

Original Articles.

ANALYSIS OF ONE HUNDRED AND TWENTY CASES OF MALARIA OCCURRING AT CAMP GREGG, PHILIPPINE ISLANDS.*

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DURING the calendar year of 1904 malarial fever was by far the most common disease among the soldiers and civilians at Camp Gregg, Bayambang, Pangasinan, Luzon, P. I. A considerable number of cases, especially among the officers and civilians, have been treated at home, without being made of record. The number of admissions to hospital for paludal disease during the year, contrasted with that for 1903, is shown below:

TABLE I.

RECORD OF MALARIA IN CAMP GREGG FOR THE CALENDAR YEAR OF 1904.

Month.	Benign Tertian.	Quar-tan.	Estivo-Autumnal.	Total.	Strength Command.	Per-centage.
Jan.	1		1	2	267	.75
Feb.	3		1	4	212	1.88
March	4		2	6	225	2.66
April	4	1	1	6	281	2.13
May	1			1	262	.38
June	2			2	266	.75
July	5		1	6	274	2.19
Aug.	10		10	20	274	7.29
Sept.	18	2	3	23	277	8.30
Oct.	13		20	33	284	11.62
Nov.	16	1	24	41	289	14.18
Dec.	6		12	18	243	7.40
Totals	83	4	75	162	267.8	59.53

TABLE II.

RECORD OF MALARIA IN CAMP GREGG FOR THE CALENDAR YEAR OF 1903.

Month.	Cases Malaria.	Mean Strength Command.	Percentage.
Jan.	27	289	9.3
Feb.	21	315	6.6
March	8	307	2.6
April	12	294	4.0
May	9	286	3.4
June	11	335	3.2
July	16	474	3.3
Aug.	13	506	2.5
Sept.	14	319	4.3
Oct.	8	329	2.4
Nov.	3	310	0.96
Dec.	6	280	2.1

All but 3 of the 162 cases in 1904 were United States soldiers.

ETIOLOGY.

Location. — The inhabited buildings at Camp Gregg are placed on a site ranging from 60 to 80 feet above the level of the plain which extends for over 100 miles south, and at a distance of about 20 miles from the mountains on the east and west and an equal distance from the sea on the north. Elevation above the sea level not known, but is probably about three hundred feet. The distance from the post to the first houses in the town of Bayambang is about one eighth of a mile. There

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are no swamps near, but in one direction rice fields approach to within one-eighth mile of the barracks and hospital. There has been a great amount of febrile disease among the natives in Bayambang.

Drainage. — The natural surface drainage of the post is good, and comparatively few puddles suitable for breeding places for anopheles mosquitoes are found on the cleared portion of the reservation, even during the rainy season. The soil is for the most part loam underlaid by clay. The arrangement of the buildings is very straggling, and the reservation is large and covered with a dense and high jungle which at times has grown up to within twenty-five yards of inhabited buildings, and has rarely been kept cut to as great a distance as 100 yards from the barracks, hospital and officers' quarters. Within this jungle it was impossible to find and treat pools, and this accounts for the large numbers of mosquitoes present after the onset of the rains.

There has been no extensive upturning of the soil during the period covered by this report, and that which has occurred has for the most part been at a distance from the barracks.

Climate. — The hottest season at this station is in April, May and June, but the heat even then is not excessive for the Philippines, and the nights for the most part are comfortable, growing very cool in October and November. The rains this year began early in April, occurring almost daily by the middle of May, and showers continued to occur frequently till the end of November. The rainy season has been a light and intermittent one, just the kind which would keep pools constantly filled, yet not severe enough to thoroughly flush out all. This probably accounts for the large amount of malaria this year, as contrasted with last season, when the rainy weather began in July and was more severe and continuous during the summer and fall, thereby being less favorable to the breeding of mosquitoes.

Habitations. — All barracks and quarters here are one story high, the floors being only a few feet from the ground. The doors and windows are not screened. The use of mosquito nets at night is compulsory, but many of the nets are inefficient because of insufficient length or coarseness of mesh, this being notably so in the case of the nets issued to this post by the medical department, these having a mesh of about one hundred to the square inch. Through these nets mosquitoes easily pass. As an example of how inefficient bed nets may be, either through carelessness in use or too coarse mesh, it may be mentioned that during the height of the mosquito season the nets of the patients in the hospital almost always contained more or less mosquitoes in the morning, and on one occasion forty mosquitoes were caught in a single net, all being gorged with blood and nearly all being anopheles.

The sanitary condition of the inhabited buildings is good, except for the nearness of the underbrush and absence of door and window screens.

Length of residence. — This command, one battalion of the 20th United States Infantry,

arrived in the Philippines on Dec. 27, 1903, and at this post Dec. 31, 1903. A very few men transferred to the battalion from the troops it displaced, but the bulk of the garrison has consisted of men who had never been in the tropics, or else of those who had been in the United States for the preceding eighteen months. From time to time recruits arrived from the United States.

Water supply. — All water for drinking, cooking and bathing purposes is distilled from river water.

Race and age. — All of the cases here studied are American whites, and for the most part young men — between twenty and thirty years old.

Practice marches. — Shortly after the termination of a practice march by Company K, taking place Feb. 13 to 22, 1904, there was a marked increase in febrile diseases. No mosquito nets were used on this march. From this company there were admitted to hospital on Feb. 28, 3 cases of malaria; Feb. 29, 1 case; March 1, 2 cases of dengue and one of isolation; March 3, 3 cases of dengue; March 2, 2 cases of dengue; March 4, 1 case of dengue and 1 of malaria; March 5, 1 of dengue; March 6, 1 of dengue. Thus in thirteen days following the return of the company there were 16 admissions for febrile conditions diagnosed on the register as above. I did not see these cases, but judging from a conversation with the surgeon who attended them, and from a study of the charts, histories and treatment (all were given quinine), it appears to me probable that the cases diagnosed as dengue and insulation were in reality malarial fevers. Nearly all these men subsequently developed malarial fevers which were probably relapses from an original infection on this march.

On the succeeding three practice marches mosquito nets were used and febrile diseases did not develop as a result of the marches. Except for a ten-day practice march for each company the command this year has done garrison duty, with no hardships, overwork or notable exposure.

Mosquitoes. — In April mosquitoes at this post were very rare. An increase began in May, and the insects were very numerous during June, July and August, beginning to decrease in the latter part of September. They were present in considerable numbers in October and November and became scarce in December. During the period from May 15 to December 31 about 1,500 mosquitoes were collected and sent to the Army Medical Museum for examination. In the collection up to July 15, mosquitoes of genus *Culex* predominated (21 to 5). In all subsequent collections *Anopheles* were in the majority. In August one shipment contained 219 of the genus *Anopheles* and 32 of *Culex*. All these collections were made either at night (8 to 10 P.M.) or about 6.30 A.M. on the inner side of screens in a screened house.

Day-flying mosquitoes have been very rarely seen during the year, and none have been collected. The usual day-flying mosquito in the

Philippine Islands is reported to be *Stegomyia fasciata* and no specimen of this insect has been found in my collections.

In the collections reported on by Miss Ludlow, of the Army Medical Museum, the following have been found: *Culex microannulatus*, Theob. *C. gelidus*, Theob.; *Culex annulifera*, Ludlow; *Culex concolor*, Desv.; *Culex fatigans*; *Mimomyia chamberlaini*, n. sp. Ludlow; *Mansonii annulifera*, Theob.; *Myzomyia (anopheles) ludlowi*, Theob.; *Myzomyia (anopheles) thorntonii*, Ludlow; *Myzomyia (anopheles) rossii*, Giles, var. *indefinata*, n. v. Ludlow; *Nyzorhynchus (anopheles) thilip.*, Ludlow; *N. (anopheles) fuliginosus*, Giles; *Nyzorhynchus (anopheles) barbirostris*, Van der Wulf; and *Stegomyia scutellaris*, Walker.

INCUBATION.

The only facts bearing on this point are those relating to the practice march above mentioned. It appears probable that the febrile cases admitted were infected during the march, which was of ten days' duration. Of these cases 12 came in within ten days after the return of the company. This is consistent with the incubation period of nine to ten days mentioned by Craig, but as the presence of the plasmodia was demonstrated only in four cases the remainder of the diagnoses are not certain, neither can infection prior to departure or subsequent to return be excluded.

IMMUNITY.

Nothing has been observed pointing to immunity of any. The percentage of cases among the commissioned officers and their families has been less than among the enlisted men, but this is believed to be due to greater care in the use of mosquito nets, to the fact that they do not spend their evenings in town among the natives and also to some extent to the use of quinine as a prophylactic.

Of the 120 analyzed cases of malaria 24 are recurrences in the same individual. Of these 24 cases at least 4 were proved to be new infections by finding a type of plasmodia different from that demonstrated on the first entry. All these new infections and also six of the recurrences (probable relapses) occurred while the patients were on a compulsory course of treatment consisting of .5 gm. quinine sulphate in solution three times a week. This treatment had been in effect several weeks in each case when fever occurred. On Dec. 11, the compulsory course was increased to .5 gm. four times a week, and since then there has been one relapse and one new infection among the men taking this treatment. These cases prove that neither 1.5 gm. nor 2 gm. quinine sulphate in solution a week is sufficient in all cases to prevent relapse or new infection.

CLASSIFICATION.

The number of cases and the classes of malarial fever occurring during the period from Jan. 1 to Dec. 31, 1904, are shown in Table I, tabulated according to months.

There came under my personal observation

and care, subsequent to April 13, 1904, 120 cases which were sufficiently complete in history, chart and blood findings to make them of value for analysis and on these the following remarks are based. Three hourly charts were kept in all these cases from 6 A.M. to 9 P.M. These 120 cases are classified as follows: Quartan intermittents, 3; benign tertians, 55, of which 28 were single infection intermittents, 23 were double infection intermittents (quotidian) and four were remittent or continued; malignant infections (estivo-autumnal), 62 cases, of which 24 were tertian intermittents, 16 were quotidian intermittents and 22 were remittents. In these 120 cases plasmodia were found in 113, the failure to find the plasmodia in 7 being due to a lack of cover glasses during a portion of August. All those in which plasmodia were not found were typical benign tertian fevers.

There was in the series one pernicious case, and no other presenting any alarming symptoms further than rises in temperature to 106.5° F. No cases of malarial cachexia developed. The case of pernicious fever developed in a civilian engineer living and working at the distilling plant one-half mile from the post. He had neglected treatment for first attack.

QUARTAN INTERMITTENTS.

Only three of these infections were observed, two being in September and one in November. Typical parasites were found in all. Severe chill was noted in one, slight chill in one and no chill in the third. All cases complained of headache and pain in back and limbs, and one was nauseated at time of paroxysm. The temperature during paroxysm reached between 104° and 105° F. in one case and was below 104° F. in the other two. No paroxysm occurred after beginning quinine treatment.

BENIGN TERTIAN INFECTION.

Of the benign tertian cases the double infections increased markedly as the season advanced. The plasmodia were demonstrated in 48 of the 55 cases diagnosed as benign tertian fever, and in many of the cases of double infection the two crops of parasites were easily demonstrated in the blood. In several cases nearly all stages of the parasite could be found on the slide, yet the fever was a typical intermittent tertian and not quotidian or remittent as had been predicted from the blood examination. The appearance of the organisms agreed entirely with the usual description in the textbooks.

In one of the benign tertian cases a round flagellated plasmodium was seen, the pigment in the main body of the organism being very sluggishly motile and the flagellum having a rounded pigmented knob at its proximal end in contact with the periphery of the main body and no clubbing at its distal extremity. The flagellum was very active. In about ninety seconds the knob of the flagellum fused with the main body of the parasite, the pigment in the organism

became exceedingly active and the flagellum faded away. It is thought that this was a so-called passive flagellated form (Craig), the main body being a macrogamete and the flagellum being an escaped one (microgamete) which fused with and fertilized the macrogamete. From the literature available here it appears that this process has very rarely been observed in the blood specimen.

The three-hour temperature charts in four of the benign tertian infections showed a remittent temperature extending over a period of several days. Three of these occurred in September and a fourth in November. Typical tertian plasmodia were found in all. Three of the cases were characterized by slight chills and the fourth by merely chilliness. The highest temperature rise was between 104° and 105° F. in 3 cases.

Of the benign tertian intermittents (single infections) one occurred in April, one in May, one in June, two in July, seven in August, six in September, three in October, five in November and two in December. Of the double benign tertian infections (quotidian intermittents) two occurred in July, one in August, four in September, five in October and nine in November and two in December.

Taken together the benign tertian infections exhibited the following points of clinical interest: Severe chills at the time of the paroxysm were noted in 28 patients, slight chills in 12, merely chilliness in 5 and no chill or chilliness in 10. Nausea has been a frequent and distressing symptom in all varieties of malarial fever in this series, and in the 55 benign tertian cases it occurred in 29 and vomiting in 17. This gastric disturbance was usually present only during the period of the paroxysm. Diarrhea was noted in one case. Abdominal pain of greater or less degree was complained of in 7 cases. It was usually accompanied by tenderness, and in one case simulated appendicitis. Cough was present in 9 cases and pain in the chest in 1. Headache was a prominent symptom during the febrile period in 34, and bone, muscle or joint pain, more or less generalized, in 24 cases. Herpes was noted on the lips in 4 cases.

The temperature at its highest point (as recorded every three hours) was between 104° and 105° F. in 19, between 105° and 106° in 2 and between 106° and 107° in 2. A pseudocrisis and precritical rise in one or more of the paroxysms was observed in 5 cases, of which 4 were double infections (quotidian) and one single. This resembled the pseudocrisis and precritical rise described by Craig and others in malignant tertian intermittents, except that in not all of the cases was the precritical rise higher than the maximum before the pseudocrisis. No marked drops below normal following paroxysms are shown on the charts. In all of the cases showing the pseudocrisis the diagnosis was confirmed by finding unmistakable benign tertian plasmodia.

In 16 cases one paroxysm occurred after beginning quinine treatment (.5 gm. 4 times a day in solution) and in 4 cases 2 occurred. In 2 cases

paroxysms and all fever ceased spontaneously, or as a result of rest in bed and cathartics, before quinine was administered.

MALIGNANT (ESTIVO-AUTUMNAL) INFECTIONS.

The prevalence of the estivo-autumnal infections by months is shown in table in Charts 1 and 2.

Parasites.—In the 62 cases of the estivo-autumnal infections here studied the plasmodia were found in all. While clinically the estivo-autumnal intermittent fevers could be clearly divided by the three-hourly chart into tertian intermittents and quotidian intermittents (as described by Manson, Craig and others), we could not detect the constant differences described by these writers as characteristic of the plasmodia in these two clinical types, and we are inclined to agree with Thayer that the differences between the two varieties of organism described are so slight that they are probably due to variations in the length of the cycle of development. The large pigmented form, one-half size of corpuscle (which seems to be the most characteristic and easily recognized distinctive feature as given by Craig), was seen in only 1 case in this series. With this one exception the largest pigmented forms seen filled from $\frac{1}{2}$ to $\frac{3}{4}$ of the corpuscle, and these were found in 7 out of 24 tertian intermittents, and in 1 out of 16 quotidians. Pigmented forms $\frac{1}{2}$ the size of the corpuscle, or smaller, were found in 6 of the tertians and 1 of the quotidians. No differences in the ameboid bodies and ring forms could be detected in the two clinical types.

In making these remarks it is recognized that the significance of such a small series of cases is not great, and also that the examinations of the bloods in many cases were not frequently repeated because of the necessity of curing the patients and returning them to duty within a reasonable time.

Crescents were found only twice, due to the fact that the patients were received promptly on appearance of first symptoms and were treated with quinine before the usual time necessary for development of crescents had elapsed.

No important changes in the size, shape or color of plasmodium containing blood corpuscles in the estivo-autumnal cases were observed. In the benign tertian cases the infected blood corpuscles were always enlarged and pale when pigmented forms were found.

Malignant (estivo-autumnal) tertian fevers.—There were 24 cases so classified on clinical grounds. The three-hour temperature chart showed a pseudocrisis and precritical rise of temperature in one or more paroxysms in 11 out of the 24 cases. In most of the malignant tertian infections the febrile stage was of long duration, frequently eighteen hours and sometimes twenty-four. In a few, however, there was a sharp rise and an equally rapid fall, the febrile reaction lasting about nine hours without pseudo-crisis, and the chart resembling that of a benign tertian fever. In six cases the maximum rise was between 104° and 105° F.; in 9 cases between 105°

and 106°, and in 3 between 106° and 107°. In 10 cases one paroxysm and in 3 cases 2 paroxysms were observed after beginning treatment with quinine. Severe chills occurred in 9 cases, slight chills in 4, chilliness in 2 and no chill or chilliness in 9.

Malignant (estivo-autumnal) quotidian fevers.—There were 16 cases of this type. The three-hour curve showed a pseudocrisis and precritical rise in 3 cases. In 7 cases the maximum rise was between 104° and 105° F., in 1 from 105° to 106° and in 2 above 106°. Severe chills were noted in 6, slight chills in 6, chilliness in 1 and no chill or chilliness in 3. Three had 1 and four 2 paroxysms after beginning quinine.

Malignant (estivo-autumnal) remittent or continued fevers.—Twenty-two of these were observed, 2 having tertian paroxysms, 13 quotidian and 7 showing no characteristic periodicity in febrile reaction. These cases varied from marked remittents to continued fevers with very slight daily remissions. None continued over a week. Estivo-autumnal plasmodia were demonstrated in all.

The temperature curve reached a point between 104° and 105° F. in 10, between 105° and 106° in 4 and above 106° in 3. Severe chills occurred in 6 cases, slight chills in 6, chilliness in 5 and no chill or chilliness in 5. After beginning quinine, fever continued for one day in 5 cases, for two days in 3 and for three days in 6.

Considered together the estivo-autumnal infections showed the following points of clinical interest:

Nausea and vomiting was marked and annoying symptom. Out of the 62 cases nausea occurred in 38, and vomiting in 23. These symptoms in most cases were confined to the period of marked febrile reaction. Diarrhea was noted in 7 cases. Abdominal pain, in most cases associated with tenderness on palpation, was recorded in 18 cases. Forty-seven patients complained of headache, and 41 of more or less generalized pain in back and limbs. Cough was present in 11 cases, and herpes on the lips in 3. Urticaria occurring at the time of paroxysms and ephemeral was noted in 2 cases.

No case with infection by two types of plasmodia was detected and no cases resisting quinine and resembling typhoid were observed. During the period between Jan. 1 and Dec. 31, there were 11 diagnoses of dengue and 7 of fever of undetermined causation. All but 1 of the cases diagnosed as dengue occurred in March after the practice march referred to above. One case of pernicious malaria of gastralgie and cardialgie type was observed and a history is appended.

In all cases of malaria the urine was examined. Albuminuria was not noted in any case.

PROPHYLAXIS.

All practicable means were employed to grade and clear the site of the military post, and pools on the cleared part of the reservation were oiled three or four times a month. No larvæ were at any time found growing in pools on the post,

though often looked for. The use of mosquito nets at night was compulsory. Each case of malaria after being discharged from the hospital received a compulsory course of quinine, lasting for a period of ten weeks. This was administered regularly at the hospital under supervision of a sergeant, so could not be neglected. That 2 gm. quinine sulphate, in solution, weekly, is not in all cases prophylactic against infection or relapse is shown above.

TREATMENT.

Rest in bed, liquid diet and in most cases a cathartic, usually calomel followed by magnesium sulphate, was a routine treatment. When quinine was administered it was given in doses of .5 gm. in solution 4 times daily during the stay in hospital, unless this was unduly prolonged by some pathological condition other than the malaria. On leaving the hospital each patient was required to take the following course of quinine sulphate treatment: For two weeks .5 gm. twice daily, at the end of which .5 gm. three times weekly was given for two months. At the end of two months .5 gm. daily was given for a week.

Quinine was given in solution, except when it caused nausea and vomiting, in which case capsules or tablets were substituted. The action of quinine has been found efficient and prompt in all cases. Arsenic was given in addition to quinine in a few of the recurrent cases.

In this series of malarial cases the blood examinations were made by Lieut. S. J. Morris, Assistant Surgeon, and by myself, and in nearly all cases each form of the parasite was examined by both.

CASE IX. *Pernicious estivo-autumnal malarial fever.* — Late in the afternoon of Nov. 26, 1904, a case of pernicious malarial fever was admitted, the history of which is as follows:

Engineer, running distilling plant located at edge of river in Bayambang, P. I., one-half mile from Camp Gregg. Age twenty-nine. Born in California. Family history unimportant. Lives in house adjacent to distilling plant. Uses alcohol to excess.

Previous history. — Has been in Philippine Islands continuously six years and at Bayambang for twenty-eight months. Has never slept under a mosquito net. Had malaria in United States eight years ago. Smallpox two years ago. Oct. 15, 1904, had chills and fever and took quinine for two or three days. Chills and fever recurred about Oct. 25 and took quinine in tablet form at irregular intervals up to Nov. 20.

Present illness. — Nov. 24, slight chill in forenoon and fever in afternoon with headache and general pains. No nausea. Bowels regular.

Nov. 25, slight chill about 10 A.M. and slight fever in afternoon. Vomited dinner about 1 P.M. Headache. No general pain. No diarrhea. Took 1.2 gm. quinine to-day in tablet form.

Nov. 26, felt fairly well in forenoon and worked till 2 P.M. Bowels moved once in morning. About 11 A.M. fever, general pain and headache came on. Vomited dinner at 12.30 and emesis continued all the afternoon. At about 4 P.M. blood appeared in the ejected material. About 3 P.M. abdominal pain began to come on and quickly became excruciating. At the same time diarrhea began. About 6 watery stools in first half

hour after which stools continued frequent but less often. A hard chill came on about the time of the abdominal pain.

At 4 P.M. patient was seen by Lieutenant Morris, Assistant Surgeon. The chill was just passing off. Vomiting was continuous, the vomitus being first yellow and then blood stained. Had two large watery stools within a few minutes consisting of bile stained fluid containing flakes of mucus. Not "rice watery" in appearance. Skin felt hot. Pulse 100, strong and full. Advised to enter hospital at once.

After this patient worked for one-half hour about the distilling plant and came to hospital in a carriage, arriving about 5 P.M.

When first seen by the writer, about 5.25 P.M., patient was in a state of extreme collapse. Examination showed a well-developed and poorly-nourished man. Face drawn and pinched, bearing the stamp of impending death. A marked cadaveric odor. Eyes sunken, eyeballs very brilliant and in constant motion. Patient very restless, groaning and crying out, complaining of severe epigastric pain and throwing himself about in the bed. Also complained of pain over apex of heart. Moderate perspiration. Trunk warm (not hot), legs cool, hands and arms extremely cold and clammy. Respiration shallow and hurried. Tongue dry and glazed. Abdomen slightly retracted, almost entirely flat on percussion and an area just below tip of sternum about the size of a dollar which was extremely tender. No other tenderness.

Pulse scarcely perceptible at wrist and could not be counted. Heart's action feeble but regular and 158 beats to the minute. Nothing abnormal heard in lungs. Temperature by mouth at 5.10 P.M. and 6.30 P.M., 98.6. Temperature by rectum at 6.30 P.M., 106.8.

There was no hiccough. Voice was husky. Intense thirst was complained of and when seen much ice water was being drunk and soon rejected. Vomitus slightly pink. Slight muscular cramps in the left calf muscles were complained of. There were two watery evacuations in the first half hour in hospital.

Progress of case. — Patient was given by hypodermic injection .016 gm. morphine sulphate and .002 gm. strychnine sulphate at 5.40 P.M. Hot water bag and warm bedding. At 6 P.M. .4 gm. quinine sulphate in capsule given by mouth and retained an hour. At 6.25 .002 gm. strychnine sulphate given hypodermically. At 7 P.M. .5 gm. quinine sulphate dissolved with .25 gm. tartaric acid and boiled was injected into the left buttock. The pulse at this time was slightly improved, irregular in force of beat and uncountable. Heart beat as before and 152 to minute. Pain relieved by morphine and vomiting and diarrhea checked.

Strychnine .001 gm. and brandy 4 cc. hypodermically every two hours, beginning at 8 P.M., was ordered and continued through the night.

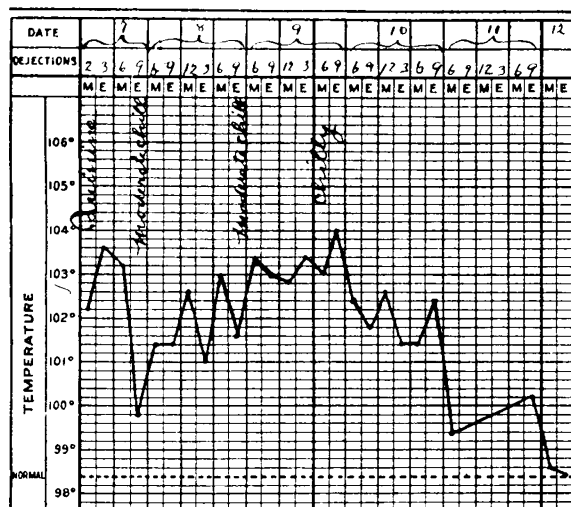
At 9 P.M. extremities were warmer, pulse somewhat improved. Heart beat 132 per minute. Temperature by rectum 102.4° F. Given calomel .2 gm.

At 11 P.M. patient comfortable. Pulse could be counted and had fallen to 116. An intermuscular injection of .5 gm. quinine sulphate was given in the right buttock.

At 12 P.M. patient was quiet but had slept none. Pulse 108. Temperature (by mouth) 100°. Given .008 gm. morphine sulphate hypodermically to induce sleep.

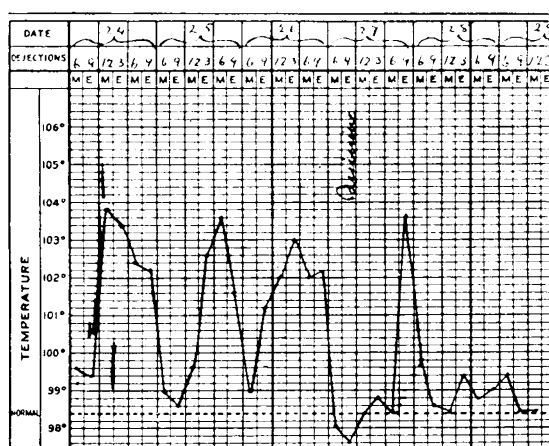
Nov. 27, 9 A.M. Patient in good condition. No vomiting or diarrhea since 9 P.M. Pulse of fairly good strength and volume, 90 per minute. Temperature 97.8°. Ordered quinine sulphate in .5 gm. doses four times a day and with each dose .001 gm. strychnine and 8 cc. brandy, all by mouth. Also in addition to

CASE IV.



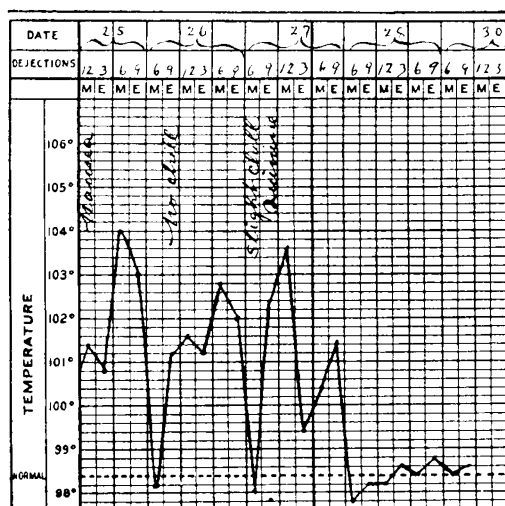
Diagnosis: Malarial fever, continued type, due to estivo-autumnal (malignant) infection. Estivo-autumnal plasmodia were demonstrated in large numbers in the blood. Quinine was begun Nov. 7 in doses of .8 gm. four times a day in solution. The temperature did not reach normal till Nov. 12. This case was the most resistant to quinine of any of the cases observed at Camp Gregg.

CASE VI.



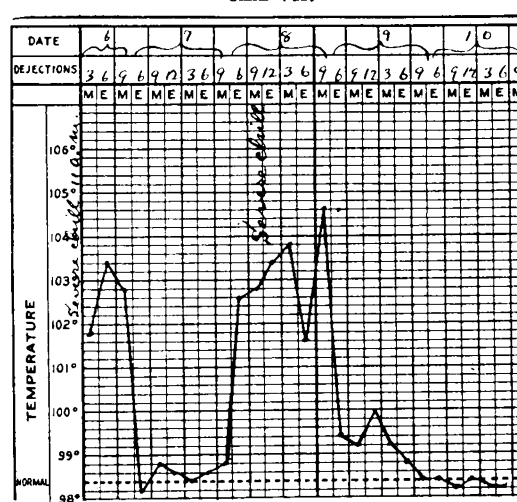
Diagnosis: Malarial fever, intermittent, malignant quotidian (estivo-autumnal). Estivo-autumnal plasmodia demonstrated in the blood. This patient had a severe chill 9 A.M., Nov. 20, and another 9 A.M., Nov. 22. No chills occurred after Nov. 22, but there was marked nausea, vomiting and abdominal pain at time of febrile paroxysms. The chart does not show a pseudocrisis when charted every three hours. The third paroxysm was charted hourly and then showed a marked pseudocrisis (1.8° F.) between 11 A.M. and 1 P.M.

CASE V.



Diagnosis: Malarial fever, intermittent, malignant quotidian (estivo-autumnal). The estivo-autumnal plasmodia were demonstrated in the blood. Each one of the paroxysms shows a distinct pseudocrisis and precritical rise of temperature. In each paroxysm the pseudocrisis began at the same hour, noon.

CASE VII.



Diagnosis: Malarial fever, intermittent, malignant tertian (estivo-autumnal). Estivo-autumnal plasmodia demonstrated in the blood. The second paroxysm shows the characteristic pseudocrisis described by Manson, Craig and others, and shows the long duration of the febrile period (before 6 A.M. till past 9 P.M.) which is in contrast with the shorter paroxysm seen in the benign tertian fevers.

