iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** VI **Month of publication:** June 2019

DOI: http://doi.org/10.22214/ijraset.2019.6292

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

Occurrence of Staphylococcus Aureus in Food Stuffs

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Abstract: ***Methicillin-resistant Staphylococcus aureus (MRSA) infection is one of the leading causes of hospital-acquired infections and is commonly associated with significant morbidity, mortality, length of stay, and cost burden.Although Staphylococcus is a common bacterium that resides on skin and in nasal passages, it can cause infections if it enters the body through a cut in the skin, and these infections can be serious. MRSA infections can occur among hospitalized patients who undergo surgery or who have suppressed immunity; however, they also increasingly occur among non-hospitalized patients who are otherwise healthy.Although identification and prevention techniques have improved, MRSA remains a major healthcare issue. MRSA bacteria can be challenging to manage, especially in patients at high risk of complications or in those with toxigenic or multidrug-resistant strains. Early identification of MRSA is an important step toward timely implementation of appropriate treatment. The development of new molecular and immune-chromatographic testing technologies has the potential to dramatically shorten delays to diagnosis and treatment. In addition, novel antibiotic therapies are becoming available to provide effective alternatives for strains that have acquired resistance to existing drugs.***
Keywords: Staphylococcus aureus; Methicillin-resistant; infection; Antibiotics; Treatment

I. INTRODUCTION

Staphylococcus aureus is Gram-positive, spherical bacteria have a diameter of 1µm - 1.3µm. on microscopic examination, the organisms seem in clusters, similarly bunches of grapes. Toxins are produced by way of a few strains while growing in meals. These pollutants can cause gastrointestinal disorder normally called Staphylococcal food poisoning. The enterotoxin produced by using S. Aureus is a heat-solid protein that resists heating at one hundred °C for 30-70 min. S. Aureus is also liable for food-borne infections [1].

Staphylococcal food poisoning is usually characterized by self-limiting gastrointestinal symptoms, but sometimes the infection can be more serious or indeed deadly [2]. S. aureus is ubiquitous within the environment and it is also one of the major causes of bovine mastitis [3]. In this manner, crude milk and crude milk dairy products may be contaminated with S. aureus, due to the shedding of large segments of the life form into milk [4, 5]. Besides, cheese-makers may carry enterotoxin-producing S. aureus in their noses or on their hands and the need of proper sterile measures during food preparing increments the probability of contamination with S. aureus, particularly in small-scale artisanal dairies [6]. Without a doubt, dairy items are among the foods most commonly involved in Staphylococcal food poisoning outbreaks [2, 7]. 23 different Staphylococcal Enterotoxins have been depicted and many S. aureus strains harbour more than one SEs gene. SEs can be separated into typical types (i.e. A to E) and new variants classified at present as SEs or SEs-like (SEls) based on their capability to cause emesis. SEs are synthesised when S. aureus cell density reaches 105 - 108 cfu g-1 . However, all of these toxins are heat-stable and can therefore be still present in the food even when the microorganism is inactivate or the contamination level is reduced by processing [2]. Among S. aureus strains, those that are Methicillin-resistant (MRSA) have spread within the final decades as hospital-acquired pathogens (HA-MRSA) all through the world, causing serious life-threatening infection not responding to a lot of antimicrobial treatment. More recently, community-acquired (CA-MRSA) and livestock-associated (LA-MRSA) MRSA have too developed [8]. MRSA have been identified in different foods worldwide, and several food-borne MRSA outbreaks have been reported demonstrating the zoonotic risk of transmission to humans [9]. The screening of S. aureus isolates from food of animal origin is therefore essential to estimate the MRSA emergence and the related zoonotic hazard [8].

Methicillin-resistant Staphylococcus aureus has been recognized as major cause of healthcare-associated contaminations around the world. Methicillin-resistant Staphylococcus aureus strains emerge to have been transferred from health care settings into the community and have developed as particularly associated with community-associated diseases in people [10]. Moreover, in recent year, Methicillin-resistant Staphylococcus aureus has been distinguished as an emerging pathogen in livestock and companion animals, as well as a few other farm animal species [11].

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In addition, S. aureus is considered one of the most important contributory infective agent of mastitis in dairy cattle [12, 13]. Generally, methicillin is not utilized for treatment of mastitis but MRSA has been recovered from dairy cattle and it has been separated from milk. Additionally the presence of MRSA within the environment might too be one of the sources of MRSA contamination in creatures since it may survive for a few months [14].

This study was conduct to review the prevalence of S. aureus enterotoxins in food, milk and dairy foodstuffs.

II. REVIEW OF LITERATURE

A. General Description

Staphylococcus aureus may be Gram-positive microbes, broadly predominant in nature. It can be separate from many environmental sites (e.g., clean, water, discuss, defecation). Approximately 20 to 60% of people are found permanent or intermittent carriers of *S. aureus* and related sites include the front nacres, maxillae, perineum and vagina [15, 16].

S. aureus is also an essential food-borne pathogen. Staphylococcal food poisoning is cause by drinking of food containing one or more preform enterotoxins (SEs) delivered by *S. aureus*. Staphylococcal food poisoning positions third among reported food-borne infections within the world [17]. In 2006, *S. aureus* toxins were responsible for 49% of 482 human food-borne outbreaks caused by bacterial toxins and 4% of all reported outbreaks reported by EU Member States (EFSA, 2007). Side effects have a fast onset and include nausea, vomiting and diarrhoea [18].*Staphylococcus aureus* Food Poisoning is a common cause of food-borne infection around the world. Of specific relevance is the capacity of a few *Staphylococcus aureus* strains to craete heat stable enterotoxins that cause Staphylococcal food poisoning, which positions is one of the mainly predominant around the world causes of gastroenteritis [19]. The significance of the enterotoxins comes due to their heat stability and their resistance to inactivation by gastrointestinal proteases like pepsin. Although Staphylococcus can be killed at standard cooking temperature, the toxins continue active [20].

B. Historical Background Of MRSA

Alexander Fleming conducted a research and reported the bactericidal impacts of a fungal contaminant that produced penicillin against *S. aureus* developing on culture plate [21]. A mass manufacture of the drug from vats of corn steep fluid developing on the mold was preceded due to the high mortalities in World War II [22]. Hence, there was a sensational drop in death rates from bacterial pneumonia and meningitis in World War II compare to World War I. This led to the improvement of penicillin as the primary key driver in select for resistant *S. aureus*. In 1940, active β- lactam ring enzyme was described in Escherichia coli that are capable of hydrolyzing the penicillin. This enzyme was named penicillinase [23] whereas in 1944; penicillinase was also revealed in the *S. aureus* [24]. In 1948, it was observed that over 50% of staphylococcal recovered from patients in a hospital were resistant to penicillin [25].Since at that point to date, 90 to 95% of *S. aureus* strains around the world is penicillin safe, with the plasmid encoded penicillinase readily transferable through transduction or conjugation. A penicillinase-resistance penicillin recognnized as methicillin was presented in 1959 to conflict penicillin-resistant *S. aureus*, but inside a year, Professor Patricia Jevons report the ealiest human *S. aureus* strain methicillin safe in United Kingdom hospital [26]. In year 1968, United States record the primary epidemic of Methicillin-resistant *Staphylococcus aureus* [27] whereas within the 1970s, *S. aureus* strains contain safe to most penicillinase-stable penicillins. It was first unspecified to be an infection of human origin until MRSA was first isolated in 1972 in a mastitic bovine. After that, report of MRSA disease become establish in domestic and wild animals [28].

C. Colonization

S. aureus procured scince an external source could be the cause of a contamination when inoculate into an open enjury. More frequently, the human have is infected by microbes that colonized her or his skins or mucosal surface [29]. The mucosal surface so as to harbor *S. aureus* contains nose, throat, vaginal divider, and gastrointestinal tract. Nasal carriage is likely most critical since nose-picking may successfully spread the bacteria to other body surface and other hosts. Remarkably, 20% of people are persistently colonized within the nose and 30% are breifly colonized. The explanation of persistent and transient carriage varies according to the study, for the most part is depicted as a single positive culture on a nasal swab (transient) versus at least two continuous positive culture one week apart (persistent). Colonization is also more frequent among younger children, and patients with HIV and diabetes [29].Though colonization inclines an individual to *S. aureus* contamination, one study shows that following nosocomial infection, colonized people have less serious *S. aureus* disease compare to non-colonized individuals [29], whether colonization may bring on low-level adaptive resistance so that consequent infections become milder. In support of this view, a study showed that carriage of *S. aureus* harboring the Toxic Shock Syndrome Toxin (TSST) is related with manufacture and preservation of antibody to the toxin

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[30]. Alternately, most persons who obtain Staphylococcus toxic shock syndrome do not have antibody to Toxic Shock Syndrome Toxin (TSST).

Once colonization is recognized, *S. aureus* is located in close to the, ears, mouth, throat and sinus; yet, shockingly nasal carriage infrequently leads to overt contamination of these sites. Studies of *S. aureus*regulation recommend that during colonization, many *S. aureus* virulence genes may be down regulated [31]. Among the genes that control *S. aureus* colonization and virulence, the best identified global regulator is the accessory gene regulator *agr* which has been describe in details in many excellent reviews [31]. Briefly, *agr* is a majority detecting locus, which directly controls expression of a number of virulence and colonizing factors. Down regulation of *agr* is related by colonization and activation of *agr* with host attack.

D. Pathogenesis

S. aureus are one the most common bacterial infection in humans and are the causative agents of multiple human infections, including bacteremia, infective endocarditis, skins and soft tissue infections (e.g., impetigo, folliculitis, furuncles, carbuncles, cellulitis, scalded skin syndrome, and others), osteomyelitis, septic arthritis, prosthetic device infections, pulmonary infections (e.g., pneumonia and empyema), gastroenteritis, meningitis, toxic shock syndrome, and urinary tract infections [32]. Depending on the strains involved and the site of infection, these bacteria can cause invasive infections and/or toxin-mediated diseases [33]. The pathophysiology varies greatly depending on the type of *S. aureus* infection [32]. Mechanisms for evasion of the host immune response include the production of an antiphagocytic capsule, sequestering of host antibodies or antigen masking by Protein A, biofilm formation, intracellular survival, and blocking chemotaxis of leukocytes [34]. endocarditic, sepsis, as well as toxic shock syndrome [35].Binding of the micro organism to extracellular matrix proteins and fibronectin in infectious endocarditis is mediated by way of bacterial cellular wall-related proteins together with fibrinogen-binding proteins, clumping elements, and teichoic acids [33]. Also, Staphylococcal superantigens (TSST-1 or poisonous shock syndrome toxin 1) are essential virulence elements in infectious endocarditic, sepsis, in addition to poisonous shock syndrome [35]. Pneumonia infections are related to the bacterial production of PVL (Panton-Valentine leukocidin), Protein A, and alpha-hemolysin, and infections are extra not unusual following influenza virus contamination in addition to a prognosis of Cystic Fibrosis. Prosthetic tool infections are often mediated with the aid of the capability of *S. Aureus*strains to form biofilms in addition to speak the usage of quorum sensing in a bacterial cellular density-established manner [36].

III. EPIDEMIOLOGY OF MRSA IN INDIA

There has been a sluggish increase in the number of reports describing MRSA in India over years (Center for Disease Dynamics, Economics & Policy (CDDEP). Varied costs of MRSA infection were reported, from ruralto urban, from paediatric to geriatric, and from easy pores and skin infections to critical sepsis instances. Several studies have mentioned the prevalence of MRSA in healthcare employees. The MRSA carriage fee amongst healthcare employees in hospitals, especially amongst individuals who were worried in vital care areas, became reported to be from 10 to 14.3% [37]. The isolation rate for MRSA from outpatients ward inpatients and intensive care units (ICUs) were 27%, 49% and 47%, respectively, in 2009. The majority of *S. Aureus* isolates were obtained from patients with SSTIs, observed through the ones affected by bloodstream infections and respiration infections [38].

According to a current examine, the frequency of 45% of *S. Aureus* clinical isolates being methicillin-resistant in India within the early 2010s is similar to what has been mentioned in the rest of the Asian countries (forty one.9% in Pakistan, forty five.8% in China, 41% in Japan, 35.3% in Singapore and 55.9% in Taiwan), except Hong Kong, Indonesia (28% every) and South Korea (>70%) [39]. Similar to global traits, but, MRSA in India has been located to be of geographically various origins [40].

Initial research of medical samples from hospitals showed that the incidence of HA-MRSA changed into as low as 6.9% in 1988 [41], however improved to 27%, 32%, 42.5% and 47% in Mumbai, Vellore, Delhi and Bengaluru, respectively, via the overdue 1990s [42]. Infections with CA-MRSA have been reported in school children and in healthful individuals both from rural and urban regions [43]

IV. CONCLUSION

Foodborne pathogens like toxigenic *S. Aureus* can without problems be transmitted via the food made from raw milk under not noted hygienic situations. Animal-related strains of MRSA isolation from specific dairy products like raw milk or a raw-milk cheese has said global. This observe find out the status of the MRSA present in milk and dairy products to be had in Northern India. Considering the final results of this examine a control strategy can be developed to save you and control the harmful results of MRSA on public health in factor of our country. In conclusion, our findings discovered that the milk and dairy product sold in and around Ghaziabaad city are contaminated with multidrug resistant *S. Aureus* which are very alarming for both human and animal fitness.

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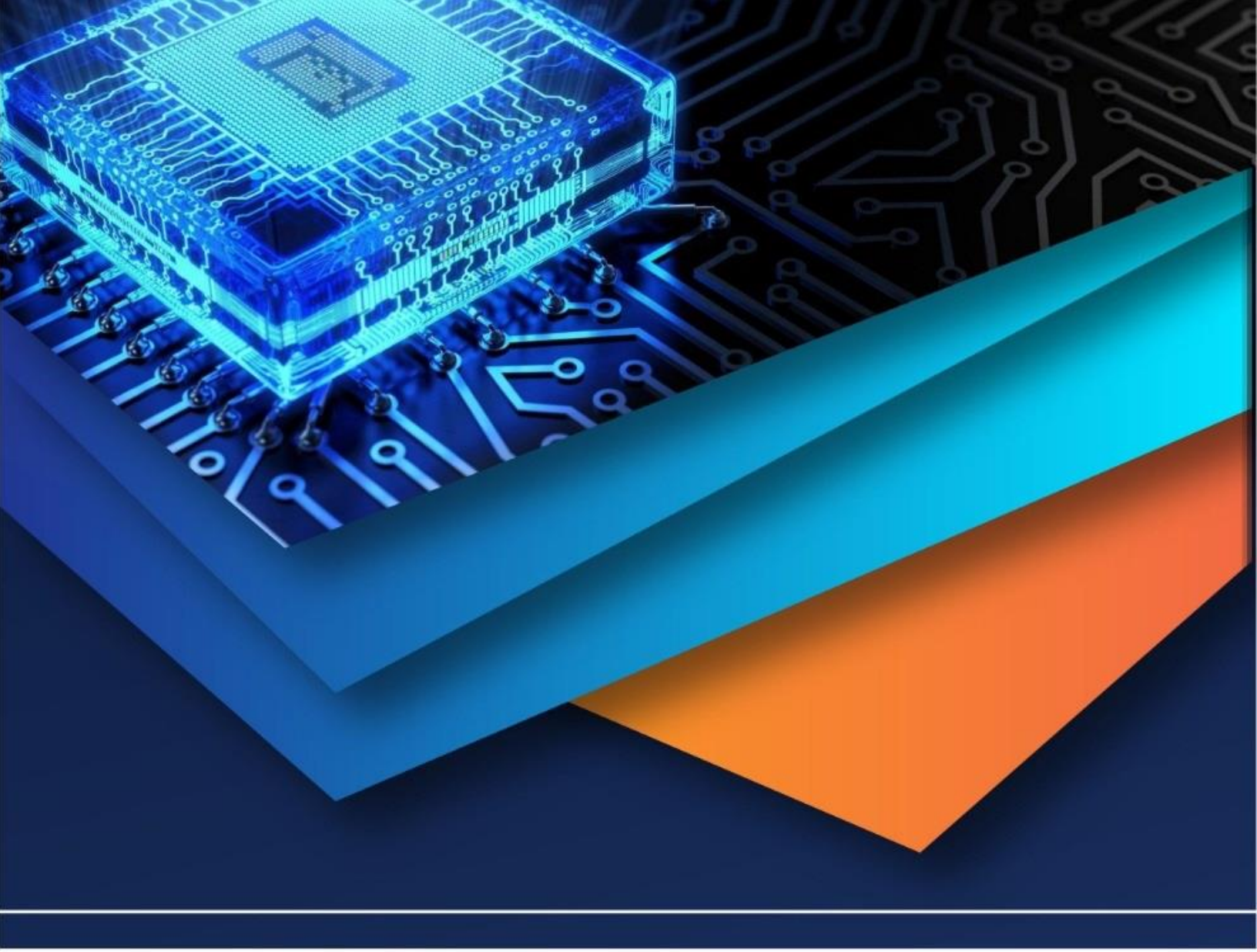
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