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RESEARCH ARTICLE

THE ROLE OF CHLORINATED PARAFFIN WITH EPOXY RESIN FABRIC AS ANTIBIOTIC PLASTIC.

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Abstract

In this paper , the chlorinated paraffin was added to epoxy resin fabric with different weight percentage ratios (1%,3%,5%,7%,10%, 15%) . All samples were molded in traditional mold ,and they were milled as a powder in the same ratios, and then added to suitable culture food media for two types of bacteria Escherichia Coli and Staphylococcus aurous. An antibiotic of chlorinated paraffin in epoxy fabric was determined as a function of it's concentrations. We found that the number of colonies of Escherichia Coli decrease with increasing percentage ratio of chlorinated paraffin. Also, the number of colonies of Staphylococcus aurous decrease with increasing percentage ratio of chlorinated paraffin .

Introduction:-

Composite materials are being used in almost every type of applications in our daily life and its usage continues to grow at an impressive rate[1]. Multifunctional epoxy resins have been used for many important applications such as adhesives ,semiconductor encapsulates , and matrix resins for advanced fiber composites due to their high thermal resistance, high tensile strength and modulus, and good chemical resistance [2] .Epoxy resins are routinely used as coatings, casting materials ,potting compounds, and binders .Some of their most interesting applications are found in the aerospace and recreational industries where resins and fibers are combined to produce complex composite structures.[3]

The word *plastic* is a technical term, not always meaning simply a polymer, but also the system of additives used during the production process. Only a few clear polymers are known to have antimicrobial effect, and their activity is low. The antimicrobial property of a plastic is usually achieved by blending with antimicrobial agents, and the migration rate and velocity properties of these additives are the key factors of the effectiveness.[4]

Antibiotics can be divided to two groups on the basis of their effect on microbial cells through two main mechanisms, which are either bactericidal or bacteriostatic. Bactericidal antibiotics kill the bacteria, while the bacteriostatic antibiotics inhibit the growth of bacteria. The effect of bacteriostatic antibiotics is reversible .If an antibiotic is removed before the immune system can eliminate the bacteria, the bacterial growth will begin again. We can also classify the antibiotics as broad spectrum or narrow spectrum , A broad spectrum antibiotic is effective on many different bacteria, while a narrow spectrum drug only attacks a limited variety of pathogens .[5]

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Chlorinated paraffin
Chlorinated paraffin (CPs) are complex technical mixtures consisting of carbon atoms from C10 to C30 . They belong to the last large group of high molecular weight chlorinated hydrocarbons in commercial use in terms of quantities produced, and are used for a variety of industrial purpose .[6]

The aim of this investigation
The main goal of this paper is to study the role of chlorinated paraffin in retarding the growth of two types of bacteria (Escherichia Coli and Staphylococcus aurous) .

The Historical Review
Eva Kun and KalmanMarossy (2013) .comparison between methods that are used to evaluate the antimicrobial efficiency of the plastics. In this work they intended to collect these methods together and compare.[4]
SilvieBernatová,and his team (2013) studied the mechanisms of bacteriostatic versusbactericidal action Using Raman Spectroscopy.[5]

M.F. Fernandez and J. P. Arrebola have studied the role of Chlorinated derivatives in adipose tissue in women in Spain - Granada University [7]. Elizabeth R. Barnhart and Donald G. patterson have studed the Chlorinated Derivatives of Dibenzo-*p*-dioxin and Related Compounds for Use as Reference Compounds in method Development and Environmental Toxicology[8].

Escherichia Coli
E. coli is the species of Escherichia usually isolated from human specimens. It is a motile bacterium, facultative anaerobe with or without a capsule. E. coli is associated with urinary tract infections, diarrheal diseases, bacteremia, and meningitis, caused primarily by a limited number of pathogenic clones. The normal habitat of E. coli is the gut of humans and animals and the common route of infection is by contact and ingestion (oral-fecal).[9]

The widespread species Escherichia coli includes a broad variety of different types, ranging from highly pathogenic strains to a virulent isolates. Pathogenicity correlates with the expression of disease-related factors that are present in pathogenic bacteria, but are generally absent from nonpathogenic species. The pathogenic E. coli is divided into those strains causing disease inside the intestinal tract and others capable of infection at extra-intestinal sites. Due to the ease of access of pathogens ingested with food, the human gastro-intestinal tract is susceptible to diarrhoeagenic E. coli infections. Several E. coli pathotypes have been implicated with diarrhea illness, a major public health problem worldwide. This review deals with different strategies regarding E. coli as a pathogen and the virulence traits of its pathotypes highlighting the species as a specialized pathogen. [10]

Staphylococcus aurous
The name Staphylococcus, Latinized Greek for ‘grape-like berry’, was invented by Sir Alexander Ogston in1882 , who also was the first person to describe the species now known as Staphylococcus aureus and convincingly demonstrate its ability to form pyogenic abscesses in humans[11].

The ability of Staphylococcus aureus to adhere to the extracellular matrix and plasma proteins deposited on biomaterials is a significant factor in the pathogenesis of orthopaedic-device related infections. S. aureuspossesses many adhesion proteins on its surface, but it is not known how they interact with each other to form stable interactions with the substrate.[12]

Experimental Work
Materials:-
Epoxy resin
The epoxy resin used in this experiment was (650)

Hardeners
The 207- hardener used in the experimental work was added in (3:1) ratio ,in room temperature .

Chlorinated paraffin

The hardener /Epoxy ratio

The Epoxy resin and the hardener were mixed together in different in specific ratio mentioned above, the ratio selected depended on stoichiometry of epoxy resin .

The mold used

The mold used to cast the epoxy resin and chlorinated paraffin is shown in figure (1) . this mold is rectangular with the dimension of 150x150x3 mm^3 the mold is made from transparency glass with 3 mm thickness .

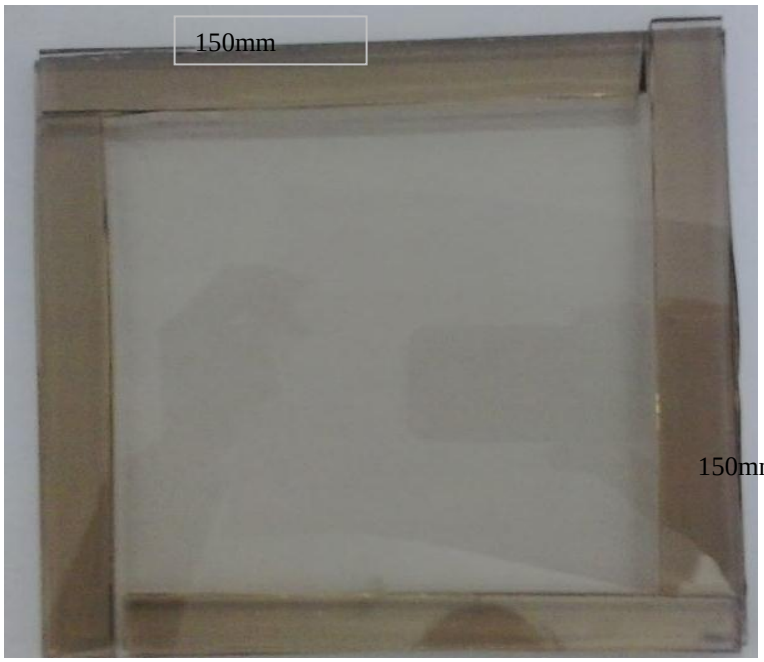

Fig 1:-mold used for casting the Chlorinated paraffin and epoxy resin

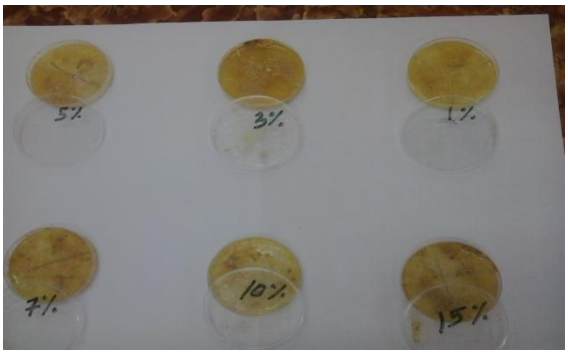

Fig 2:-suitable culture food media for Staphylococcus aurous

Results and discussion:-

The Fig. (3) represented the relation between the percentage weight of Chlorinated paraffin in the Epoxy resin fabric and the number of colony of Escherichia coli ,shows that the numbers of colony decrease with increasing of percentage weight of chlorinated paraffin in Epoxy fabric ,while Fig.(4) represented the relation between the percentage weight of Chlorinated paraffin in the Epoxy resin fabric and the number of colony of Staphylococcus aurous, illustrates that the numbers of colony of Staphylococcus decrease with increasing of percentage weight of chlorinated paraffin in Epoxy fabric. Therefore chlorinated paraffin may be used as antibiotic plastic as containers for miscellaneous foods.

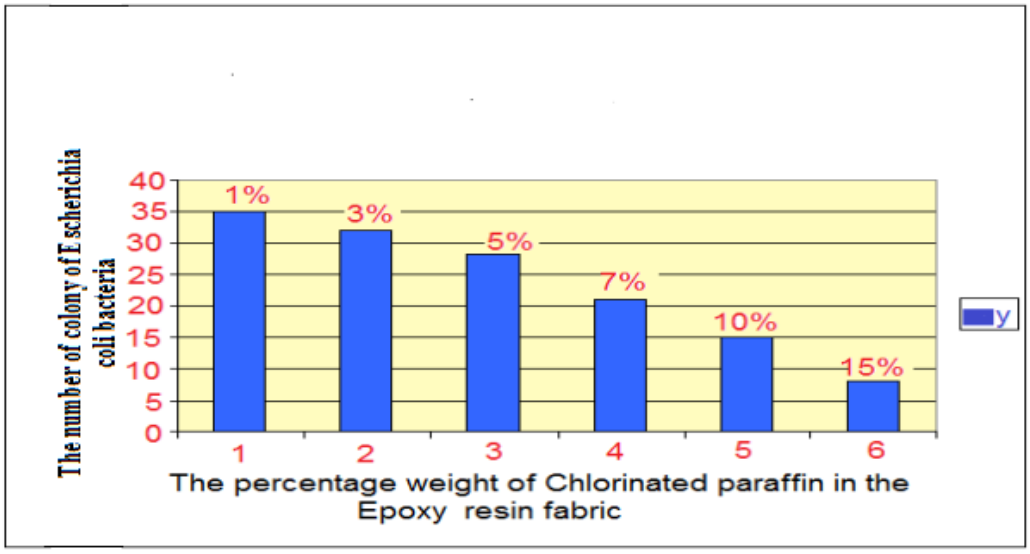

Fig 3:-The relationship between percentage weight of chlorinated paraffin andthe number of colony of Escherichia coli bacteria

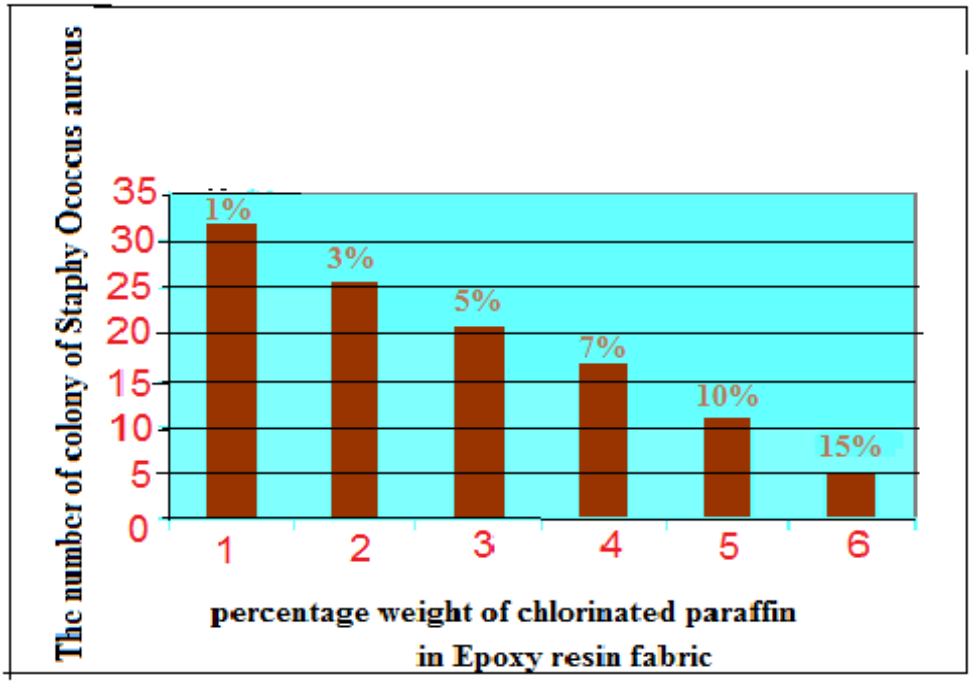

Fig 4:-The relationship between percentage weight of chlorinated paraffin and the number of colony of StaphyOcoccusaureus

Conclusion:-

An inhibition effect of chlorinated paraffin against two types of bacteria that are used in this paper, was appeared in Fig.(3&4). The number of colony of two types of bacteria "Escherichia coli and StaphyOcoccusaureus" decrease with increasing of percentage weight of Chlorinated paraffin in Epoxy). Hence , Chlorinated paraffin may be used with an other polymers as antibiotic materials in miscellaneous applications . Finally, we can say that there are many fields of the efficiency of antibiotics plastic, so we have to carry a very high level of foresight and carefulness. Especially, with regard to human health, in a medical application.

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