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Leola Eldean Gerrans

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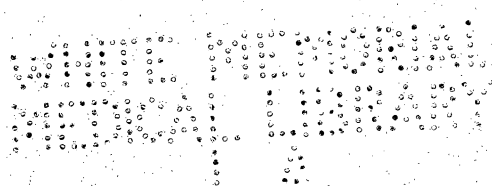
A STUDY COMPARING THE EFFECTIVENESS OF
TWO METHODS OF TREATING AMMONIACAL DIAPER RASH

by

Leola Eldean Gerrans

A Thesis in Partial Fulfillment
of the Requirements for the Degree
Master of Science in the Field of Nursing

May, 1964



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Each person whose signature appears below certifies that he has read this thesis and that in his opinion it is adequate, in scope and quality, as a thesis for the degree of Master of Science.

Marcia H. Dunbar, Chairman
Marcia H. Dunbar, M.S., Instructor
in Nursing

Nord S. Nation, M.D., Assistant
Professor in Pediatrics

Betty Jean Trubey
Betty Jean Trubey, M.S., Associate
Professor in Nursing

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Leola Eldean Gerrans

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CHAPTER I

INTRODUCTION TO THE STUDY

Sore buttocks caused by diaper rash is a common problem in the care of infants from birth to toilet training. This condition, not necessarily indicative of neglect, can be a source of discomfort to the infant and of concern to both mother and nurse. The causes are varied, as are the treatments. While many studies have been conducted concerning this problem, none were found to have been done on the effectiveness of hygienic measures and a bland ointment containing vitamins A and D in comparison with hygienic measures alone in the treatment of ammoniacal diaper rash, the type of diaper rash considered in this study.

I. THE PROBLEM

Statement of The Problem

This study was undertaken to compare the effectiveness of two methods of treating ammoniacal diaper rash: (1) hygienic measures plus the use of a bland ointment containing vitamins A and D in a lanolin-petrolatum base; and (2) hygienic measures alone.

Need for the Study

Four reasons justify this study: (1) diaper rash is a common and upsetting problem to nurses and mothers; (2) the nurse needs to know what is most effective in the treatment of diaper rash so she can advise the mother intelligently; (3) the mother needs to know how to treat diaper rash effectively for the well-being of her baby; and (4) no

study was found to have been done to find out the effectiveness of hygienic measures and a bland ointment containing vitamins A and D in comparison with hygienic measures alone.

Null Hypothesis

In this study it was hypothesized that the two methods employed in the treatment of ammoniacal diaper rash (hygienic measures alone or hygienic measures supplemented by the use of a bland ointment containing vitamins A and D) are equally effective.

Method of the Study

In this study the experimental method was used. The experimental factor was the use of a bland ointment containing vitamins A and D in the treatment of ammoniacal diaper rash. The control group used only hygienic measures. The experimental group used the ointment in addition to hygienic measures.

The two groups were chosen by random sampling of the infants seen in the selected well-baby clinic. The infants with ammoniacal diaper rash were placed alternately in the control group or in the experimental group. The mothers of the infants in both groups were given instructions regarding hygienic measures to be used in caring for the diapers and the buttocks of the infants. In addition to the instructions for hygienic measures, the mothers of the infants placed in the experimental group were given an ointment containing vitamins A and D to use on the buttocks of the infant.

A guide for instructions in the use of hygienic measures was designed by the researcher to provide the mothers with written instructions

for cleansing the diapers and the buttocks of the infant with ammoniacal diaper rash. An observation form was prepared and given to the mothers with the explanation of how to record their observations of the diaper rash on the specific days as indicated. When the mothers had completed recording their observations, they mailed the form to the researcher. Even though the forms were verbally explained to the mothers, a letter which explained the purpose of the forms and of the study was given to them.

Medical literature was reviewed to discover what studies had been done on this subject and as an aid in developing the approach to be used for this study.

Before proceeding with the study, permission was obtained from the director of the pediatric well-baby clinic of the selected hospital.

In order to evaluate the lucidity and comprehensibility of the instructions and observation form, a limited pilot study was made. Since the response of the mothers used in the pilot study indicated they apparently understood the instructions and were able to follow them satisfactorily, the researcher felt that the research instruments were effective.

From the data received from the mothers, the effectiveness of the two methods of treatment of ammoniacal diaper rash was determined. Conclusions were drawn and recommendations made.

Assumptions

In this study it was assumed that: (1) the prescribed method of treatment was understood and carried out by the mothers; (2) the mothers' observations were reliable and recorded accurately; and (3) that the person seen in the clinic if other than the one caring for the infant

relayed the information and instructions accurately.

Limitations

This study was limited to: (1) infants under two years of age with ammoniacal diaper rash seen in the selected well-baby clinic; (2) infants who had diaper rash at the time they were seen in the clinic; and (3) infants whose mothers could understand and read English.

II. DEFINITION OF TERMS

For the purpose of this study the following definitions of terms have been used:

Mild diaper rash. Rash in which erythema is present.¹

Moderate diaper rash. Rash characterized by papulovesicles or pustules.²

Severe diaper rash. Rash in which excoriation has taken place.³

Erythema. Redness of the skin.⁴

Excoriation. Removal of the superficial protective layer or the skin or mucous membrane; a raw surface left after the scraping away of the epidermis.⁵

Hygienic measures. Measures designed by the researcher for caring

¹Reuel A. Benson and others, "The Treatment of Ammonia Dermatitis with Diaparene," Journal of Pediatrics, 34:50, January, 1949.

²Ibid.

³Ibid.

⁴Norman Burke Taylor (ed.), Stedman's Medical Dictionary (eighteenth revised edition; Baltimore: The Williams and Wilkins Company, 1953), p. 464.

⁵Ibid., p. 476.

for the diapers and buttocks of the infant with ammoniacal diaper rash.⁶

Infant. A child under two years of age.

Mother. The person seen in the clinic with the infant.

Papule. A small circumscribed elevation of the skin, containing no fluid.⁷

Papulovesicular. Characterized by both papules and vesicles.

Pustule. A small circumscribed elevation of the skin containing pus.⁸

Vesicle. A small circular elevation of the skin containing clear, watery fluid; a blister.⁹

III. ORGANIZATION OF REMAINDER OF THESIS

A resumé of the remainder of the thesis follows.

Chapter II consists of a review of the medical literature concerning the physiology of the skin and concerning the types, causes and treatments of diaper rash.

Chapter III is a description of the method of approach used by the researcher and of the research tool.

Chapter IV contains an analysis and interpretation of data.

Chapter V contains a summary of the study, conclusions drawn, and recommendations made.

⁶See Appendix B.

⁷Taylor, op. cit., p. 1003.

⁸Ibid., p. 1144.

⁹Webster's New Collegiate Dictionary (Massachusetts: G. and C. Merriam Company, Publishers, 1956), p. 948.

IV. SUMMARY

Since diaper rash is a common and upsetting problem to nurses and mothers, investigation of the comparative effectiveness of two methods of treating ammoniacal diaper rash was thought to be desirable and valuable. A control and an experimental group were chosen by random sampling. Identical instructions in the use of hygienic measures for caring for the buttocks of the infant and for laundering the diapers were given to the mothers of both groups. The mothers of the infants in the experimental group were instructed to use an ointment containing vitamins A and D in addition to the hygienic measures. The review of the medical literature did not reveal any studies done on the method as used by the selected clinic.

It was the researcher's goal that the findings of the study would be of some use to the selected clinic as a basis for treatment and as a means of teaching mothers how better to care for their infants with ammoniacal diaper rash. It was also hoped that other hospitals with infants and young children would benefit from the study and that other investigators would be able to use the findings as a basis for further research on the effective treatment of ammoniacal diaper rash.

CHAPTER II

REVIEW OF THE LITERATURE

A perplexing skin irritation, quite often recurrent, is the commonly seen excoriated skin about the buttocks and diaper area of infants. It is referred to by parents as "raw bottom," "chafing," "diaper rash," or "napkin irritation" and is known to the physician as ammoniacal dermatitis.¹⁰ Before attempting this study of the treatment of this condition in the selected well-baby clinic, the medical literature was reviewed to find out the basic physiology of the skin of the infant, the types and treatments of diaper rash, the causes of ammoniacal diaper rash; to substantiate the need of this study; to find similar studies which could be used as an aid in the construction of the design for this study. The review of the literature was confined to that available in the Los Angeles division of the Loma Linda University library. The material presented appears to be comprehensive of the research done in this field.

I. BASIC PHYSIOLOGY OF THE SKIN OF THE INFANT

Of vital importance in the study of diaper rash is an understanding of the physiology of the skin of the infant. While the physiologic functions of the skin during infancy are similar to those of adult life, some are not fully developed. For instance, the infant's sense of pain and temperature is absent at birth.¹¹ The sebaceous and sweat glands

¹⁰Guy C. Cunningham, "Ammoniacal Dermatitis," Journal of the Kentucky State Medical Association, 59:1174, December, 1961.

¹¹Henry H. Perlman, Pediatric Dermatology (Chicago: The Year Book Publishers, Inc., 1960), p. 11.

assume their characteristic shape and full function only after the fourth or fifth month of extra-uterine life.¹² Soft, smooth, tender, and velvety to the touch, the infant's skin is more permeable to water, fats, lipid substances, lipid suspensions, and volatile substances than is that of an adult. For this reason medicaments applied on the surface may penetrate into the deeper structures. Actually, the stratum corneum which is the protective outer layer, is poorly developed following birth and for a considerable period during early infancy.¹³

Another protective characteristic of the skin--its acid reaction--is lower in the newborn than in the adult. The pH of the normal infant's skin--varying from 3.5 to 7, and averaging a close-to-neutral 6.7,--is spoken of as the "acid mantle."¹⁴

Physiologically, pigment serves to prevent injury from the sun's rays to the deeper structures of the skin. Nature also prevents injury by producing a protective coat of tan.¹⁵

But internal and external factors such as fevers, nervous changes, trauma, and chemical action sometimes challenge and interfere with the protective functions. Environmental conditions, thickness or thinness of the skin, differences in hair covering, texture, pigmentation, race, and similar factors also tend to alter the surface characteristics of the skin.¹⁶ It is doubtless because of these variations and because of

¹²Kurt Wiener, Skin Manifestations of Internal Disorders (St. Louis: The C. V. Mosby Company, 1947), p. 394.

¹³Perlman, op. cit., p. 10.

¹⁴Ibid., pp. 10-11; Wiener, loc. cit.

¹⁵Perlman, op. cit., p. 11.

¹⁶Ibid.

the typical physiology of the infant's skin that diaper rash is so common as to present a problem.

II. TYPES OF DIAPER RASH

The characteristic lesions confined to the diaper region have long been a problem. However, in early medical practice they were often confused with the lesions of hereditary syphilis. Early in this century, Jacquet clearly differentiated these eruptions of the diaper region from those of syphilitic lesions.¹⁷ His article on diaper rash is among the first ones written on the subject. Since then many investigators have reported studies presenting several non-syphilitic types of diaper rash. While this study deals only with the ammoniacal type, other common types are briefly discussed in this chapter.

Candidiasis

Candidiasis has frequently been mistaken for ammoniacal dermatitis since the lesions are similar. Candidiasis can sometimes be distinguished from ammoniacal dermatitis because of the former's "predilection for the intertriginous areas of the body."¹⁸ Moniliasis, thrush, and candidiasis are synonymous terms for a rash caused by the *Candida albicans* organism. Candidiasis is usually thought of as an oral lesion, but may occur independently of oral lesions. It may be seen on the skin, nails, vagina,

¹⁷L. Jacquet, Traite des Maladies del l'Enfance (Paris: Graucher et Comby, 1905), 4, 714, cited by J. V. Cooke, "The Etiology and Treatment of Ammonia Dermatitis of the Gluteal Region of Infants," American Journal of Diseases of Children, 22:481, November, 1921.

¹⁸Philip J. Kozinn and others, "'Diaper Rash,' A Diagnostic Anachronism," Journal of Pediatrics, 59:75, July, 1961.

and internal organs, and should be suspected in infants with oral thrush or unmanageable dermatoses.¹⁹

Intertrigo

Intertrigo appears very similar to ammoniacal dermatitis and is confined to skin surfaces that are in contact with each other anywhere on the body.²⁰ Primarily, it is due to excessive perspiration with constant friction of the affected part increasing heat. Maceration of the skin is common with this rash.²¹

Miliaria Rubra

Miliaria rubra is often called "heat rash" since it is usually seen in the hot summer months. The rash occurs in infants who are kept in overheated rooms and/or dressed with excessive clothing. It is caused by blocking of the sweat ducts by possible secondary infections.²²

Contact Dermatitis

The contact rash is caused by the friction of the skin with clothes. The baby has very sensitive skin which may break out in a rash when it is in contact with rough or synthetic materials.²³

¹⁹Sheldon Swift, "Diaper Dermatitis," Pediatric Clinic of North America, 3(No. 3):762-3, August, 1956.

²⁰Ibid., p. 762.

²¹Perlman, op. cit., p. 129.

²²Arthur Lipschutz and Horst Agerty, "Prophylaxis in Pediatric Skin Care," Archives of Pediatrics, 79:258, July, 1962.

²³Ibid., p. 257.

Seborrheid Diaper Rash

The seborrheid rash follows from a few days to several weeks after the diaper rash has first been noted. It commonly appears on the scalp, foot, sides of the nose, axilla, groin, intergluteal cleft, buttocks, external auditory meatus, over the spinal column, the eyebrows, and behind and in front of the ears. It apparently occurs as a complication of ammoniacal dermatitis.²⁴

Ammoniacal Dermatitis

Ammoniacal diaper rash is a term used synonymously with ammoniacal dermatitis or diaper rash. Jacquet classified the severity of ammoniacal dermatitis according to the type of lesion. There are four types or stages of lesions in ammoniacal diaper rash: the simple erythematous, erythemato-vesicular or erosive, papular or post-erosive, and ulcerative. Though these are stages of one process, they may overlap or coexist in the same patient.²⁵ The ammoniacal dermatitis is one of the more common skin irritations seen in pediatric practice. The fact that the exact etiology of this common skin irritation has been known for years has not reduced its occurrence.²⁶

In a description of ammoniacal dermatitis lesions Kozinn stated:

Ammoniacal dermatitis combines an unmistakable smell with skin eruptions on the surfaces of the areas in contact with wet diapers. The eruptions may be erythematous or become lichenified, or they may consist of reddish-purple, occasionally eroded vesicopapules.²⁷

²⁴Henry Harris Perlman, "The Seborrheid Diaper Rash," Medical Times, 90:1184, November, 1962.

²⁵Jacquet, loc. cit.

²⁶Cunningham, loc. cit.

²⁷Kozinn, loc. cit.

III. CAUSE OF AMMONIACAL DIAPER RASH

Theoretically, the cause of ammoniacal diaper rash is simple. It is the result of the reaction on the skin beneath the diaper by chemicals, principally ammonia, resulting from the activity of microorganisms. The principal organism responsible for this condition is a saprophytic gram-positive bacillus which is always present in the feces. A study was done to determine the effect of the pH of culture media on the growth of *Bacterium ammoniagenes*. Between a pH of 7.0 to 8.5 the rate of growth was greatly increased.²⁸ The urine and alkaline stools are excellent culture media for its growth. Thus, "the ammoniacal diaper is a condition brought about by the splitting-off action of *Bacillus faecalis* (*Bacillus ammoniagenes*) on urea."²⁹

Cooke found that in an acid medium the growth of the *Bacillus faecalis* was inhibited. In his study on the cause of ammoniacal diapers, he discovered that infants fed on formulas relatively high in fat or cows milk had a much higher incidence of ammoniacal diapers than those that were breast fed. Therefore he concluded that any factors in the diet which tend to make a stool alkaline could be a cause of ammoniacal diapers.³⁰

In a study conducted by Swift in 1956, high protein foods were found to produce an irritating alkaline stool. By promoting the growth of bacteria in the bowel, these stools also increase a tendency to

²⁸J. V. Cooke, "The Etiology and Treatment of Ammonia Dermatitis of the Gluteal Region of Infants," American Journal of Diseases of Children, 22:486, November, 1921.

²⁹Perlman, Pediatric Dermatology, p. 125.

³⁰Cooke, op. cit., pp. 487-8.

ammoniacal dermatitis. The pH of the feces is directly affected by the protein and fat content of milk.³¹ If the pH of the stool is such that the pH of the perianal skin is raised above the range found in breast fed infants, the incidence of perianal dermatitis is increased.³²

The prolonged contact of the excretions with the skin increases the likelihood of the occurrence of ammoniacal diaper rash. Some predisposing causes may be (1) the continuous use of rubber pants, which prevent the evaporation of the urine, and (2) the use of strongly alkaline soaps or detergents in laundering which are apt to leave an irritating residue in the diapers even after careful rinsing.³³

The conclusions of some researchers do not wholly agree with the results of those cited above. Their findings appear to be exceptions to the majority. Brennemann found diaper rash to occur even when the alkaline stool factor was excluded experimentally.³⁴ In a more recent article, Grossman reported perianal dermatitis occurring in infants with either acid or alkaline stools with about the same frequency.³⁵ In separate studies, Swift and Warin found diaper rash to be more common in breast-fed infants than in those who were bottle-fed.³⁶

³¹Swift, op. cit., p. 760.

³²Arthur G. Pratt and others, "Influence of Type of Feeding of pH of Stool, pH of Skin, and Incidence of Perianal Dermatitis in the New-born Infant," Journal of Pediatrics, 46:543, May, 1955.

³³Swift, loc. cit.

³⁴Joseph Brennemann, "The Ulcerated Meatus in the Circumcised Child," American Journal of Diseases of Children, 21:47, January, 1921.

³⁵Leo Grossman, "A New Specific Treatment for Perianal Dermatitis," Archives of Pediatrics, 71:176, June, 1954.

³⁶Swift, loc. cit.; R. P. Warin and K. E. Faulkner, "Napkin Psoriasis," British Journal of Dermatology, 73:445, December, 1961.

IV. METHODS OF TREATMENT

Since diaper rash is due primarily to the irritating effects of urine and feces on the delicate skin, the most important prophylaxis lies in keeping the diaper area clean and dry. Methods of treatment include the care of the skin and of the diapers of the infant.³⁷

Skin Care of the Diaper Area

The proper care of the skin of infants is important in preventing infection. At present the concensus of the American Academy of Pediatrics seems to be that the less done, the less danger of infection.³⁸

Soap and water. In caring for the infant's skin, the mother should be advised to use a simple unscented soap. Such a soap is one which does not contain an excessive amount of alkali. "Perfumed soaps are contraindicated not only because they may sensitize the skin but also because they frequently act as primary irritants, predisposing the infant to secondary infection by traumatizing the skin."³⁹ Soap has a pH of 9 which accounts for the irritation to the skin.⁴⁰ Therefore, any soap should be used sparingly and the skin should be thoroughly rinsed.

Studies have shown that the infant may be allergic to soap. The clear skin of forty-one children bathed with soapless detergent showed no change. Of the 115 children in the group using soap, fifty developed

³⁷Lawrence S. Ross, "An Inexpensive Prophylaxis for Ammoniacal Dermatitis," Pediatrics, 31:145, January, 1963.

³⁸Committee on the Fetus and Newborn of the American Academy of Pediatrics, Hospital Care of the Newborn Infants (Illinois: American Academy of Pediatrics, 1957), p. 34.

³⁹Perlman, Pediatric Dermatology, p. 77. ⁴⁰Ibid., p. 76.

skin eruptions (thirty-five had diaper rash and fifteen had miliaria).⁴¹
In a study of one hundred control cases in which only soap and water were employed prophylactically, Lipschutz found that 29 per cent of the infants developed some type of skin rash.⁴²

Another study was done by Grossman to determine the effectiveness of just soap and water as compared to the use of Diaparene ointment after each stool. He found that Diaparene ointment cleared the rash twice as fast as the soap and water. There was noticeable irritability of the skin when soap and water were used.⁴³ Armstrong and Browder have suggested that the skin be cleansed with cotton pledgets wet with only clear cool water each time the diaper is changed.⁴⁴

Ointments. Because absorption takes place through the skin, adverse systemic effects may result from the use of topical remedies such as ointments, creams, and liniments. Recent literature reports poisoning and death caused by application of boric acid used as a wet dressing or in an ointment for the treatment of skin conditions in infants.⁴⁵ Any ointment should therefore be selected with caution.

⁴¹Arthur Lipschutz and Regina Fittis, "New Antibacterial Detergent for Common Skin Diseases in Children," A.M.A. Archives of Dermatology and Syphilology, 68:84, July, 1953.

⁴²Lipschutz and Agerty, op. cit., p. 261.

⁴³Grossman, op. cit., p. 174.

⁴⁴Inez L. Armstrong and Jane J. Browder, The Nursing Care of Children (Philadelphia: F. A. Davis Company, 1958), p. 186.

⁴⁵Perlman, Pediatric Dermatology, p. 10.

Yet many types of ointments have been tried in the treatment of diaper rash. One of the more commonly used ointments is Diaparene chloride ointment, also known as methylbenzethonium. In 1950 Niedelman and Bleier reported a study in which Diaparene ointment was applied to the diaper rash after each diaper change. Of 107 consecutively treated infants, the time for cure was from one day to three weeks. There were about an equal number of male and female infants with an age range of five days to two and a half years. All but five were formula fed. Of the eight cases which were not cleared, three were thought to be atopic infantile eczematoid dermatitis with secondary infection.⁴⁶

Two years later Bleier and Niedelman reported on ninety cases of diaper rash. Fifty-eight were treated with DiapareneR chloride ointment which contains the active ingredient, methyl benzethonium chloride. Of these, 93 per cent were cured or improved. In the control group of thirty-two, the ointment base alone without the active ingredient was used as the treatment. Only 25 per cent of the control group were benefited.⁴⁷

Benson treated fifty cases of ammoniacal dermatitis with Diapene (now referred to as Diaparene). In three days, thirty-one were improved so that the dermatitis was receding. In eighteen cases, the dermatitis was cured. There was one case in which there was no response.⁴⁸ In

⁴⁶Meyer Niedelman and Adolph Bleier, "Ammonia Dermatitis: Treatment with Diaparene Chloride Ointment," Journal of Pediatrics, 37:763, November, 1950.

⁴⁷Adolph Bleier and Meyer L. Niedelman, "Ammonia Dermatitis: Comparative Study of DiapareneR Chloride Ointment," Archives of Pediatrics, 69:448, November, 1952.

⁴⁸Reuel A. Benson, "A New Treatment for Diaper Rash," Journal of Pediatrics, 31:371, October, 1947.

1949 he reported on the results of five hundred cases treated with Diaparene. Within one week, four hundred thirty-six of the cases had cleared. Of the sixty-four who did not clear, there were forty-three mild, sixteen moderate, and three severe. It was believed that some of these were not ammoniacal dermatitis.⁴⁹

In a study of prophylactic methods done by Cunningham on 240 infants, the mothers were instructed to cleanse the diaper area with a mild soap and water rinse, then to dry the area thoroughly before a fresh diaper was applied. He divided this group into two with 120 infants in each. The control group received no other treatment. The experimental group received an application of Diaparene twice a day and after each diaper change which contained stools. Of those in the control group, seventy-six had little or no trouble with diaper area irritation, eleven developed only perianal irritation, twenty-five developed moderate irritation, and eight had severe irritation.

Of the 120 in the experimental group, 108 developed little or no irritation, seven had perianal irritation, three with moderate irritation, and two with considerable irritation. On further diagnostic workup, these last two proved to have monilial infections which cleared with proper therapy.⁵⁰

Cunningham then conducted a study on two hundred infants with ammoniacal dermatitis. As in his study of prophylactic methods, he divided the group equally with one hundred in each group. He followed

⁴⁹Reuel A. Benson and others, "The Treatment of Ammonia Dermatitis with Diaparene," Journal of Pediatrics, 34:50, January, 1949.

⁵⁰Cunningham, "Ammoniacal Dermatitis," p. 1175.

the same procedure as with the former study using prophylactic methods. It is interesting to note that about 30 per cent of the control group admitted using home preparations such as oil, lotion, powder, vaseline, heat, corn starch, and zinc oxide ointment. The maximum improvement with the controls in ten days was 69 per cent. The Diaparene ointment group produced good to excellent results in all the cases in three to ten days. In this study it was concluded that hygienic measures alone are not nearly so efficient in the prophylaxis or treatment of ammoniacal dermatitis as the same measures combined with the use of Diaparene ointment.⁵¹

In his study, Cunningham observed and tabulated the condition of the rash on the third, sixth, and tenth days of treatment. He found that on the third day eleven were healed, on the sixth day, 68 were healed, and on the tenth day a total of 89 were healed. The same time interval was used in this present study.

Another ointment recently used in the treatment of diaper rash is Methakote. In the study done by Susca, fifty-two infants and children were treated either two or three times daily with Methakote. In all the children the diaper rash receded after two days and was completely healed by the fifth day.⁵²

Dipamycin ointment has also been used with excellent results. Of the cases treated, 96 per cent responded favorably. Dipamycin is urine repellent, has tenacity, and does not interfere with the normal epidermal

⁵¹Ibid.

⁵²Louis A. Susca and others, "Treatment of Diaper Rash," New York State Journal of Medicine, 60:2859, September 15, 1960.

processes.⁵³

Various other ointments, such as Roccal and hexachlorophene, have been used with varying degrees of success. Many of the ointments are also in lotion form.

Oil. The study of 4,448 infants done by Fischer reports the results of two methods using oils in caring for the skin. He used the "no bath" technique on 2,009 infants. Nothing was put on the skin for seven days. Then the infants were given a gentle soap and water sponge bath followed by the application of sterilized peanut oil. Of the infants treated with the peanut oil, there was a 0.85 per cent incidence of impetigo. In the other group of 2,439 infants, the skin was cleansed daily from birth with sterile cottonseed oil and additional oil was applied to the buttocks after each diaper change. The incidence of impetigo in this group was 0.94 per cent.⁵⁴

Powder. Powders are used to absorb excessive perspiration. When used properly, they act as a drying and slipping agent to remove friction between the skin folds. In seventy-three cases with clear skin, powder with calcium undecylenate was found to prevent skin eruptions beneath the diaper. When it was used as a treatment in seventy cases of seborrheic dermatitis, sixty were improved.⁵⁵

⁵³Donald K. Adler, "An Effective Ointment in the Treatment of Diaper Dermatitis," New York State Journal of Medicine, 61:2060, June 15, 1961.

⁵⁴Carl C. Fischer, "Prevention of Impetigo Neonatorum," Archives of Pediatrics, 61:354, June, 1944.

⁵⁵Harry M. Robinson, "A Study of a Protective Powder," Southern Medical Journal, 52:1421, November, 1959.

A cornstarch base powder containing methylbenzethonium 1:1800 was used after each diaper change on two hundred infants. There was no diaper rash in 96 per cent of these.⁵⁶

Baby silicare powder has the characteristics of being moisture repellent, keratolytic, and bacteriostatic. It was found to be 100 per cent effective in eighty-four cases of diaper dermatitis.⁵⁷

However, other authors feel that the use of powder does more harm than good.⁵⁸ The moist accumulations of powder remain in the folds of the skin and chafe the opposed skin surfaces.⁵⁹ Robinson found in his study using calcium undecylenate powder that four of the seventy-three cases with clear skin developed some irritation.⁶⁰

Exposure to air. Many authors have expressed the idea of exposing the buttocks to the air. This helps to dry the skin and may be done several times a day. The average length of exposure is ten to fifteen

⁵⁶Lipschutz and Agerty, op. cit., p. 260.

⁵⁷Henry W. Kaessler, "Dermatitis of the Diaper Region: A New Remedy for an Old Affliction," Archives of Pediatrics, 74:50, February, 1959.

⁵⁸Reuel A. Benson and others, "Commercially and Home-Laundered Diapers," Archives of Pediatrics, 73:250, July, 1956; Emanuel Dubow, "Ammoniacal Napkin Dermatitis in Infants," Archives of Pediatrics, 71:324, October, 1954; Seymour L. Hanfling, "Skin Care of the Expectant Mother and the Newborn Baby," GP, 20:100, October, 1951.

⁵⁹Ernest A. Fairburn, "The Care of the Skin in the Newborn," Practitioner, 186:194, February, 1961; Charlotte Isler, "The First Week of Life," RN, 23:53, December, 1960.

⁶⁰Harry M. Robinson, loc. cit.

minutes.⁶¹ The healing effect may be enhanced by dry heat from an electric light bulb during the time of exposure to the air. The heat increases circulation to the area, promoting healing.⁶² The reports of studies do not give the length of time required for healing.

Diaper Care

Mercuric chloride, boric acid, and mercuric iodide. Some of the oldest methods of caring for diapers consist of the use of mercuric chloride, boric acid, and mercuric iodide in the final diaper rinse. Because of the toxic nature of these preparations, some authors feel that they should not be used.

O-benzyl-p-chlorophenol. The use of o-benzyl-p-chlorophenol is very effective, but may cause hand irritation to the mother. It is used 1:2500 in the final diaper rinse. In a study of eighty-seven cases of ammoniacal dermatitis, most cleared within an average of four days. Cases with staphylococcus aureus cleared in six days, and those with monilia albicans in seven days.⁶³

Stephens reported 250 cases of a similar nature with completely satisfactory results; and in an additional 1,500 cases in which o-benzyl-p-

⁶¹"Diaper Rash," Journal of the American Medical Association, 165: 254, September 21, 1957; Elsie Fitzpatrick and Nicholson J. Eastman, Zabriskie's Obstetrics for Nurses (tenth edition; Philadelphia: J. B. Lippincott Company, 1960), p. 338; "If You Ask Me," American Journal of Nursing, 59:1762, December, 1959.

⁶²Swift, op. cit., p. 766; Dubow, loc. cit.; Waldo E. Nelson, Textbook of Pediatrics (seventh edition; Philadelphia, London: W. B. Saunders Company, 1959), p. 1298.

⁶³William K. Friend, "Ammoniacal Dermatitis," California Medicine, 97:156-7, August, 1962.

chlorophenol was used prophylactically, none of the patients developed ammoniacal dermatitis.⁶⁴

Diaparene rinse. In studies done by Benson, Diaparene used in the final diaper rinse was found to be effective in the treatment of ammoniacal rash. Of five hundred cases treated, 436 cleared within one week. All the others were improved.⁶⁵

Vinegar. The use of vinegar in the final diaper rinse in the treatment of ammoniacal dermatitis is relatively new. Following the last rinse of the diapers in the washing machine, one cupful of vinegar is added to the tub and the machine is filled halfway. The diapers are then spun-dry without further rinsing and dried by air or in a drier.

The scientific basis for the vinegar rinse treatment recommended is the assumption that a weak acid present in the diaper will neutralize the base, ammonium hydroxide, as quickly as it is produced. The neutral salt, ammonium acetate, thus formed would have the homeostatic effect of restoring the skin to its normal pH.⁶⁶

Ross did a study using the vinegar rinse for the diapers of fifty-three children who had not responded to usual methods of inhibition of ammonia formation. The usual methods which had proved unsuccessful included: (1) use of quaternary ammonium compound in powder or ointment form or as a diaper rinse to inhibit the growth of *Bacterium ammoniagenes*

⁶⁴LeRoy J. Stephens, "O-Benzyl-p-Chlorophenol in the Prevention and Treatment of Ammonia Dermatitis," Journal of Pediatrics, 40:750-756, June, 1952.

⁶⁵Reuel A. Benson, "The Treatment of Ammonia Dermatitis with Diaparene," Journal of Pediatrics, 34:50, January, 1949.

⁶⁶Lawrence S. Ross, "An Inexpensive Prophylaxis for Ammoniacal Dermatitis," Pediatrics, 31:145, January, 1963.

in the urine; (2) prohibition of water-proof pants; (3) changing of diapers once or twice per night; (4) heavy coating of repellent type ointments to the skin; (5) feeding methionine orally.⁶⁷

In using the vinegar rinse, forty-five of the fifty-three cases showed complete elimination of the ammonia odor in the diapers, three had moderate decrease, and five had little or no decrease in the ammonia odor. The elimination of the ammonia odor was immediate, and the lesions on the buttocks were usually improved within a day or two. Only one mother reported marked decrease in the odor of ammonia without total clearing of the rash.⁶⁸

In this present study, the vinegar rinse was prescribed for the diaper care of the infants in both the control and the experimental groups. It was chosen in preference to other effective rinses because it is non-toxic in nature, is inexpensive, and is readily available.

V. SUMMARY

A review of the medical literature on the physiology of the skin, the types and treatments of diaper rash, and causes of ammoniacal diaper rash was reported. Included in the physiology of the skin is a description of the newborn's skin physiology as compared with that of the adult. The physiologic functions are similar to those of the adult except that some of the functions such as the sense of pain and control of temperature are not fully developed. A description of various rashes which may be seen in the diaper area are mentioned and the causes given.

⁶⁷Ibid., p. 144.

⁶⁸Ibid.

The cause of ammoniacal diaper rash is the formation of ammonia in the presence of a good culture medium. The ammonia is formed by the splitting-off action of the *Bacillus ammoniagenes* on urea in the urine. It has been found that the organism grows abundantly in a neutral or alkaline medium but is inhibited by an acid medium. In a study by Swift it was found that foods which cause an alkaline stool also aggravate a tendency toward ammoniacal diaper rash.

The treatment of diaper rash includes both the care of the skin and the diapers of the infant. Studies using soap on the skin are reported by Cunningham, Lipschutz, and Grossman. They found that soap causes skin irritation in as many as 37 per cent of the cases.

In studies considered, Diaparene ointment was one of the more commonly used ointments in the treatment of diaper rash. It has been reported to be 93 per cent effective in a study by Bleier and Niedelman. Dipamycin and Methakote ointments were reported to be over 90 per cent effective in treating diaper rash.

Powder may be used as a drying and slipping agent. Some studies indicate that powder does more harm than good. Medicated powders have been used and were found to be over 90 per cent effective in preventing and treating diaper rash.

The exposure of the buttocks to the air helps promote healing by drying the skin. The healing may be enhanced by dry heat from an electric light bulb.

Various acetic solutions have been added to the rinse water of diapers to counteract the formation of ammonia. Vinegar is one such solution that has been found useful in clearing diaper rash in cases

where other methods of treatment had proved ineffective. Besides being non-toxic in nature, it is inexpensive and readily available.

No studies were found using vitamin A and D ointment in the treatment of diaper rash. As a basis for this study, the time interval was the same as that used by Cunningham; the use of a vinegar rinse in the laundering of diapers was the same as that reported by Ross.

CHAPTER III

METHOD OF PROCEDURE AND COLLECTION OF DATA

I. METHODOLOGY OF STUDY

The experimental method was used to find out the effectiveness of two methods of treating diaper rash. Originally, it was hoped that the study could be done on newborns in the nursery. However, a survey of over 300 charts of infants born in the selected hospital within the three month period of January to March 1963 revealed only eleven cases of diaper rash. Eight of the eleven cases were premature infants who were in the hospital two weeks or more after birth. Because of the small number of cases of diaper rash found in the nursery, it was decided to use the well-baby clinic of the White Memorial Hospital Pediatric Department for this research project.

The parallel-group technique, with a single variable, was employed. Good and Scates define this technique thus:

The parallel-group procedure is an attempt to overcome the difficulties of the one-group technique, in that two or more groups, as nearly equivalent as possible, are employed at the same time. Under conditions controlled as carefully as possible, only a single factor or variable is manipulated or changed; the experimental factor is varied for one group (the experimental group), while the parallel group serves as the control for comparative purposes, undergoing customary (usual) or non-experimental conditions. If the investigator desires to vary more than one phase of the experimental factor, more than two equivalent or parallel groups are needed.⁶⁹

Forty-two infants with diaper rash were selected and placed alternately in the experimental group and in the control group. The mothers of those in the control group were given instructions on the hygienic

⁶⁹Carter V. Good and Douglas E. Scates, Methods of Research, (New York: Appleton-Century-Crofts, Inc., 1954), p. 705.

measures to be used as designed by the researcher. In the experimental group, the mothers were instructed to use a bland ointment containing vitamins A and D in addition to the hygienic measures used by the control group.

Obtaining Permission and Cooperation to Conduct Study

The researcher obtained permission to conduct the study at the well-baby clinic of the White Memorial Hospital Pediatric Department (hereafter referred to as the clinic) by a personal interview with its director. He was given a research design of the proposed study together with copies of the forms and instructions to be used.

Instruction of Personnel

The director of the clinic informed the personnel that the study was to be conducted and asked for their cooperation with the researcher. The researcher then showed and explained the various forms to be used in the study to the resident physicians, medical students, and nurses working in the clinic to give them a clear idea of the purpose and method of the study.

Selection of Groups

In order that the groups might be as nearly equivalent as possible, forty-two infants with ammoniacal diaper rash were placed alternately in the experimental and control groups. The type of rash was diagnosed by the doctors. One case in the experimental group which did not heal by the tenth day was thought to have a monilial type of rash. However, since the original diagnosis was ammoniacal diaper rash, the infant was

included in the final analysis.

There were nine mothers of the infants in the control group who returned the observation form as requested. Telephone calls were made to an additional ten to obtain the results of the treatment. Most of these mothers admitted that they had forgotten to mail the form. Letters were written to two of the mothers who could not be contacted by telephone. One of these returned the form. A home visit was made to the other mother but she was not home. Thus there were twenty infants that were used in the control group.

The results were similar in the experimental group. Of the twenty-one infants placed in this group, the results of the treatment were obtained by the return of the observation form on eleven of the infants, telephone calls were effective in that the results of the treatment on nine additional infants were obtained. There were two home visits made, one of which was successful in that the needed information was obtained. The other mother was sent a letter but did not respond. In the experimental group there were twenty infants on whom the results of the treatment were obtained.

Construction and Use of Forms

Information form. The information form* was filled out and kept by the researcher. The infant's name, address, and telephone number were recorded. This information was used to follow up cases on which the observation form was not returned. The clinic number was recorded for future reference if needed. The age of the infant, duration of present rash, degree and area of rash involvement, present method of laundering

*See Appendix A.

diapers, and the group to which the infant was assigned were recorded.

General cleansing instructions. The general cleansing instructions form* contained a written explanation of the hygienic measures to be used in caring for the infant's buttocks and diapers. The buttocks were to be cleansed by washing them in cool running water each time the infant had a soiled or wet diaper. Cool water was emphasized as it is less irritating to a rash than is warm water. It was emphasized that running water be used rather than a wash cloth because a wash cloth may not get all the urine off the skin, and the rubbing of the rash with the wash cloth could be irritating to the skin. If the infant was quite heavy or large, it was suggested that the mother place the infant in a tub, basin, or sink of cool water as in a sitz bath. The skin was then to be blotted dry with a soft towel or cloth. If the infant was in the control group, a clean diaper was then to be applied; if in the experimental group, the mother was told to apply the specified ointment before applying a clean diaper.

In the laundering procedure the diapers were to be rinsed at least twice. Mothers using automatic washing machines were advised to let the diapers run the complete cycle, then to set the dial back on "rinse" and to let the tub fill. One cup of vinegar or the equivalent of one tablespoon of vinegar to two quarts of water was to be added to the tub of rinse water. The vinegar rinse was used to counteract the effect on the skin of the alkali in the soaps used in laundering the diapers. After the rinse water was spun out, the diapers were to be dried in the usual manner without further rinsing.

*See Appendix B.

The form was read and explained to the mothers with emphasis on the methods to be used. The form was sent home with the mothers so they would have a copy of the instructions for reference.

Observation form. The observation form* was constructed so the mother could evaluate the rash and circle the description which agreed with her observations. The rash was to be observed on the third, sixth, and tenth days after starting the prescribed treatment. The dates for each of the three days for observation were written on the blank provided. The days for observation were third, sixth and tenth days. The condition of the rash was evaluated by the following: (a) rash has become worse since starting treatment; (b) rash remains the same, is no better, or is unimproved; (c) rash is healing, is better, or is improved; and (d) rash is healed. Since the connotation of healing varies with the severity of the rash, an explanation of what was meant by "healed" was given to each mother. A mild rash was considered healed if there was no longer a bright red or inflamed appearance; a moderate rash would no longer be red and any lesions would be gone or crusted over; and a severe rash would no longer have the appearance of weeping or oozing and any raw areas would be crusted over. The observation form was then to be returned to the researcher in the stamped, self-addressed envelope provided. The mother was told that she could return the form on the third or sixth day if the rash had healed in that time.

Letter to mother. A letter** was written and given to the mother to explain the purpose of the study and the instructions given. The

*See Appendix C.

**See Appendix D.

name, address, and telephone number of the researcher were included so the mother could call if she had any questions. It was emphasized that the name was put on the observation and information forms solely for the purpose of checking which forms had been returned. The identity of the participants would not be revealed in the study.

Instructions to Mothers

Most of the infants were seen while being prepared for the doctor's examination. To prepare the mother for the study, the researcher introduced herself as a nurse and gave her name. She then explained her purpose for being there by stating something similar to the following: "A study is being done here at the clinic to find out the best way of helping mothers treat the common problem of diaper rash. Does your baby have diaper rash?" If the infant did have diaper rash, the researcher took the infant and mother to an empty room to give her the instructions. When no empty room was available, the general instructions applying to both groups were given to the mothers in the waiting room; but no mention was made of the ointment to be used by the experimental group. In this way the mothers of the infants in the control group did not know that their infants were being treated any differently. Then, while the infants in the experimental group were in the doctor's examining room, their mothers were given the additional instructions for the use of the ointment.

The doctors and medical students checked with the researcher to find out if the patient had been seen by her. In this way, those not interviewed in the waiting room due to an oversight or because the researcher was busy with another patient were seen in the examining room

and included in the study.

Several mothers made the comment that their infants had had a problem with diaper rash before and wanted to know what method of treatment was being used in the study. To such mothers the researcher briefly explained the hygienic measures being used.

Pilot Study

Before the main study was begun, a pilot study was conducted to find out the effectiveness of the research tool. Since no significant changes were made in the forms or the method of research, the cases used in the pilot study were included in the main study.

Analysis of the Data

The data were analyzed by the use of the coefficient of correlation and the "Student" t table. The findings were summarized, conclusions drawn, and recommendations made.

II. SUMMARY

In order to determine the comparative effectiveness of two methods of treating ammoniacal diaper rash, a study was made employing the experimental method with the parallel-group technique.

Forty-two infants with ammoniacal diaper rash seen in a selected clinic were placed alternately in control and experimental groups. The mothers of the infants in both groups were given verbal and written instructions for hygienic measures to employ in the treatment of the rash. The hygienic measures included the laundering of the diapers and care of the buttocks. The mothers were asked to record their observations and

return the report to the researcher. The mothers of the infants in the experimental group were given an ointment containing vitamins A and D to use on the infant's rash in addition to the hygienic measures prescribed in the general instructions.

Prior to the study, the effectiveness of the research tool was confirmed by a limited pilot study.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

The purpose of this study was to discover the comparative effectiveness of two methods of treating ammoniacal diaper rash. The method of conducting this study was described in Chapter III. In this chapter data are presented and analyzed by use of the coefficient of correlation and the "Student" t table. Interpretations are made, and findings summarized.

I. SAMPLE DISTRIBUTION

A total of forty-two infants with ammoniacal diaper rash were selected during February and March, 1964, at the White Memorial Pediatric Clinic in Los Angeles, California. They were divided into two groups and were assigned to the experimental group or the control group in a consecutive, alternating manner. One in each group did not send back the observation form and could not be contacted by letter, telephone or home visits. Thus a total of forty patients were used in the final analysis, twenty in each group.

II. PRESENTATION AND ANALYSIS OF THE TWO GROUPS

Bases for Comparison

In order to compare the two groups, a record was kept of the following: age, severity of the rash, number of days the infant had the rash prior to treatment, condition of the rash and area of rash involvement. The data collected are shown on Table I for the control group

TABLE I

DATA COLLECTED ON CONTROL GROUP

Case Number	Age of Infant in Months	Prior Duration of Rash in Days	*Severity of Rash	**Area of Involvement	**Diaper Cleansing Agent	#Rate of Healing Day 3	#Rate of Healing Day 6	#Rate of Healing Day 10
1	3	14	1	2	2	2	1	1
2	11	3	1	3	2	2	1	1
3	9	3	1	3	1	2	1	1
4	3	1	2	2	1	1	1	1
5	11	7	2	2	1	2	1	1
6	12	1	2	1	2	2	1	1
7	2	2	1	2	2	2	1	1
8	7	1	1	3	2	1	1	1
9	1	2	1	1	1	2	1	1
10	1	1	1	1	1	1	1	1
11	9	2	1	3	3	1	1	1
12	22	2	2	3	2	2	1	1
13	13	7	2	3	2	3	2	1
14	14	10	2	3	2	3	3	2
15	14	10	2	1	2	3	3	2
16	21	1	1	2	1	1	1	1
17	9	3	1	2	1	2	1	1
18	9	2	2	2	2	2	1	1
19	15	2	2	2	1	2	1	1
20	8	1	1	2	2	1	1	1

*Severity of Rash = 1 Mild
 2 Moderate
 3 Severe

**Diaper Cleansing Agent = 1 Soap
 2 Detergent
 3 Other

**Area of Involvement = 1 Perianal
 2 Pubic
 3 Severe

#Rate of Healing = 1 Healed
 2 Improved
 3 Unimproved
 4 Worse

and Table II for the experimental group.

Age. The distribution of ages in months in the control group varied from one month to twenty-two months, with an average of 9.7 months. In the experimental group the ages ranged from one month to twenty-one months with an average age of 5.85 months. The distribution of the ages of the two groups is shown on Figure 1.

Severity of rash. The severity of the rash was rated as mild, moderate, or severe. In the control group, eleven had mild, nine had moderate, and none had severe rash. There were in the experimental group nine with mild, ten with moderate, and one with severe diaper rash. The classification of the severity of the rash for the two groups is continued in Table III.

Duration of rash prior to treatment. The duration of the rash prior to treatment was recorded in days. In the control group the duration varied from one day to fourteen days with an average of 3.75 days. The duration varied from one to fourteen days with an average of 3.65 days in the experimental group. The duration of the rash for the infants in the two groups is shown in Figure 2.

Area of rash involvement. The control group had six with only perianal involvement, eight with only pubic involvement, and six in which the entire diaper area was involved. In the experimental group, two had only perianal involvement, eight had only pubic area involvement, and ten had rash of the entire diaper area. The area of rash involvement for the two groups is shown on Table IV.

TABLE II

DATA COLLECTED ON EXPERIMENTAL GROUP

Case Number	Age of Infant in Months	Prior Duration of Rash in Days	*Severity of Rash	**Area of Involvement	***Diaper Cleansing Agent	#Rate of Healing Day 3	Day 6	Day 10
1	5	1	2	3	1	1	1	1
2	3	2	1	2	1	1	1	1
3	7	7	1	2	2	2	2	1
4	7	7	2	3	2	2	1	1
5	9	7	1	2	2	1	1	1
6	3	2	2	2	2	1	1	1
7	3	3	2	1	2	1	1	1
8	1	14	3	3	1	2	2	2
9	4	1	1	2	3	1	1	1
10	9	7	2	3	2	4	2	2
11	6	2	2	3	2	2	1	1
12	5	3	1	3	2	2	2	1
13	7	7	2	2	1	2	2	2
14	7	14	2	2	2	3	2	1
15	9	1	1	3	1	1	1	1
16	2	1	1	3	1	3	3	2
17	3	1	1	2	3	1	1	1
18	3	1	2	3	2	1	1	1
19	21	2	1	3	2	2	1	1
20	3	2	2	1	2	1	1	1

*Severity of Rash = 1 Mild
 2 Moderate
 3 Severe

***Diaper Cleansing Agent = 1 Soap
 2 Detergent
 3 Other

**Area of Involvement = 1 Perianal
 2 Pubic
 3 Severe

#Rate of Healing = 1 Healed
 2 Improved
 3 Unimproved
 4 Worse

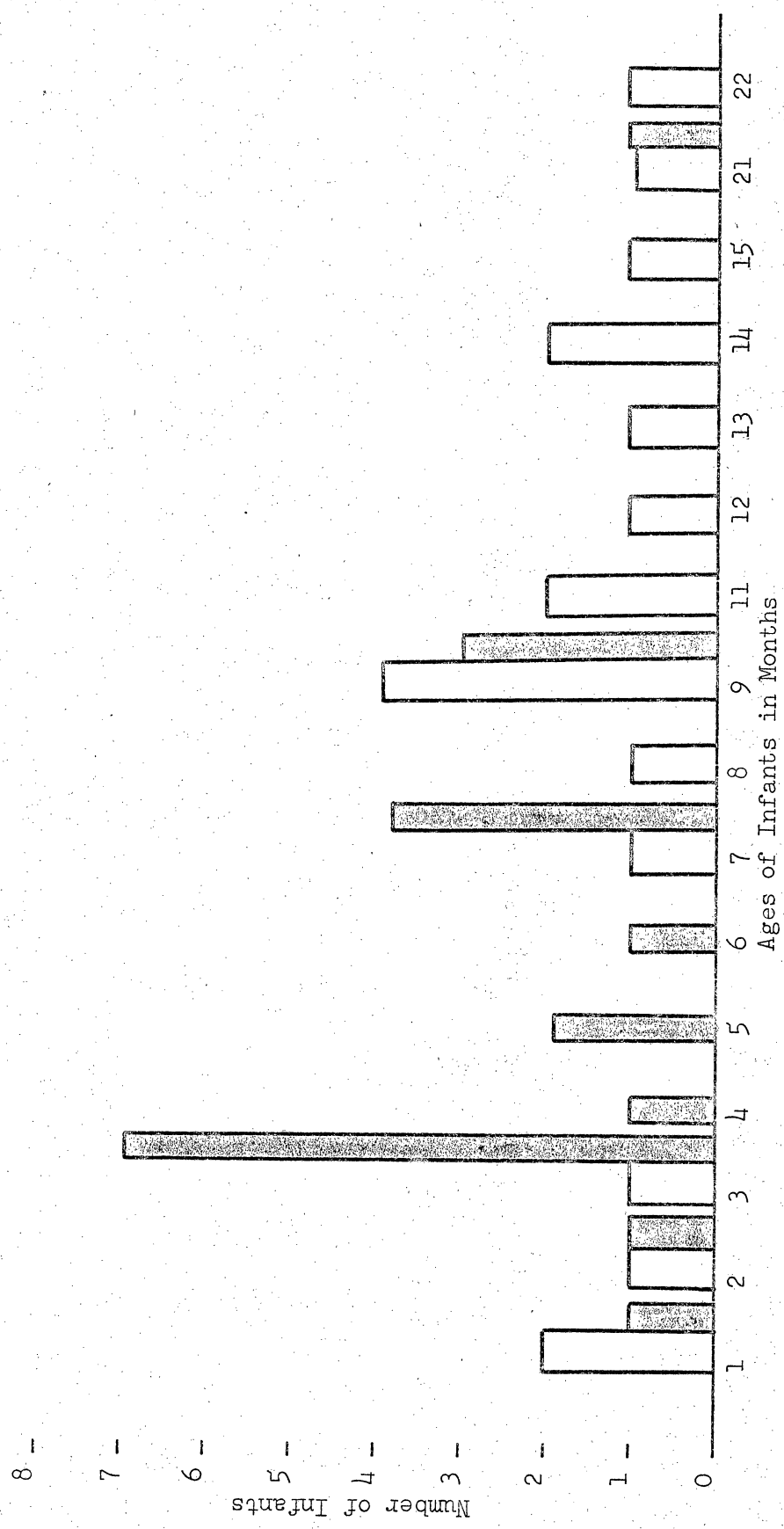


FIGURE 1

DISTRIBUTION ACCORDING TO AGE OF THE INFANTS IN THE TWO GROUPS

Control Group
Experimental Group

TABLE III
SEVERITY OF RASH INVOLVEMENT

Group	Mild	Moderate	Severe	Total
Control	11	9	0	20
Experimental	<u>9</u>	<u>10</u>	<u>1</u>	<u>20</u>
Total	20	19	1	40

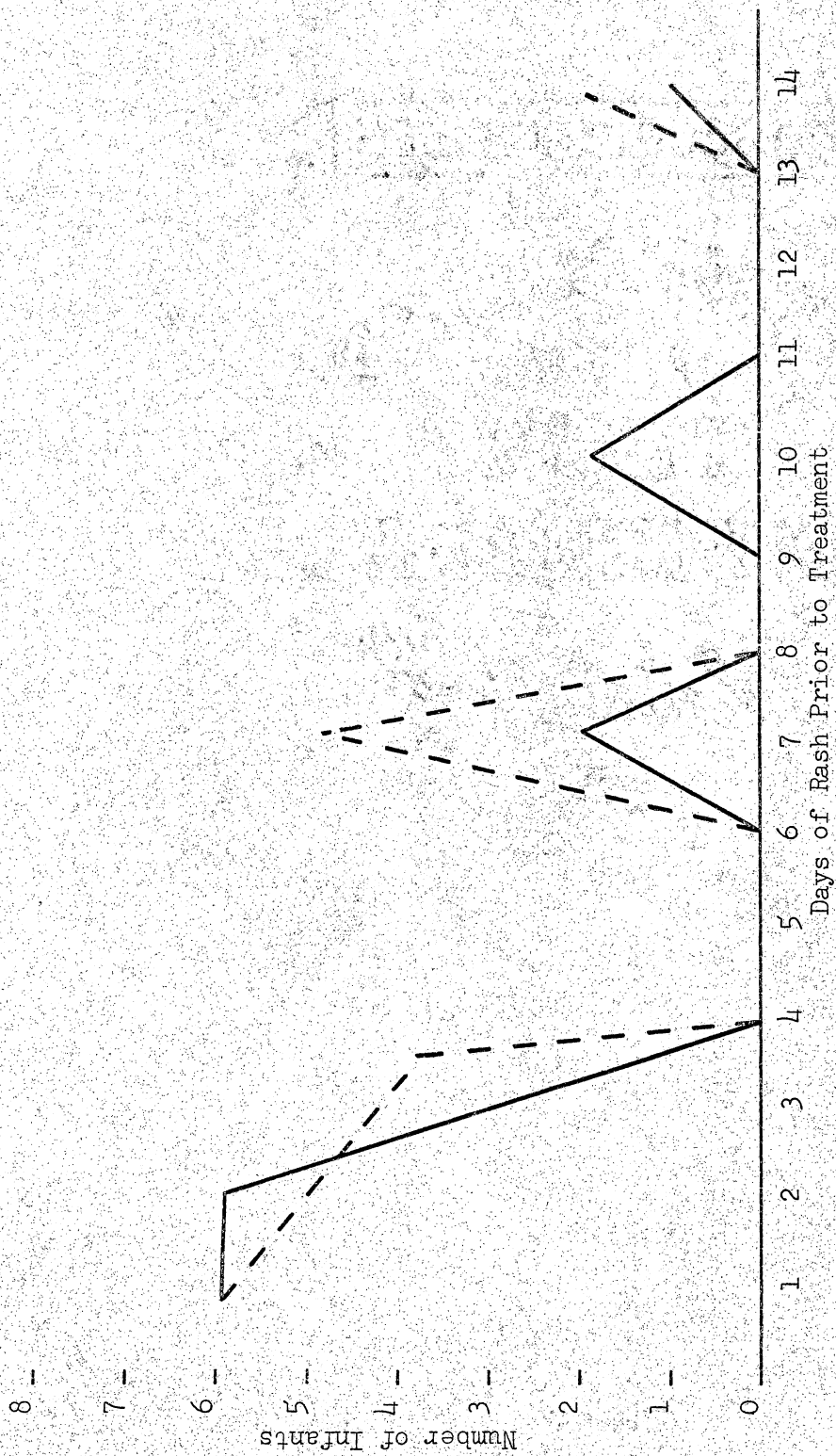


FIGURE 2

NUMBER OF CASES SHOWING DURATION OF RASH
PRIOR TO TREATMENT

— Control
- - - Experimental

TABLE IV
AREA OF RASH INVOLVEMENT

Group	Perianal	Pubic	Entire Diaper Area	Total
Control	6	8	6	20
Experimental	<u>2</u>	<u>8</u>	<u>10</u>	<u>20</u>
Total	8	16	16	40

Diaper cleansing agent. In the control group, seven used soap, twelve used detergent, and one used diaper service. The results were similar in the experimental group except that only six used soap in laundering the diapers and two made use of the diaper service. On Table V is shown the number of the control and experimental groups who used either soap, detergent, or diaper service in caring for the diapers.

TABLE V
DIAPER CLEANSING AGENT

Group	Soap	Detergent	Diaper Service	Total
Control	7	12	1	20
Experimental	<u>6</u>	<u>12</u>	<u>2</u>	<u>20</u>
Total	13	24	3	40

Time required for healing. The length of time required for healing varied from three to ten days for both groups. The average time of healing for the control group was 6.2 days; for the experimental group the average was 6.9 days. The comparison of the rate of healing of the control and experimental groups is shown in Figures 3 and 4 respectively.

Statistical Analyses

The "Student" t test as used to support the null hypothesis is given last. Certain comparisons of the data are given to show the relationship between the two groups. This was done by correlation

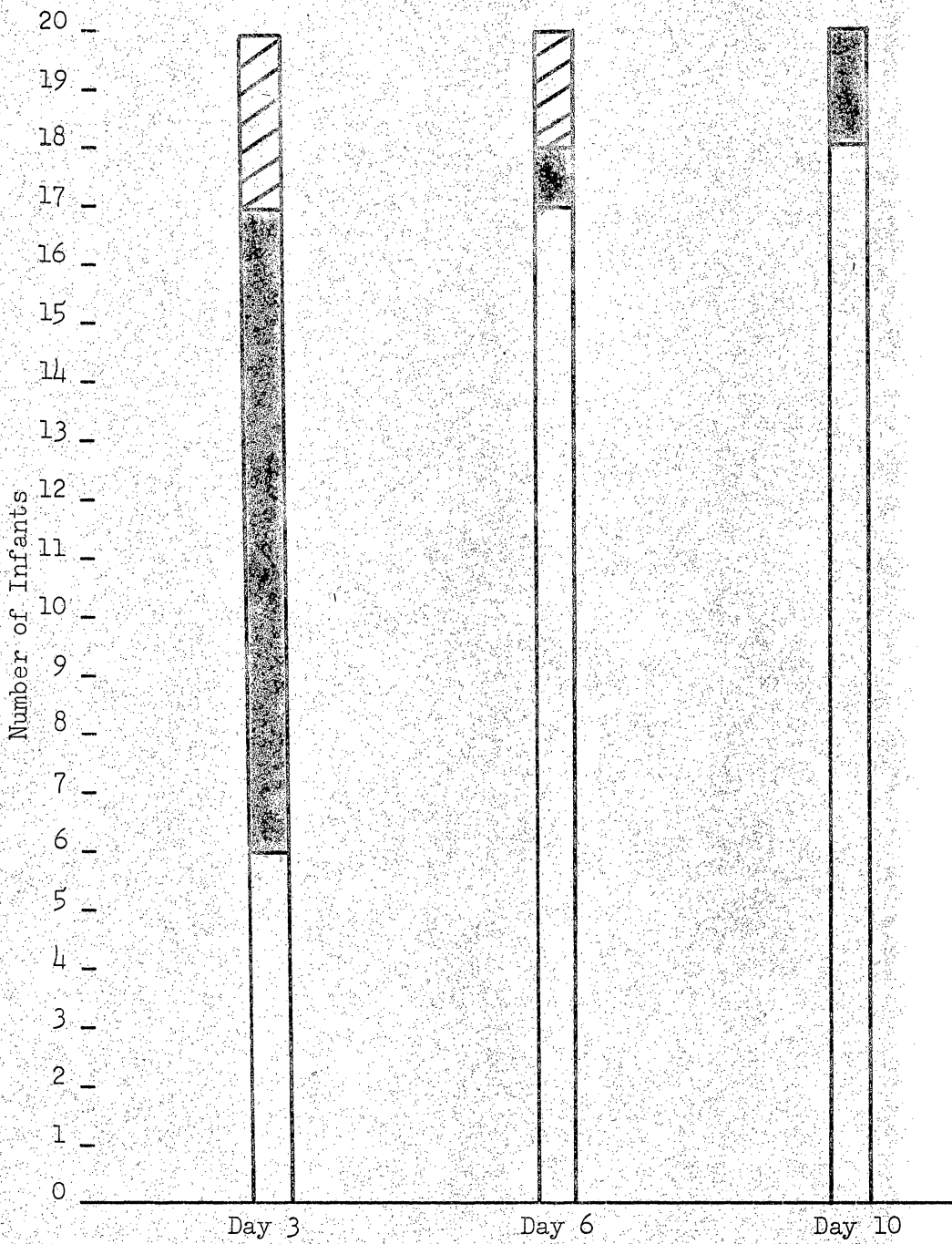
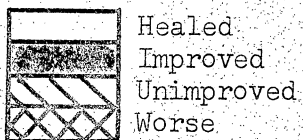


FIGURE 3

RATE OF HEALING OF THE CONTROL GROUP



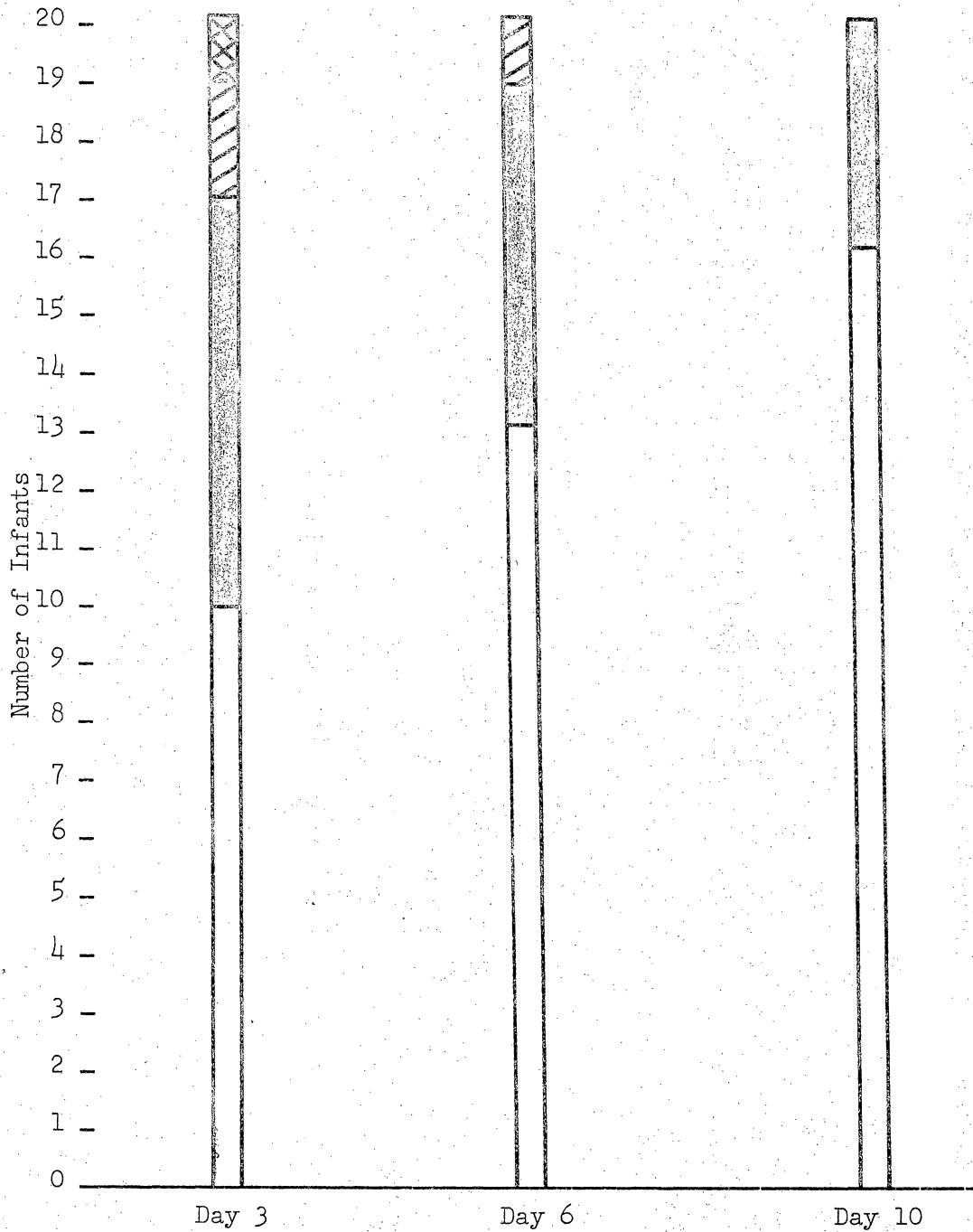
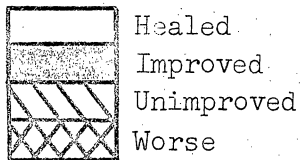


FIGURE 4

RATE OF HEALING OF THE EXPERIMENTAL GROUP



studies. The results of the analyses are shown in Table VI.

Basically, seven correlations were made and the results analyzed.

1. The correlation of the previous duration of rash with the number of days required for healing.

The control group had a positive correlation of $.684 \pm .12$. The experimental group had a positive correlation of $.394 \pm .19$ which is not so high as in the control group.

2. The correlation of the severity of the rash with the number of days required for healing.

Here again both correlations were positive. The control group had a correlation of $.508 \pm .166$ and the experimental group was $.215 \pm .213$.

3. The correlation of the age of the infant with the number of days required for healing.

The control and experimental groups had a correlation of $.333 \pm .199$ and $.017 \pm .224$ respectively.

4. The correlation of the area of involvement with the number of days required for healing.

The correlation for the control group was $.497 \pm .169$ and for the experimental group was $.336 \pm .198$.

The next three relationships were correlated on the group of infants as a whole because the correlation was between factors present before treatment was begun. The first was between the severity of the rash as compared with the previous duration of the rash. For the group, the correlation was $.39 \pm .13$. Then the severity of the rash was compared with the diaper cleansing agent to determine whether some agents are more prone to cause rashes than are others. The correlation was

TABLE VI
THE COEFFICIENT OF CORRELATION
OF SEVEN COMPARISONS

Comparisons	Control	Experimental
1. Correlation of previous duration of rash with number of days required for healing.	.684 ± .12	.394 ± .19
2. Correlation of severity of rash with number of days required for healing.	.508 ± .166	.215 ± .213
3. Correlation of the age of the infant with the number of days required for healing.	.333 ± .199	.017 ± .224
4. Correlation of the area of involvement with the number of days required for healing.	.497 ± .169	.336 ± .198
Group as a Whole		
5. Correlation of the severity of the rash with previous duration of rash.	.39 ± .13	
6. Correlation of the severity of rash with the diaper cleansing agent.	.025 ± .159	
7. Correlation of the age of the infant with the severity of the rash.	.039 ± .16	

.025 \pm .159. Last, the correlation between the age of the child and the severity of the rash was .039 \pm .16.

III. INTERPRETATION OF THE ANALYSES

In the first comparison the control group had a positive correlation of .648 \pm .12. This would be read thus: In comparing the previous duration of the rash with the number of days required for healing, there was a slightly positive correlation indicating that the longer the infant had the diaper rash prior to treatment, the greater the number of days required for healing. The standard error of .12 indicated that the true correlation would fall between .564 and .816 on a 68 per cent probability basis. The correlation of the experimental group was .394 \pm .19 and on a 68 per cent probability basis would be .204 to .584. The reason the correlation was higher in the control group might be because the random method of selecting the control and experimental groups did not avoid a disparity of the average age between the two groups. The small sampling might also have been a factor.

The control group had a higher correlation between the severity of the rash and the number of days required for healing. The control group was .508 \pm .166 compared to .215 \pm .213 in the experimental group. On a 68 per cent probability basis, the correlation for the control group would be .342 to .674 as compared to .002 to .428 for the experimental group. The result did show that when the rash was more severe, the time for healing tended to be longer.

There seemed to be some correlation between the age of the infant and the number of days required for healing. This correlation was higher

in the control group than in the experimental group, with a correlation of $.333 \pm .199$ and $.017 \pm .224$ respectively. Actually, there was very little if any correlation in the experimental group. On a 68 per cent probability basis, the correlation for the control group would be $.134$ to $.532$ and for the experimental group would be $-.207$ to $.241$. This was most likely due to the small number of the sample and might have been due to the age difference of the two groups.

The correlation between the area of involvement and the number of days required for healing showed a negative correlation for the control group of $-.497 \pm .169$ and a positive correlation for the experimental group of $.336 \pm .198$. In essence this meant that in the control group the greater the area of involvement the fewer the number of days required for healing, while in the experimental group the greater the area of involvement the greater the number of days required for healing. In reviewing this relationship with the statistician, no possible explanation could be found for the difference. A Chi-Square was done to compare the control and experimental groups with regard to the area of involvement in order to check the problem. The Chi-Square showed a probability of significance at the 50 per cent level. Since the test for the significance of the difference in the time of healing showed very small probability of significance according to the method of treatment, a recalculation of the coefficient of correlation was done using both groups together. The correlation was $.023 \pm .159$ which meant there was practically no correlation.

The last three correlations were done on the group of forty infants as a whole. The severity of the rash did show a positive correlation with the previous duration of the rash of $.39 \pm .13$. In

other words, the infants who had had the rash the longest time tended to have the more severe rash.

There appeared to be no correlation between the severity of the rash and the method of laundering diapers. The correlation was $.025 \pm .159$. Since the majority (67.5 per cent) of the mothers used automatic washing machines and only 10 per cent of all the mothers used any precautions in laundering the diapers, this might account for the lack of correlation between the two factors.

The last correlation showed no relationship between the age of the infant and the severity of the rash. The correlation was $.039 \pm .16$. From this it would appear that some factor other than the age of the infant must account for the severity of the rash.

The experimental and control groups were compared as to the time of healing and the validity of the hypothesis checked by the "Student" t test yielding a t of .515 with 38 degrees of freedom. Entering this data on the t table, there was a probability of .60 or 60 per cent that chance would explain the observed difference and .40 or 40 per cent probability that the experimental factor would explain observed difference. This supported the null hypothesis that the two methods used were equally effective in the treatment of ammoniacal diaper rash. This might explain the positive and negative correlations obtained when the area of involvement was compared with the number of days required for healing in the two groups.

IV. SUMMARY

A control and an experimental group were used to compare hygienic measures alone and hygienic measures plus the use of an ointment containing vitamins A and D in the treatment of ammoniacal diaper rash. Of the forty-two infants selected, forty were used in the final analysis, twenty in each group.

The age of the infant, the severity of the rash, number of days the infant had the rash prior to treatment, condition of the rash at the beginning of treatment, the area of rash involvement, diaper cleansing agent, and the length of time required for healing were used as the bases for comparing the two groups. The data were analyzed by the use of the coefficient of correlation and the "Student" t table. It was found that:

1. The comparison of the previous duration of rash to the number of days required for healing showed a positive correlation which was higher in the control group.
2. The comparison of the severity of the rash to the number of days required for healing showed a positive correlation in the control group and very little if any correlation in the experimental group.
3. The comparison of the age of the infant to the number of days required for healing showed little correlation in the control group and no correlation in the experimental group.
4. The comparison of the area of involvement with the number of days required for healing showed a negative correlation

for the control group and a positive correlation for the experimental group. A Chi-Square was done which showed that the area of involvement had a probability of significance at the 50 per cent level.

5. The comparison of the severity of the rash to the previous duration of the rash did show a positive correlation for the group as a whole.
6. The comparison of the severity of the rash to the method of laundering diapers showed no correlation for the group as a whole.
7. The comparison of the age of the infant to the severity of the rash showed no correlation for the group as a whole.

There was no correlation between the method of treatment used and the number of days required for healing. This supported the null hypothesis that the two methods were equally effective in the treatment of ammoniacal diaper rash.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The purpose of this study was to find out the effectiveness of hygienic measures alone and hygienic measures plus the use of a bland ointment containing vitamins A and D in the treatment of ammoniacal diaper rash. The experimental method with parallel groups and a single variable was employed.

A review of the literature available from the Los Angeles branch of the Loma Linda University library was made. The review revealed that there are a number of types of diaper rash with various causes but that the ammoniacal diaper rash caused by the splitting-off action of the *Bacillus ammoniagenes* on urea is one of the most common types. This bacillus is always present in feces. Urine and alkaline feces provide excellent cultures for its growth while an acid medium inhibits it. Many types of oils, lotions, creams, and powders have been used in the treatment of ammoniacal diaper rash, but no study was found to have been done on the effectiveness of a bland ointment containing vitamins A and D.

This study was conducted in the White Memorial Hospital Pediatric Clinic. Forty-two infants with ammoniacal diaper rash were placed alternately in the experimental and control groups. Both groups used the same hygienic measures for washing the infants' buttocks and for the vinegar rinse in laundering the diapers. The single variable was the use of a bland ointment containing vitamins A and D by those in the

experimental group. The researcher prepared a form with the instructions for the hygienic measures to be used. An observation form was used to record the severity of the rash on the third, sixth, and tenth days after starting treatment. It was to be filled in by the mothers and returned in the self-addressed stamped envelope provided. A letter was given to the mother so she would have a written explanation of the purpose and method of the study in addition to the verbal explanation. These forms were given to the mother at the time the infant was seen in the clinic. The information form, which contained pertinent data concerning the infant and his rash, was filled out and kept by the researcher at the time of the interview. Two mothers did not send back the observation forms and could not be contacted by letter, telephone, or home visits so their infants were not included in the study. Thus forty, or twenty in each group, were used in the final analysis of this study.

The data collected were analyzed by the coefficient of correlation. The "Student" t table was used to find significant differences in comparing the groups. The average length of the time required for healing of the diaper rash in the control group was 6.2 days and in the experimental group 6.9 days.

The correlations showed the following:

1. A positive correlation between the days of duration of the rash before treatment and the days required for healing, the control group having the higher correlation.
2. A slightly positive correlation between the age of the infant and the days required for healing, the control group having the higher correlation.

3. A positive correlation between the severity of the rash and the days required for healing, the control group having the higher correlation.

4. Essentially no correlation between the area of rash involvement and the days required for healing in either the control or experimental group.

5. A slightly positive correlation between the severity of the rash and the previous duration of the rash.

6. No correlation between the severity of the rash and the diaper cleansing agent used.

7. No correlation between the age of the infant and the severity of the rash.

II. CONCLUSIONS

The null hypothesis, that hygienic measures when used alone or when used with a bland ointment containing vitamins A and D are equally effective in the treatment of ammoniacal diaper rash, was largely sustained by the findings of this study. The slight significance of differences between the groups indicated that a much larger sampling would be necessary to draw any valid conclusions.

From the analysis of the data collected, it is further concluded that:

1. The effectiveness of the treatment may depend upon many uncontrollable factors.

2. The use of the bland ointment containing vitamins A and D does not significantly increase the rate of healing. Therefore, its

use may be more of a psychological aid to the mother than of actual benefit to the infant.

III. RECOMMENDATIONS

As a result of the findings of this study, the following recommendations were made:

1. That the instructions for the hygienic measures as outlined in this study be used in the selected clinic.

2. That studies similar to this one be done to determine (a) if infants of one race are more susceptible to diaper rash than others; (b) if the pigmentation of the skin is a factor in the frequency or severity of the rash; (c) if there is a difference in the severity of the rash and/or the rate of healing according to the sex.

3. That a comparative study be done using the vinegar diaper rinse instructions for the control group and instructions for using only a bland ointment containing vitamins A and D for the experimental group.

4. That a study be done in which the control group is given no hygienic instructions and the experimental group is given only instructions for using a bland ointment containing vitamins A and D.

BIBLIOGRAPHY

SELECTED BIBLIOGRAPHY

A. BOOKS

- Armstrong, Inez L. and Jane J. Browder. The Nursing Care of Children. Philadelphia: F. A. Davis Company, 1958. 606 p.
- Committee on the Fetus and Newborn of the American Academy of Pediatrics. Hospital Care of Newborn Infants. Illinois: American Academy of Pediatrics, 1957. 144 p.
- Fitzpatrick, Elise and Nicholson J. Eastman. Zabriskie's Obstetrics for Nurses. Tenth edition. Philadelphia: J. B. Lippincott Company, 1960. 571 p.
- Good, Carter V. and Douglas E. Scates. Methods of Research. New York: Appleton-Century-Crofts, Inc., 1954. 920 p.
- Jacquet, L. Traite des Maladies de l'Enfance. Paris: Grancher et Comby, 1905, 4, 714.
- Leider, Morris. Practical Pediatric Dermatology. St. Louis: The C. V. Mosby Company, 1961. 437 p.
- Nelson, Waldo E. Textbook of Pediatrics. Seventh edition. Philadelphia: W. B. Saunders Company, 1959. 1401 p.
- Perlman, Henry H. Pediatric Dermatology. Chicago: The Year Book Publishers, Inc., 1960. 477 p.
- Wiener, Kurt. Skin Manifestations of Internal Disorders. St. Louis: The C. V. Mosby Company, 1947. 690 p.

B. DICTIONARIES

- Taylor, Norman Burke (ed.). Stedman's Medical Dictionary. Eighteenth revised edition. Baltimore: The Williams and Wilkins Company, 1953. 1561 p.
- Webster's New Collegiate Dictionary. Massachusetts: G. and C. Merriam Company, Publishers, 1956. 1174 p.

C. PERIODICALS

- Adler, Donald K. "An Effective Ointment in the Treatment of Diaper Dermatitis," New York State Journal of Medicine, 61:2057-60, June 15, 1961.

- Benson, Reuel A. and others. "Commercially and Home-Laundered Diapers," Archives of Pediatrics, 73:250-8, July, 1956.
- Benson, Reuel A. and others. "A New Treatment for Diaper Rash," Journal of Pediatrics, 31:369-74, October, 1947.
- Benson, Reuel A. and others. "The Treatment of Ammonia Dermatitis with Diaparene," Journal of Pediatrics, 34:49-51, January, 1949.
- Bleier, Adolph and Meyer L. Nieldelman. "Ammonia Dermatitis: Comparative Study of Diaparene with Chloride Ointment," Archives of Pediatrics, 69:445-9, November, 1952.
- Brennemann, Joseph. "The Ulcerated Meatus in the Circumcised Child," American Journal of Diseases of Children, 21:38-47, January, 1921.
- Brown, Claude P. and Frederic H. Wilson. "Dermatitis, A Study in Biological and Chemical Control of Ammonia 'Diaper Rash'," Archives of Pediatrics, 74:90-9, March, 1957.
- Chadwell, Orville R. "Impetigo Neonatorum; Its Control and Treatment," New England Journal of Medicine, 199:983-5, November 15, 1928.
- Chiara, Nicholas. "A New Lotion for Newborn Skin Cleansing," New York State Journal of Medicine, 57:2391-3, July 15, 1957.
- Cooke, J. V. "The Etiology and Treatment of Ammonia Dermatitis of the Gluteal Region of Infants," American Journal of Diseases of Children, 22:481-92, November, 1921.
- Cunningham, Guy C. "Ammoniacal Dermatitis," The Journal of the Kentucky State Medical Association, 59:1174-6, December, 1961.
- _____ "Diaper Rash," Journal of the American Medical Association, 165:254-5, September 21, 1957.
- Dubow, Emanuel. "Ammoniacal Napkin Dermatitis in Infants," Archives of Pediatrics, 71:323-6, October, 1954.
- Fairburn, Ernest A. "The Care of the Skin in the Newborn," Practitioner, 186:194-9, February, 1961.
- Fischer, Carl C. "Clinical Study of Skin Rashes During the Newborn Period," American Journal of Diseases of Children, 85:688-93, June, 1953.
- Fischer, Carl C. "Prevention of Impetigo Neonatorum," Archives of Pediatrics, 61:352-7, June, 1944.
- Friend, William K. "Ammoniacal Dermatitis," California Medicine, 97:56-7, August, 1962.

- Gezon, Horace and others. "Hexachlorophene Bathing in Early Infancy," New England Journal of Medicine, 271:379-86, February 20, 1964.
- Glaser, Jerome and others. "Prevention of Minor Skin Irritation (Miliaria) and Impetigo in the Newborn," American Journal of Diseases of Children, 81:329-34, March, 1951.
- Grossman, Leo. "A New Specific Treatment for Perianal Dermatitis," Archives of Pediatrics, 71:173-9, June, 1954.
- Hagen, Kathryn L. "Diaper Rash," Life and Health, 77:10-11, November, 1962.
- Hanfling, Seymour L. "Skin Care of the Expectant Mother and the Newborn Baby," GP, 20:97-101, October, 1959.
- _____. "If You Ask Me," American Journal of Nursing, 59:1762-3, December, 1959.
- Isler, Charlotte. "The First Week of Life," R.N., 23:45-54, December, 1960.
- Kaessler, Henry W. "Dermatitis of the Diaper Region: A New Remedy for an Old Affliction," Archives of Pediatrics, 74:47-50, February, 1957.
- Kahan, Herbert and others. "A New Topical Remedy for the Prevention and Management of Napkin Dermatitis (Diaper Rash)," Archives of Pediatrics, 73:125-9, April, 1956.
- Keitel, H. G. and others. "Diaper Rash, Self-Inflicted Excoriations, and Crying in Full-Term Newborn Infants Kept in the Prone or Supine Position," Journal of Pediatrics, 57:884-6, December, 1960.
- Kozinn, Philip J. and others. "Cutaneous Candidiasis in Early Infancy and Childhood," Pediatrics, 20:827-834, November, 1957.
- Kozinn, Philip J. and others. "'Diaper Rash', A Diagnostic Anachronism," Journal of Pediatrics, 59:75-80, July, 1961.
- Lipschutz, Arthur and Horst Agerty. "Prophylaxis in Pediatric Skin Care," Archives of Pediatrics, 79:257-62, July, 1962.
- Lipschutz, Arthur and Carl C. Fisher. "Methylbenzethonium Chloride in the Care of Skin of Infants and Children," American Journal of Diseases of Children, 89:596-8, May, 1955.
- Lipschutz, Arthur and Regina M. Fitti, "New Antibacterial Detergent for Common Skin Diseases in Children," Archives of Dermatology and Syphilology, 68:83-5, July, 1953.

- Litchfield, Harry R. "The Treatment of Intertriginous Eruptions (Diaper Rash) and Infantile Eczemas," New York State Journal of Medicine, 60:3253-7, October 15, 1960.
- Niedelman, Meyer L. and Adolph Bleier. "Ammonia Dermatitis: Treatment with Diaparene Chloride Ointment," Journal of Pediatrics, 37:762-4, November, 1950.
- Osburn, Raymond A. "Nystatin Topical Therapy of Moniliasis," Archives of Dermatology, 72:371, October, 1955.
- Perlman, Henry Harris. "The Seborrheid Diaper Reaction," Medical Times, 90:1184-91, November, 1962.
- Perlstein, M. A. "Evaluation of Certain Preparations for Care of the Skin of Newborn Infants," American Journal of Diseases of Children, 75:385-94, March, 1948.
- Pfeffer, William and Clement A. Smith. "A Note on the Treatment of Diaper Rash with Alkyl-Dimethyl-Benzyl-Ammonium Chlorides (Roccal)," Journal of Pediatrics, 37:351-6, September, 1950.
- Pratt, Arthur G. and others. "Influence of Type of Reeding on pH of Stool, pH of Skin, and Incidence of Perianal Dermatitis in the Newborn Infant," Journal of Pediatrics, 46:539-43, May, 1955.
- Robinson, Harry M. "A Study of a Protective Powder," Southern Medical Journal, 52:1421-2, November, 1959.
- Robinson, Raymond C. V. "Cutaneous Moniliasis in Infants," Journal of Pediatrics, 50:721-3, June, 1957.
- Ross, Lawrence S. "An Inexpensive Prophylaxis for Ammoniacal Dermatitis," Pediatrics, 31:144-5, January, 1963.
- Stephens, LeRoy J. "o-Benzyl-p-Chlorophenol in the Prevention and Treatment of Ammonia Dermatitis," Journal of Pediatrics, 40:750-6, June, 1952.
- Susca, Louis A. and others. "Treatment of Diaper Rash," New York State Journal of Medicine, 60:2858-62, September 15, 1960.
- Swift, Sheldon. "Diaper Dermatitis," Pediatric Clinics of North America, 3(No. 3):759-69, August, 1956.
- Warin, R. P. and K. E. Faulkner. "Napkin Psoriasis," British Journal of Dermatology, 73:445-7, December, 1961.

APPENDICES

- Appendix A: Information Form
- Appendix B: General Cleansing Instructions
- Appendix C: Observation Form
- Appendix D: Letter to Mother

APPENDIX A: INFORMATION FORM

Name _____ Telephone _____

Address _____

P.F. Number _____ Age _____

1. How long has the baby had the rash? _____ days

2. Condition of rash at this time:

- a. Mild
- b. Moderate
- c. Severe

3. Area of rash involvement:

- a. Perianal
- b. Pubic area
- c. Entire diaper area

4. Diaper care:

a. Cleansing agent

(1) Soap

(2) Detergent

(3) Other _____

b. Method of washing diapers

(1) Automatic washer

(2) Wringer machine

(3) Hand

(4) Other _____

c. Number of times rinsed _____

5. Group:

a. Control

b. Experimental

APPENDIX B: GENERAL CLEANSING INSTRUCTIONS

Care of the Buttocks:

1. Change the soiled diaper as soon as possible.
2. Cleanse the buttocks with cool running water.
3. Dry the skin thoroughly. (Blot, don't rub)
4. Apply clean diaper.
5. DO NOT USE soap, powder, oil, or any other substances on the skin of the buttocks.

Care of the Diapers:

The diapers should be washed in hot soapy water and rinsed until water is clear. To the final tub of rinse water add 1 cup of vinegar. (The vinegar should be the equivalent of 1 tablespoon vinegar to two quarts of water.) Diapers may then be dried in the usual manner.

Note: If you have an automatic washer of your own, let diapers run through the complete cycle. Then set the dial back to rinse and let machine fill again. Add 1 cup of vinegar to the tub of rinse water. Let water rinse diapers and spin, but do not spray rinse again. Diapers may then be dried in the usual manner.

APPENDIX C: OBSERVATION FORM

Your name _____

INSTRUCTIONS:

Please examine your baby's diaper rash on the following dates.

Circle the letter which best fits the description of the rash.

For example, if on the third day you notice that the rash appears to be improved, you would circle the letter **C**.

- a. Rash has become worse since starting treatment.
- b. Rash remains the same, is no better, or is unimproved.
- C**. Rash is healing, is better, or is improved.
- d. Rash is healed.

Day 3 Date _____

- a. Rash is worse.
- b. Rash is unimproved.
- c. Rash is improved.
- d. Rash is healed.

Day 6 Date _____

- a. Rash is worse.
- b. Rash is unimproved.
- c. Rash is improved.
- d. Rash is healed.

Day 10 Date _____

- a. Rash is worse.
- b. Rash is unimproved.
- c. Rash is improved.
- d. Rash is healed.

On the tenth day please mail this form in the envelope provided for your convenience.

Thank you for your cooperation.

APPENDIX D: LETTER TO MOTHER

Dear Mother:

The problem of diaper rash is common and may be upsetting to you and your infant. We are interested in finding out the best method of helping you with your baby's rash. Your cooperation in a study on the treatment of diaper rash is requested.

Please follow the General Cleansing Instructions form carefully. Let me emphasize the importance of using the vinegar in the final rinse of the diapers. Vinegar, when used in washing diapers, will neutralize the effects that soaps have on the skin.

Carefully follow the instructions for completing the Observation Form on the third, sixth, and tenth days. On the tenth day mail the Observation Form in the stamped envelope provided. If you have any questions feel free to contact me by letter or call me between 10:00 a.m. and 2:30 p.m. Sunday through Friday. My name and address are as follows:

Miss Leola Gerrans, R.N.
317 North Boyle Avenue
White Memorial Pediatric Clinic
Los Angeles, California 90033
Telephone: 262-0767

Your name will not be used in the study. It is put on the Observation Form only so we will know who has or has not returned the form.

However, your identity will not be revealed in the study.

Thank you for your cooperation.

Sincerely,

(Miss) Leola Gerrans, R.N.
Loma Linda University

LOMA LINDA UNIVERSITY

Graduate School

A STUDY COMPARING THE EFFECTIVENESS OF
TWO METHODS OF TREATING AMMONIACAL DIAPER RASH

by

Leola Eldean Gerrans

An Abstract of a Thesis
in Partial Fulfillment of the
Requirements for the Degree
Master of Science in the Field of Nursing

May, 1964

ABSTRACT

This study was conducted to find out if there was any significant difference in the effectiveness of two methods of treating ammoniacal diaper rash. The experimental method with parallel groups and a single variable was used. The instructions for hygienic measures were the same in the control and experimental groups. The variable was that the mothers of the infants of the experimental group used an ointment containing vitamins A and D in addition to the hygienic measures. A review of literature on diaper rash was done at the library on the Los Angeles campus of Loma Linda University. No study was found to have been done on the effectiveness of a bland ointment containing vitamins A and D in the treatment of diaper rash. Ammoniacal diaper rash is caused by the action of microorganisms always present in the stools on urea in the urine. One of the end products is ammonia which causes the skin irritation. Urine and alkaline stools promote the growth of the bacillus ammoniagenes while an acid medium inhibits its growth. Many types of oils, lotions, creams and powders have been employed in the treatment of ammoniacal diaper rash. This study was conducted in the White Memorial Hospital Pediatric Clinic on forty-two infants with ammoniacal diaper rash. They were placed alternately in the control and experimental groups. The data were gathered by the researcher in the form of a questionnaire when the interview was made in the clinic and from an observation form completed by the mother. The observation form for one infant in each group was not obtained; thus forty infants were used in the final analyses. The data collected were analyzed by the coefficient of correlation and the "Student" t table. Seven

correlations were done which revealed that there was: (1) a slightly positive correlation between the days of duration of the rash prior to treatment and the days required for healing; the severity of the rash and the days required for healing; the age of the infant and the days required for healing (the control group had a slightly higher correlation in each of the above comparisons); and (2) practically no correlation between the area of involvement and the days required for healing in either group. Three correlations were done on the group as a whole which showed: (1) a slightly positive correlation between the number of days the infant had the rash prior to treatment and the severity of the rash; (2) no correlation between the severity of the rash and the diaper cleansing agent used or between the age of the infant and the severity of the rash. The hypothesis was supported in that the two methods of treating diaper rash appeared to be equally effective in this study. It is recommended that more emphasis be placed on keeping the diaper area clean by washing with cool running water and on using the vinegar rinse for diapers.