were conducted according to standard test procedures. Based on results, basic properties-related parameters that include vascular bundle, moisture content (MC) and basic density of oil palm lumber were highly dependent on the distance in radial plane with tree heights. For dimensional shrinkage, oil palm billets were sawn into lumber scantlings of different nominal sizes using four types of sawing pattern, namely sawing patterns of type A (SP-A), type B (SP-B), type C (SP-C) and type D (SP-D). After drying, the lumber shrinkage in radial, tangential and its cross-sectional area were measured using a mathematical technique of numeral integrations. In general dimensional shrinkage of oil palm lumber from the SP-D sawing pattern was the lowest, followed by the SP-A sawing pattern, while those lumbers sawn using both the SP-B and SP-C sawing patterns were highest (too distorted). With regards the resin treatment, oil palm billets were sawn into lumber scantlings using the SP-D sawing pattern, and dried to 10 ± 2% MC. After drying, dried lumber was impregnated with a phenol formaldehyde (PF) resin using a vacuum infusion system, and followed by a densification process. With the introduction of grooves and channels, the resin flow was dispersed homogenously within the lumber matrix. The dimensional stability of densified resin-treated lumber was determined by measuring its antiswelling efficiency (ASE) while three-point bending procedures were employed for flexural strength properties. A positive ASE value indicated that the PF resin had penetrated into the cell wall and subsequently cross-linked, leading to bulking along interstitial spaces of parenchyma cells. The flexural strength of densified resin-treated lumber was significantly stronger than those lumbers devoid of PF resin, which in turn, was related to their basic properties-related parameters. These results collectively should provide some insight to the understanding of factors that influence the physical and mechanical properties of oil palm trunk, which when combined with a corresponding changes in material handling and processing may point the way forward to a satisfactory conversion and efficient utilisation for sawn lumber productions. Apart from sawn lumber products, information on variation in physical and mechanical properties as a function of the bole position along its radial plane with tree heights could assist to segregate billets from different sections of oil palm trunk for biocomposites such as plywood.