REVIEW OF LITERATURE
Burn remains a major health problem throughout the world. Over the years there has been progressive refinement in the treatment of burns. All researches are being oriented at promoting wound healing and decreasing chances of septicaemia.

In ancient era, the initial modalities of treatment were greatly different like boiled cow dung (Papyrus, 1500 B.C.), mixture of gum with red archo of the bark of fig tree (Sushruta), a mixture of gum or goat hair. Milk from a lady who had given birth to a son by Egyptian (5th and 6th century). Tincture and extracts from tea leaves (Chinese and Japanese, Honey and Bran, Vinegar and wine (Romans), a mixture of white lead, oil of roses and wax (Rhozer, 586-920 A.D.), Vinegar and chalk (David Clighrom, 1792).

Pressure dressing as a mode of treatment was suggested by Edward Kentish (1797) to relieve pain and to stop blister formation. Cold water acts as a good analgesic and prevents oedema formation. This was recognised by Sir James Earle (1799). Penwatt (1856) suggested the use of saline bath for local management of burn wounds.

Joseph Lister (1868) heralded carbolic acid use in treatment of burn. The disadvantage of carbolic acid (2.5%) was local gangrene converting primary partial thickness burn into full thickness burn. The local
absorption of carbolic acid causes nausea, vomiting, muscle twitching, excitement, weakness, hypotension and perspiration. The time of 1885 to 1910 was the carbolic acid era.

Wet dressing initially with sodium bicarbonate and boric acid or picric acid was advocated by Oppenheimer (1906). Macleennan (1903) and Elliol recognised that the picric acid absorption from local site may causes nausea, vomiting, diarrhoea, tachycardia, fever, renal failure and coma. On the other hand, boric acid may cause rashes with desquamation of skin, restlessness, confusion, weakness, hypothermia, hypotension tachycardia and renal failure.

Dewitson (1894–1933) advocated the use of tannic acid application on burn surface in 1925 at the Henry Ford Hospital. Later on in 1944 Maclus of the same hospital described it as a hepatotoxic agent and attributed many deaths to it.

Aldridge (1933) had tried using gention voilet as an escharoclytic agent on burn surface.

In early 1940's world war II acted as a launching pad for further advancement in the management of burn. Allen and Koch (1942) introduced the use of petroleum gauze piece locally.

In 1940’s the interest developed in the exposure method of treatment in burn injury. Exposure causes drying of wound and inhibition of bacterial proliferation. Besides this, ultraviolet light also acts as a deterrent to bacterial growth.
The credit for reintroduction of exposure method as modality for treatment of burn goes to Wallace (1949) of Edinburgh and Pulak Artzi and Blocker (1950) of U.S.A. Later on other surgeons accepted the same method with a view that the formation of crust aids in the creation of a physiological covering of the burn wound thus reducing the disadvantages of the raw areas.

The world war has heralded a new era in the treatment of infections with the development of antibiotics like Penicillin and other associated compounds. The simultaneous progress in other fields like improvement in the microbiological techniques, culture media etc. aided in identifying the organisms responsible for death. The principal cause of death was septicaemia and organism responsible was staphylococci (Ludburg Reise and Artzi, 1953).

The major cause of death in burns is still septicaemia. This is because of absorption of toxins from burn surface which has been colonized by micro-organism for restoration of impaired barrier advent the discovery of biodressings.

If an ideal skin substitute could be discovered it could bring about a drastic change in the outlook to the treatment of burns. Eschar could be excised in the early post burn period and then can be covered with a skin substitute.

An ideal skin substitute should possess the following properties.
1. Should not be antigenic.
2. Should adhere rapidly and strongly with the underlying raw areas.
3. Should have water vapour characteristics like that of normal skin.
4. Should be elastic enough to stretch over joints.
5. Should be durable.
6. An intact bacterial barrier.
7. Should be normostatic.

Various materials that could be used are:

A. Biological:
   1. Human Allograft (Homograft).
   2. Xenograft (Heterograft)
   3. Tissue derivatives - Collagen sheet
      - Bioplastin fibrin.

B. Synthetic:
   1. Solid silicon polymer membrane.
   2. Other plastics.
   3. Microporous material.

C. Composite material:
   1. Adherent substrate.
   2. Surface membrane.

LIMITATIONS OF BIOLOGICAL DRESSINGS

In spite of being the best dressing material for burn wound they have certain disadvantages in form of:
1. Paucity of availability.
2. Overwhelming financial over stones.
4. Subgraft suppuration.

**TOPICAL AGENTS**

Burn wound infection is the major factor causing death during the phase of burn illness (Alexander and Wesley, 1979; Moncrief and Pruitt, 1979; Krupp and Guignand Locati, 1982; Teplitz, 1969). One factor that has substantially contributed to this wretched problem has been the inability of systemic therapy to control local sepsis yet the search for ideal topical therapy has as yet proved elusive.

Zellner and Bugyi (1985) considered the qualities required for an ideal topical drug.

1. It must be non toxic and must not interfere with metabolism.
2. It must have a good microbiocidal spectrum.
3. It must pass through and penetrate the eschar.
4. It must not harm surviving and proliferating tissue.
5. It must have no antigenicity.
6. It must not endanger resistance in the bacteria.
7. It must have a tanning effect.
8. It should enable the wound to be treated without the use of dressings.

In order to fulfill the above criteria a number of newer techniques of burn dressings have been evolved. Each has its own advantages and disadvantages. To name a
few of the important agents some of which are still in vogue like Mefenide or sulfa mylon (Monocriif, 1974), cerum nitrate (William et al, 1976), 0.5% silver nitrate)Mayer, 1960), Silver sulfadiazine (Fox Jr, 1975; Rappapale and Standard, 1969) and Mercurochrome.

These topical agents have more of a palliative effect and help only in reducing the local bacterial concentration (Say from $10^7$ to $10^4$/gm of tissues), not in eradicating bacteria from the wound (Arzt, 1979). These agents possess a number of deliterious side effects which in the ultimate analysis could prove lethal, if proper safe guards are not observed.

Silver Nitrate

It is a very ancient topical bactericidal agent. If the eschar is not debrided after three weeks, subeschar suppuration and bacterial growth occurs. Hyponatremia occurs because of leakage of electrolyte into the wet dressings. It also leads to metal toxicity, Necrobirosis and sodium chloride depletion (Kulock et al, 1980). With mercurochrome toxic amount of mercury can be absorbed (Steen, 1983).

Sulfasynlon

It is a methylated sulphonamide and it has been used since 1964. The material is applied in 10% solution in a water cream base. It suppresses proliferation of bacteria in burn wound. In early stages the content of bacterial growth on the surface of wound is rendered
extremely low but after first week the surface colonization increases despite treatment. It also causes change in metabolism. This drug was selected because of its effectiveness in controlling pseudomonas burn wound sepsis.

**Silver Sulphadiazine (SSD)**

A newer compound silver sulphadiazine (SSD) was introduced because of severe side effects of silver nitrate. Its advantages over silver nitrate are that SSD penetrates the eschar readily and the silver ions are released slowly and in a concentration such that they are selectively toxic to pathogens. SSD inhibits nearly all bacteria and fungi and exerts a prominent action against pseudomonas (Rosenberg, 1972). Silver ion acts on the bacterial cell surface causing alteration in cell wall and cell membrane leading to death.

**Povidone-Iodine (PVP-I)**

Garner et al (1959), Georgide (1962), Connell (1964), Copeland (1972) and Nicholas G Georgide (1972) reported their experiences with PVP-I. They found that this to be one of the best and most preferred antiseptic agent as its broad spectrum, good penetrability through eschar while exerting its microbicidal affects. It does not harm the surviving and proliferating tissue and has neither antigenicity nor any skin reaction. It has a 'tanning' effect and enhances wound healing by preventing infection.
After application of PVP-I, iodine is released. It precipitates the bacterial proteins and reacts with the exudate to precipitate protein on the wound surface forming a firm crust under which no micro-organism can survive.

Povidone-Iodine can easily be applied locally or along with ascarbene (Koch, 1985). PVP-I is effective against a wide range of gram positive and gram negative organisms as well as fungi (Schwartz, Sheris and Spencer, 1988).

Law and Mc Millan (1974) reported adverse effects of PVP-I on thyroid gland in two patients. Zellner and Bugyi (1985) have never seen thyroid dysfunction in patients treated with PVP-I and who were examined several times over a long period of time. Their experience showed an initial steep increase in iodine level in blood and a parallel one in urine. These increases reached their maximum on the second or third day. This high level of iodine is an indicator of the good penetration of PVP-I. There after the iodine concentration in serum falls and a little later the urine concentration falls as well despite continued administration. An explanation for this phenomenon could be that the healing process of wound preventing the penetration. Most probably penetration was less because of the tanning effect. The iodine level returned to normal levels about one week after withdrawal of treatment.

As far as the thyroid hormones were concerned there was a clear decrease in T3 and T4 initially because
of the high serum iodine concentration. However, a gradual decrease in T₃ and T₄ was also observed in burn patients who had never received tropical treatment with iodine (Becker et al, 1980). So one can say that this change in thyroid function can be brought about by different kinds of stresses or diseases (Burger et al., 1976). Furthermore the thyroid hormones bound to protein also become lost in large quantities because of the high protein loss in burn. The TSH level rises because of compensatory hyperfunction of part of the pituitary (Zellner and Bygyi, 1985).

Dalogh, Bauer and Riccabora (1985) also reported that if renal function is not impaired the resorbed iodine is quickly excreted and no clinical signs and iodine intoxication were observed.

Nakano and Uchiyam (1991) of Japan reported that prolonged exposure of wet PVP-I can cause chemical burn but no other author observed such type of reaction in their studies.

**Neosporin Powder**

Neosporin powder (Wellcome and Burrough) consists of three ingredients:

1. Neomycin sulphate.
2. Zinc Bacitracins.
3. Polymyxin-B.

Neomycin is predominantly a locally acting bactericidal having adverse effects like otonephrotoxicity
and depression of respiratory system.

Plymyxin-B is effective against M. Pertusis, pseudomonas, E. Coli and other gram negative bacilli.
Side effects include acute renal failure, and nystagmus.
Bacitracin is effective against gram positive cocci and bacilli. Its systemic absorption is little and allergic reactions are rare.

Lindberg et al (1954) stated infection should be divided into three sub levels.

1. Simple colonization
2. Local invasive infection.
3. General invasive infection.

These sub levels represent the normal progression of massive bacterial infection so common to the deeper and more serious burn injury.

Without topical antibacterial the progress of burn wound infection from simple colonization to general invasive infection was swift and sure. Topical agents are effective weapons for holding bacterial growth to a minimum level. So to assess the effectiveness of topical agent the following parameters are used:

1. A quantitative estimation and bacterial count.
2. A surface culture reflects the bacterial contamination.
3. Culture of burn biopsy. Burn wound biopsy can expose three parameters:
   a. Quantitative bacteriology.
   b. Qualitative bacteriology.
C. Histology (Perivascular perilymphatic and inter-luminal accumulation of bacteria prove without doubt invasive bacterial infection (Kripp, Bachler and Brill, 1985).

Mc Manus, Manson Jr and Pruitt Jr (1980) used subescharal infusion of antibiotics to prevent or to treat wound invasion in burn wounds that escape topical chemotherapeutic control. The introduction of cefmetazole by the subescharal and subcutaneous routes appears to provide a depot from which sustained blood levels are maintained.

Subescharoclysis is best used as adjunctive therapy is preparation of patients for eschar excision or as primary treatment for patients who are too unstable haemodynamically to tolerate surgical intervention (J Trauma, 1980; 20 : 1021).

A detailed study using PVP-I + Neosporin powder locally by Sinha R et al (1988) showed extremely encouraging results in term of control of infection and markedly reduced healing time of burn wound. To enhance the effectiveness of the above results using PVP + Neosporin following study of multiple subescharal injection of PVP was done.

Das and Moncrief had demonstrated that the profound ischaemia in burn wounds resulted in failure of systemic and local treatment to reach the subescharal plane. The systemically administered antibiotics can only reach the ischaemic area by gradient diffusion from the wound
periphery. The subescharal technique is based on this observation.

Baxter et al (1973) had first used subescharal injection of antibiotics in deep burns. Subescharoclysis offers the mechanical advantage of direct administration of antimicrobial to the deep burn area where systemic antimicrobials may fail to reach.

In the present study, it was aimed to increase the antimicrobial concentration subescharally where the concentration was low. The aim was to also assess whether or not multiple subescharal injection of PVP-I aids in altering the bacterial concentration in the subescharal plane and thereby helping in early escharoclysis, decreasing the bleeding on separation of eschar and ultimately in preventing septicemia and death.