cream, butter, bacon, olive oil (plain or in mayonnaise) and cod liver oil.

5. The presence of constipation. Since constipation is commonly associated with epilepsy and seems to predispose to an attack, it is desirable to insure good elimination. The ketogenic diet is in itself somewhat laxative so that cathartics should not be necessary, but if they are, the selection should be limited to plain granular agar, various mineral oils, salts (Carlsbad or magnesium sulphate), and the bitter fluidextract of cascara. Any of these should be used to aid in establishing regularity of defecation and should be withdrawn as soon as possible.

6. The nausea or even vomiting occasionally resulting at the beginning of the ketogenic diet, from the sudden change from the normal or high carbohydrate diet, on which the average patient lives today, to the low carbohydrate and high fat diet. This, as pointed out, may be avoided by the gradual change in the proportions of carbohydrate and fat.

The problem of meeting these difficulties is purely a matter of the education and instruction of the patient, which is the most important part of the treatment. While the diet is being adjusted the patient is learning how to test for the acetone bodies in the urine, how to use a set of scales, how to use food tables, and how to translate the diet prescription, which calls for grams of carbohydrate, protein and fat, into meals in terms of vegetables, fruits, eggs and other foodstuffs. This at first seems difficult, but experience teaches us that patients who have enjoyed only limited educational advantages can be trained to take care of themselves.

TABLE 7.—*Summary of Cases*

	Cases
Adults controlled by ketogenic diet	7
Adults improved by ketogenic diet	7
Adults improved by ketogenic diet, but also using drugs	5
Adults definitely deriving benefit by diet	19
Adults in whom the diet failed	13
Adults (unselected) on diet for only two to four weeks	17
Total adults on ketogenic diet	49

SUMMARY

Thirty-two adult patients suffering from idiopathic epilepsy were treated with a ketogenic diet. In seven cases the attacks were controlled, and in twelve the patients were definitely improved; thus nineteen were benefited by the diet. Thirteen patients were not definitely benefited, although many of them were not maintained in a state of ketosis. The results are summarized in table 7.

Growth of Cults Lack of Common Sense.—It is not amiss to note that, during the period of greatest development of medical science, development not only in its content but also in its intent, there has been at the same time in this country the greatest development of favorable inclination toward weird hypotheses concerning the character of disease and methods of its treatment that the world has ever seen. That this is not due merely to the dissemination of new knowledge, to those strata of society which previously had never thought and which are now incapable of logical thought, is amply demonstrated by the growth of cults with a clientele made up in large measure of those members of society who have been by tradition and training accustomed to thinking. The aberration of their mental processes is not due to moronic heredity but perhaps in large measure to lack of contacts with enough individuals with sound common sense.—Wilson, L. B.: *Minnesota Med.* **11**:365 (June) 1928.

THE SERUM TREATMENT OF ERYSIPELAS *

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In May, 1926, Birkhaug [1] reported the results of the treatment of sixty cases of erysipelas with a specific serum. Of these, twelve especially striking cases were reported in detail. The serum was produced by the adaptation of the method which Dochez [2] had employed in the production of an immune serum against the streptococcus of scarlet fever. The serum was first employed in the unconcentrated form, of which an average dose of 100 cc. was used, and later in a concentrated form, with an average dose of 15 cc. The report does not state that all recovered, though no specific statement is made that any died, only that "two patients were moribund when first visited." It is impossible to analyze his series of cases from the standpoint of age distribution, seasonal occurrence, total duration of fever and other factors which might enter into an evaluation of the results, nor has a comparison been made with a control series. As a result of this and of previous studies, Birkhaug concluded that the etiologic agent of erysipelas was a specific strain of hemolytic streptococcus and that the serum produced with the specific type of micro-organism possesses "very marked curative properties when administered early in the disease," that is, within the first three days. He observed an amelioration of "the general toxic depression," presumably that due to the presence in the blood of a toxic substance "similar in nature to the toxic filtrate produced by *Streptococcus erysipelatus*," which he had demonstrated in the blood and urine of patients in the acute stages of the disease.[3] He was careful to state that one should determine the adequacy of dosage by the intradermal injection of a skin test dose (0.1 cc. of a 1:1,000 dilution of erysipelas toxic filtrate) made simultaneously with the intramuscular injection of serum. Adequate neutralization of the toxins of the disease would be indicated by a negative reaction to intradermal toxin.

When the medical clinic began to receive patients with erysipelas, the serum was used, beginning in July, 1926, with the opening of the Municipal Hospital. The early results were most discouraging, so that it was decided to run a control series of alternate cases untreated with serum. This was continued to May 8, 1927, after which date alternate cases were treated with scarlet fever serum obtained from the New York State Department of Health. Some of the early cases were treated with unconcentrated erysipelas serum obtained from Dr. Birkhaug, while later concentrated serum was furnished by the firm of Squibb according to the terms of a contract with Dr. Birkhaug.

In order to compare results over a longer period of time, we have included in the statistical analysis following all the cases of erysipelas treated in the old Municipal Hospital from January, 1925, to the opening of the new hospital in July, 1926. In addition we are

* From the Department of Medicine, University of Rochester School of Medicine and Dentistry.

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1. Birkhaug, K. E.: Erysipelas V. Observations on the Etiology and Treatment with Erysipelas Antistreptococcic Serum, J. A. M. A. **86**: 1411 (May 8) 1926.

2. Dochez, A. R.: Significance of Streptococcus Hemolyticus in Scarlet Fever, J. A. M. A. **82**: 542 (Feb. 16) 1924.

3. Birkhaug, K. E.: Proc. Soc. Exper. Biol. & Med. **23**: 201, 1925.

indebted to Dr. S. W. Clausen, chief of the pediatric service, for permission to include fifteen cases of children treated in his service.

The monthly incidence of admissions for erysipelas was greatest in January, February, March and April. Deaths of adults occurred only in December, January, February and April. The period covered by this report extends from January, 1925, to May 1, 1928. The statistics cover 115 attacks, of which there were ninety-three adults with ninety-six attacks and nineteen children with nineteen attacks. Without reference to treatment there were twenty deaths, ten in adults, and ten in children. Autopsies were performed on eight adults and eight children.

The distribution of erysipelas lesions is given in table 1.

Analysis of fifty-one attacks in adults during the period from Jan. 1, 1925, to May 8, 1927, shows that thirty received erysipelas serum, with six deaths, a mortality of 20 per cent; twenty-one did not receive serum, with four deaths, a mortality of 19 per cent.

TABLE 1.—*General Statistical Data*

Distribution of erysipelas lesions:	Cases	Deaths
Adults		
Body only	3	0
Head only, face, ears and scalp	81	6
Head, spreading to neck and trunk	12	4
Children		
Body only	6	4
Head only	9	2
Head extending to body	4	4
Cases in which erysipelas serum was used:		
54 adults with 6 deaths (11.1 per cent)		
15 children with 8 deaths (53.4 per cent)		
69	14	(20.2 per cent)
Cases in which scarlet fever serum was used:		
21 adults with 0 deaths		
2 children with 2 deaths		
23	2	8.7 per cent
Cases in which no serum was used:		
23 adults with 4 deaths, 17 per cent		
2 children with 0 deaths, 0 per cent		
25	4	16 per cent
Of 19 children, 10 died = 52.6 per cent mortality		
Under 1 year, 13 with 9 deaths = 69 per cent		
1-2 years, 3 with 1 death = 33.3 per cent		
Over 2 years, 3 with 0 deaths = 0 per cent		
Ages of adults who died:		
6 receiving erysipelas serum ranged from 15-73. Average, 52 years		
4 receiving no serum, ranged from 50-78. Average, 60 years		

The twenty-four living patients who received erysipelas serum were treated on an average of 3.9 days after onset. The six dead patients who received erysipelas serum were treated on an average of 3.5 days after onset. The patients who lived received an average dose of 50 cc. of concentrated serum, or an average of 136 cc. of unconcentrated serum when this was used. The patients who died received an average of 70 cc. of concentrated serum, and in one case 225 cc. of unconcentrated serum. From this it is obvious that the deaths were not due to the later starting of treatment or to the use of smaller doses than in the cases of those who survived.

There were no deaths among the adults treated alternately, as they were admitted, with erysipelas and scarlet fever serum in the period from May 8, 1927, to May 1, 1928.

In twenty-one cases scarlet fever serum of an average dose of 17,000 units of antitoxin was given 4.3 days after onset, and in twenty-four cases an average dose of 35 cc. of concentrated erysipelas serum was given 3.5 days after onset. Those who survived prior to May 8, 1927, received 50 cc., and those who died in the same period 70 cc. of concentrated erysipelas serum. The patients treated during the period in which all the deaths occurred were given much larger doses of serum than in the period in which all survived. One might

TABLE 2.—*Effect of Erysipelas Serum on the Disease*

Duration of Fever
No serum. 25 cases
21 living averaged 6.9 days of fever
4 dead averaged 6.8 days of fever
Erysipelas Serum, 69 cases
55 living averaged 8.6 days of fever
14 dead averaged 8.4 days of fever
Scarlet Fever Serum, 23 Cases
21 living averaged 9.1 days of fever
2 dead averaged 2.5 days of fever

infer that this indicated a greater potency of the serum, though it could be equally well explained by a lessened severity of the disease in the period from May, 1927, to May, 1928.

In the children's series there were nineteen cases. Fifteen children were treated with erysipelas serum, seven living and eight dying. Those who lived were treated on the average of 2.9 days after the onset, while those who died were treated on the average of 3.8 days after onset. Those who lived received an average total dose of 26 cc. of concentrated erysipelas serum, and those who died received an average total dose of 38 cc. of concentrated erysipelas serum. It would appear that the deaths were not due to the use of smaller doses of serum than were used when the patients survived. However, the later onset of treatment might have significance as a cause of greater mortality.

In considering the total duration of fever, it was felt that one could deal best with a perfectly objective record left by nurses on the temperature chart, supplemented by the history obtained from the patient as to the duration of the disease prior to admission to the hospital. This information was complicated by the fact that some patients with facial erysipelas had been suffering from sinusitis, otitis media and mastoiditis prior to the appearance of erysipelas on the face. In nearly all cases it was possible to date the onset of the erysipelas accurately as a cause of fever apart from the preceding infection. It should also be stated that a secondary fever occurring from serum sickness, or

TABLE 3.—*Total Number of Days in Hospital*

Group	Cases	Average Total Days in Hospital	Percentage of Serum Sickness
No serum	23	10.0	0
Erysipelas serum (prior to May 8, 1927)	30	15.2	32
Erysipelas serum (after May 8, 1928)	24	19.7	20.8
Scarlet fever serum	21	16.6	9.5

from a complication, was not counted in the duration of fever due to erysipelas provided the skin lesions were not advancing and showed signs of regression. The fever of serum sickness was usually quite easy to exclude.

The several groups of cases may also be compared on the basis of the total number of days in the hospital (table 3). Only the adults are included in this analysis.

The occurrence of serum sickness had little effect on the total stay in the hospital; it was quite mild as a rule. A few patients had severe serum sickness with fever and joint pains as well as urticaria. Patients subjected to the disturbances incident to the parenteral assimilation of considerable amounts of foreign protein seem to undergo convalescence more slowly than those not so handicapped, even though serum sickness is not observed.

In order to determine whether intradermal injection of erysipelas and scarlet fever toxins simultaneously with serum give an indication of adequacy of serum dosage, the following tests were carried out in eleven patients receiving erysipelas serum and seven receiving scarlet fever serum. The amounts of diluted toxin injected were 0.1 cc. Dilutions were so arranged that tests were made of 1, 10 and 25 skin test doses of erysipelas toxin, and of the usual amount of scarlet fever toxin employed in the so-called Dick test. The reactions were read at twenty-four and forty-eight hours. The results were quite surprising. Seven patients receiving erysipelas serum with negative reactions to all the toxin tests continued to have fever and active erysipelas lesions for from two to eight days with an average of five and three-tenths days after serum treatment. On the other hand five patients showing positive reactions to toxins had a continuation of fever from one to three days with an average of only two and four-tenths days after treatment. Similarly, seven of the patients receiving scarlet fever serum were tested. In five cases the skin reactions were negative, yet fever persisted for up to six days, with an average of three and six-tenths days after treatment. In two cases showing markedly positive skin toxin reactions, an arrest of the disease was effected in one day and in six days, respectively. It would appear that skin toxin tests do not afford reliable indications of the need of further treatment.

The results of these skin toxin tests showed that the two serums were capable of cross neutralization of the respective toxins.

COMMENT

The results of an analysis of the data in these cases indicate that a proper evaluation of the efficacy of the erysipelas serum requires a consideration of many factors. The mortality is greater in some seasons than in others. The age of the patient is of great importance, especially in a group of children. The variations in severity of erysipelas from year to year are quite marked, as is the case with other acute infectious diseases. The control series should be observed simultaneously with the treated series of cases. The distribution of the erysipelas lesions on the body affects the severity of the disease profoundly. Two series of cases of body erysipelas might have very different mortality rates provided more young children were included in one than the other. There may be geographic differences in the severity of erysipelas just as there are in the case of scarlet fever. Thus Musser [4] reports only two deaths in a series of thirty cases treated with erysipelas serum, but no data are presented showing the usual mortality for erysipelas in New Orleans.

If one examines critically the results reported by Symmers and Lewis,[5] much of their apparently favorable significance disappears. These writers report a considerable number of cases, to be sure, 131 patients treated, and 107 patients untreated with serum. The control and treated cases were observed in different years for a period of only forty-nine days in each year. These forty-nine days occurred in May and June, months of relatively low mortality of erysipelas. If one compares first the mortality in facial erysipelas only, in the report of Symmers and Lewis, the difference in mortality is slight, 4.5 per cent for those treated with serum against 6.5 per cent for those untreated. In view of the fact that they occurred in different years, this difference has slight significance. Taking next the average number of days in the hospital, these authors show a difference between 5.6 days for those treated with serum and 13.1 days for those not treated. The total number of days in the hospital may depend on the energy with which patients are discharged by the house officers, and as a basis for comparison it is far less reliable than the figures on the days of fever, objective data recorded by the nurses on the charts.

The difference in mortality is striking in the two series with body erysipelas observed by these authors. The age distribution of these two groups is not given. It should be pointed out that the incidence of a few more or a few less children would have a profound effect on the statistics.

Of the six fatal adult cases in which erysipelas serum was given, only two were treated within the first three days of the disease. In this respect the requirements of Birkhaug have not been fulfilled. On the other hand, much larger doses were used than he originally recommended as adequate.

Supplementing the analysis just given of cases of erysipelas occurring in the years from January, 1925, to May, 1928, we have obtained from the records of the Rochester Municipal Hospital an additional series of 221 cases admitted in the eleven years 1913-1924, inclusive. Of the 221 patients only ten died, a mortality of 4.5 per cent for erysipelas not treated by serum. The highest mortality rate occurred in 1914, twenty-three cases with three deaths, or 13.4 per cent; in 1917 and 1921 it was 9 per cent; in 1924, 10 per cent. In the years 1913, 1915, 1916, 1919 and 1922 there were no deaths from erysipelas in the Municipal Hospital among the eighty-eight cases received in those years.

The 221 patients had an aggregate duration of 2,872 hospital days, with an average stay of thirteen days. The range of variation was from 10.1 days in 1924 to 15.0 days in 1920. The average stay of patients not treated with serum was less than of the serum treated patients of the later series.

CONCLUSIONS

1. The true value of the serum treatment of erysipelas will not be established until an analysis can be made of a long series of cases with simultaneous controls untreated by the serum, so that seasonal and annual variations will be controlled. The treated and control series should be balanced according to the ages of patients and the distribution of erysipelas.

2. The previously published reports of results of serum treatment are open to serious objections on the score of inadequate control.

3. The cases just reported do not prove that erysipelas serum is of no value. Comparison of these with statistics for the cases admitted in the eleven years previous to the introduction of serum treatment are

4. Musser, J. H.: Treatment of Acute Infectious and Contagious Diseases, with Especial Reference to Scarlet Fever, Erysipelas, Measles and Meningitis, J. A. M. A. **88**: 1125 (April 7) 1927.

5. Symmers, Douglas; and Lewis, K. M.: The Antitoxin Treatment of Erysipelas, J. A. M. A. **89**: 880 (Sept. 10) 1927.

most unfavorable to the use of serum, both as regards mortality and duration of stay in hospital.

4. If erysipelas serum is of value, the evidence of this series indicates that a scarlet fever antitoxin prepared by the New York State Health Department is likewise of value in the treatment of erysipelas.

THE MANAGEMENT OF TARSAL AND METATARSAL FRACTURES

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It has been customary to lavish praise on the structure of the human hand as representing the highest development of specialized function of the extremities and typifying a specialization characteristic of man as distinguished from other primates. The foot is apt to be regarded as an organ which once in the phylogeny of man was more specialized than the present member, which is inferred to be degenerating and, within the narrow limits of civilized foot-gear, becoming distorted and progressively less useful.

In the light of the more recent contributions to comparative anatomy—for example, the studies on arboreal man by Keith [1] and by Jones [2]—it seems clear that in mechanical construction and function there is no essential distinction between the hand of man and that of many of the anthropoids, whereas the adaptation of the foot of man to terrestrial progression has developed a specifically human organ. Although the ape's foot has a definitive structure with a specialization of function distinctive from the hand, the digital formula (of relative toe lengths) and the mechanism for partial apposability of the hallux have not been changed completely. In man, furthermore, the hallux has definitely become the dominant digit and the scaphoid-cuneiform portion of the long arch the chief weight-bearing portion, while the fifth toe is fast becoming vestigial. In the anthropoid's foot, none of these changes are occurring.

It is a generally accepted doctrine of reconstructive surgery that the more specialized an injured part, the more difficult is its rehabilitation and the more likely is its specialized function to be impaired by trauma. Attention is therefore directed to the extreme specialization of the human foot. Surgeons have somewhat laggingly followed the comparative anatomists and are too prone to regard the foot as a poor relation of the hand, less mobile and therefore less specialized, not deserving, when injured, of the expenditure of time and energy which is accorded to the restoration of function of the injured hand. Certainly, less space is devoted in the surgical literature to the minutiae of the indications and the methods for its treatment after injury.

In man the muscle balance is ranged around the second digit, the interosseus muscles converging symmetrically from either side upon it, the toes being moved laterally to and from this digit. The midline of the human foot has changed from the third to the second toe. Duckworth [3] says that while in most specimens of the gorilla the midline falls through the third toe, "it must be admitted that many possess the human arrangement, these muscles being grouped about an axis formed by the second digit."

The human baby first walks on the outer side of the foot and the bones of this side are first to ossify. Human specialization seems to be producing a tendency to place more and more weight on the inner margin of the foot as a supporting apparatus. In other words, the typical human change and tendency in evolution seems to be a trend toward pronation of the foot. Man has inherited an arboreal concave and supinated foot and is now tending to flatten and pronate this as an adaptation of the foot to terrestrial progression. Paradoxical as it may seem, it is this evolutionary tendency that must be guarded against in the management of foot injuries.

Among the anatomic considerations bearing on the management of foot injuries, the importance of preserving the skeletal, muscular and ligamentous constituents of the various arches has received exhaustive attention by many writers. The same is true of considerations with regard to preserving the proper angles between and the relation of the body and the neck of the os calcis, which are well covered in the modern literature, particularly by Cotton,[4] Magnuson,[5] Straus [6] and Speed.[7] We can add little to these phases of the surgical anatomy of the foot.

PATHOLOGIC PHYSIOLOGY

There are several important therapeutic implications to be drawn from the pathologic physiology of injury to the bones of the foot. In general, there are two types of reaction of these bones to trauma. For clinical purposes these may be classified as atrophic and hypertrophic.

The atrophic class of reaction began to attract attention in 1908 following the description of Köhler [8] of Wiesbaden of a peculiar tarsal scaphoiditis in children in which the scaphoid, as shown in the roentgenogram, was diminished in size (principally in the long axis [9]), became irregular in outline and presented an increased density. In Köhler's first three cases, no definite history of trauma was given and he considered their occurrence as spontaneous. Moffat [10] and McClure [11] studied cases in which the bone did not show any change until several weeks had elapsed after the trauma. The latter had one case in which evidence of bone changes began six weeks after fracture. In 1911, Preiser [12] became interested in Köhler's disease of the tarsal scaphoid and thought it comparable to Kienböck's [13] traumatic disease of the semilunar and both these diseases to result from compression as determined by increased density of the bone in the roentgenogram. This compression, he thought, injured the blood vessels and led to subsequent nutritional disorder in the bone.

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