

and often hemorrhage. The genesis of hyaline membrane is in doubt in these cases,^{1, 5, 10} since many received oxygen therapy in high concentration (40%). All received Sulfamylon topically⁵ and showed varying degrees of pneumonitis. There was no vasculitis or arteritis to suggest hypersensitivity to Sulfamylon in the lung sections studied. A more detailed account of the pathologic findings will be published elsewhere.

Summary

Two hundred forty-six Sulfamylon treated thermal burns have been compared to a previous experience of 1,831 patients. In a burn population of young and old patients (47% age 40 and over), trends suggesting improved mortality in young patients were seen, but no overall mortality improvement was observed. There were more older patients in the Sulfamylon group which weighted the comparison against Sulfamylon. Burn wound sepsis and septicemia was the leading cause of death, with pulmonary and cardiovascular causes following.

The ability of Sulfamylon to decrease local bacterial counts was observed, and resultant prolonged separation of the dead tissue appears to play a major role in mortality in the Sulfamylon group.

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DISCUSSION

DR. JOHN ARTHUR MONCRIEF (Charleston): I would agree with many of the things that Dr. Haynes has said and take issue with some others, and I hope that it is not as great an issue as we have seen earlier.

(Slide) As Dr. Haynes has mentioned, the problem of change of the frequency of bacteria flora qualitative change has been noted previously. After one year of use of Sulfamylon in the surgical research unit, the *Aerobacter* rapidly began gaining in prominence and now, as Dr. Haynes reported, does indeed outnumber in frequency the *Pseudomonas*. However, it has not be-

come a major pathogen as far as increasing mortality rates are concerned.

(Slide) One can certainly reduce the numbers of bacteria in the barren wound with any type of effective topical therapy, whether one uses Sulfamylon, silver nitrate, gentamycin or anything else, one has by no means sterilized the wound; you have merely reduced the bacterial count to more manageable levels.

But these levels are more manageable for limited periods of time, the limits of which are undetermined. Actually, I think it is reasonable for us to assume that if the individual is constantly exposed, to even a reduced level of bacterial colonization for this long period of time,

as Dr. Haynes described—4 or 5 weeks—certainly there is going to be an upset in the balance in favor of the bacteria.

(Slide) Our mortality data, this is an old slide. Actually, there are about 2,500 cases in this group now and the mortality rates have remained essentially the same as you see in the middle group of figures. It is true that in this patient population, particularly in the last 1,200 patients, most of them were patients ranging in age between 18 and 40. However, in the first 1,200 patients, there were large numbers—not large but significant numbers of individuals over the age of 50, essentially veteran and retired military population, both male and female. I think there is a significant difference, however, in the two patient populations.

(Slide) Why is there then a difference in the mortality? I think if we look at a breakdown on the SRU figures in patients below 15 and over 15, you will find an explanation for most of this, and that is prior to effective topical therapy. Of every 100 children who came in the front door with a burn, 35 of these children died of proven burn wound sepsis; that is, organisms actively multiplying and invading tissues in numbers exceed 10⁵ milligrams of tissues.

Small numbers died of pneumonia. Larger numbers than those who died of pneumonia died from other causes, whereas in the adult group, burn wound sepsis was not nearly as significant a factor in the cause of death. Therefore, reduction in mortality rates which are reflected by controlled burn wound sepsis will not be reflected as much in the adult population as there will be in the population of children so that any decrease in that will not be reflected, and I think this explains in part Dr. Haynes' figures.

I would wonder about Dr. Haynes' statement in his manuscript that the *Aerobacter* has become resistant to Sulfamylon. We have found none resistant to Sulfamylon and I would wonder really about the definition of death due to sepsis. We don't believe that just a positive blood culture means sepsis originates in the burn wound.

DR. BRUCE G. MACMILLAN (Cincinnati): I thought it would be of interest to discuss 200 patients that we have accumulated in the experience of the Department of Surgery here at the University of Cincinnati. Fifty-five of these are patients who have been treated with Sulfamylon.

It is of interest that in 18 of the 55 of these patients who have died, there have been two patients who died in the Sulfamylon group as a result of *Pseudomonas* sepsis; there are two of *Aerobacter Klebsiella* sepsis and as we have heard from Dr. Haynes, in previous work with Sulfamylon, six of these also died as a result of pulmonary complications of pneumonia.

Of the six, two of these were pure *Pseudomonas*; two were *Aerobacter Klebsiella* and two were combined etiology as to organisms. The mor-

tality rate in the three groups as you see are 33 per cent with a burn total of 45 per cent and 30 per cent full thickness for Sulfamylon. Mortality rates for the other two groups under consideration are 26 and 11 per cent for silver nitrate and gentamicin respectively.

As far as the flora which has evolved from the use of these agents is concerned, I think it should be pointed out that the gram positive organisms are essentially the same throughout all groups, but it is of interest that in the *Pseudomonas aeruginosa*, *Aerobacter Klebsiella* and *Escherichia* under the Sulfamylon group, the incidence ranges from 15 up to 23 per cent. This is opposed to an incidence of 55 per cent in those patients being treated with silver nitrate and 32 per cent with gentamicin.

This was of interest to us when we went back and reviewed the experience of sensitivity studies in this group of organisms for the past 4 years. One can see here that there has been very little change in the sensitivity patterns of the four organisms which we are considering which have evolved during this period under Sulfamylon therapy.

I think in conclusion, I would only like to emphasize that we are dealing with three effective agents and I think Sulfamylon for specific indications is a very effective agent for the treatment of thermal trauma.

It is an agent which lends itself specifically to the use of burns which are old, which have been well established and also, in our experience, we have used it for electrical burns with very great success.

DR. BOYD W. HAYNES, JR. (Closing): I want to thank both Dr. Moncrief and Dr. MacMillan for their comments. We, of course, discuss the burned patients' problems frequently and agree and disagree. I think Dr. Moncrief and I are in agreement that the basic problem in the presented series of cases is the prolonged separation of the dead tissue leading to delayed wound healing and prolonged hospitalization. Sulfamylon delays slough separation presumably by inhibiting bacterial lysis of dead tissue. Surgical debridement can offer some help.

Being a surgeon, I am in favor of surgical debridement. Being a realist, I think there are significant numbers of patients with severe burns in whom debridement must be used in a tempered manner or else prompt overwhelming sepsis and fatality results. It is difficult at times to find the right balance between too much and too little dead tissue excision, especially in the extensively burned, often debilitated, older patient. Our series contains many more such patients than the group treated at the Army Institute of Research.

I think it is fair to say that we do need a better way of removing the dead tissue, particularly in the larger burn in the older patient, and in the debilitated one.