

noteworthy that no experimental excitations below the level of these organs are capable of causing generalized convulsions in animals. (Nothnagel.)

In other words, it would seem that the efficient factor is the irritation, not of the motor tracts of fibres, but of the ganglia lying near them.

It is true that many of the lesions found in these choreiform cases are in such a position that they *might* irritate the motor tracts. This is true also of our case. But so also there are other disturbances which these lesions might, and indeed must effect, and chief among them is the damaging of the associating tracts between the various cerebral centres, with which the direct motor tracts in the cerebral portion of their course are everywhere interlaced. This is, physiologically, almost equivalent to an injury of the centres themselves.

In our opinion, the most natural way of regarding these choreic movements is to suppose them produced in disease by similar means to those which would produce them in health.

There are various coördinating ganglia in the brain which, in health, probably act sometimes together, sometimes separately, in the production of coördinated movements. In disease these same ganglia are also sometimes set in action, but by some other than the normal mode of excitation, and in such a manner that the results of their activity suggest the motion of a machine, of which the parts are out of gear or the balance-wheel destroyed. Why lesions in or near the thalamus opticus should be especially prone to produce this result cannot be explained.

In whatever way the motor-coördinating apparatus is called into this uncontrolled activity, the movements which come to the front are probably those expressing the average mode of activity of the ganglionic masses concerned, that is, they are movements of most habitual recurrence; and it is therefore not remarkable, that cases with different lesions, and with lesions in different localities, should bear a certain likeness to each other. Neither can we agree with Nothnagel in regarding it as improbable that similar lesions should give rise now to slow and regular, now to quick and irregular movements, unless, indeed, we deny that the individual himself makes use of one and the same nervous centres for movements of these different grades, a position which could not be maintained.

The case before us could not, to be sure, be used as an argument against the view of Kahler and Pick and Dérange, since the lesion bordered closely on the motor (volitional) segment of the crus cerebri (the middle third), and even encroached on it to some extent. The bulk of the lesion, however, lay partly in the inner third of the pes crucis, partly in the fibres of the tegmentum, and it is this latter part of the lesion which, reasoning from the other cases reported, we suspect to have been the really efficient factor. It is not to be forgotten that there were several very small patches of softening in the nucleus lenticularis. Their influence in the result is problematical; but from the fact that they were present to a nearly equal degree on both sides, it is not probable that they caused the purely unilateral choreic symptoms. Possibly the injury done to the substantia nigra, which receives fibres from the nucleus lenticularis, and discharges others into the pes crucis (Wernicke), may have played its part also in the result.

At all events this case is certainly to be ranged

with the now considerable number of those in which the region supplied by the posterior thalamic artery has been found diseased, a fact for which at present no explanation can be given.

THE CASES OF THE SURVIVORS OF THE LADY FRANKLIN BAY EXPEDITION.

BY EDWARD H. GREEN, PAST ASSISTANT SURGEON, U. S. N.

As a preliminary to a medical history of the cases of the survivors of the Lady Franklin Bay Expedition, it is well to give a brief *résumé* of their mode of life at Camp Clay, their quarters, rations, etc., so as to better appreciate the condition in which they were found.

On September 29, 1883, Lieutenant Greely landed with his party at Baird Inlet after thirty days' exposure drifting on an ice-floe. The record left at that time stated the *party was all well*. Having sent an advance detachment ahead, it was found and reported that a *cache* of provisions existed at Cape Sabine (fifteen miles farther to the northward than he was at this time); it was deemed expedient to move the whole command up to that neighborhood, rather than send for the provisions and winter at Baird Inlet. Finally, on October 25th, they moved around to a point between Cape Sabine and Cocked Hat Island (latitude 78° 45' N., longitude 74° 15' W.). The site of their winter quarters was sheltered between high ridges of mountains, which screened them in a measure from the northerly and southerly winds. A glacier was situated at the foot of the mountain on either side of them about a mile distant. They constructed a house of loose rock and moss, the walls being three feet in thickness; the roofing consisted of old canvas stretched over a boat; the dimensions of the house were twenty-five feet long, seventeen feet wide, and four feet high, making the cubic air space 1,700 feet. In this the twenty-five members of the party lived all winter, having a cubic air allowance of about seventy feet for each man. The whole party could barely squeeze in and lie at length, two or three being obliged to occupy the same sleeping bag; the effect of this diminished air space will be seen later on. Their hut was but one hundred yards removed from the ice-foot of the Sound, and two hundred yards to the south of them was an artificial lake, from which they drew their water supply by melting ice. As the sea water strained into this lake, they were drinking brackish water all the while.

On November 1st Lieutenant Greely took a careful account of his stock of provisions, and found there was but a whole ration for each man (estimated as an army ration, about forty-six ounces solid food per diem) for forty days. Dr. Pavy and he advised together, and it was with some reluctance that they determined to divide up the rations so as to make them last until March 1st, putting aside from time to time, so that at the end they would still have ten days' supplies left with which to attempt the trip to Littleton Island if the straits were frozen over. Dr. Pavy did not think the party could exist on the ration during the winter, but the common voice was to make it go as far as it would, so each man was given the following daily allowance:—

Meat and blubber	4.33 oz.
Bread and dog biscuit	6.5 "
Canned vegetables and rice	1.4 "
Butter and lard75 "
Soup and beef extract90 "
Berries, pickles, raisins, and milk	1 "

making the daily allowance for the four months 14.88 ounces. During the winter the following amount of game was secured, which added to their stores: two seals, yielding about 120 pounds of meat; one bear, yielding 300 pounds of meat; eight foxes (four pounds each), and sixty dovekies (*Uria Brünnichii*), a small bird weighing about a pound.

March 1st found the party intact, with the exception of Sergeant Cross, who died in January with well-marked scorbutic symptoms, the only case of pronounced scurvy that developed; and Hans, their Eskimo hunter, who was lost in his boat while hunting seals early in February. The straits having been kept open during the winter by a succession of violent gales, the attempt to cross to Littleton Island had to be abandoned, and their ration was still further reduced to the following allowance: meat, 6.8 ounces; bread and dog biscuit, 3.2 ounces, — the rest of their stores being exhausted. The stores were divided up so as to last until May 12th. The sun had returned by this time, after an absence of 128 days, and those employed as hunters caught the sea fleas, or shrimp, a small crustacean, one eighth to one fourth inch long, consisting of about four fifths shell and one fifth meat. From one to three ounces of these a day, according to the catch, were allowed in addition to the ration. After the last reduction, the party began to weaken and die off rapidly.

About the 24th of March the whole party was overcome with asphyxia and nearly lost their lives, owing to the atmosphere being recharged with carbonic acid. They had lit their alcohol stove in the hut to cook a meal, without previously having removed the rags from the vent-hole in the roof; the remaining oxygen of the air was soon consumed by the stove, and the whole party were seized with faintness, vertigo, and dyspnoea. It was with the greatest difficulty they struggled from their sleeping-bags, and stumbled and were helped into the open air, many fainting away and dropping unconsciously after reaching the opening; being poorly clad for a temperature such as prevailed outside at the time (—46° F.) many were frost-bitten. The after effects of this mishap remained for a long time and weakened many of them.

After May 12th everything like a regular ration was exhausted, and they struggled on as best they could, catching the shrimp (which they boiled), gathering reindeer moss, which, when boiled, yields a mucilage, similar to Iceland moss, and boiling up the seal-skin linings of their sleeping-bags from which a gelatinous moss was extracted. It was not till they had exhausted the supply of moss around the camp that they gathered the black lichen (*crêpe de la roche*) growing on the rocks, and boiled that. Dr. Pavy urged strongly against its use, as he had the authority of Kane and Hayes that when eaten it would produce a diarrhoea which, in their weakened condition, would be fatal. They had no fuel for artificial warmth, and barely sufficient to allow for melting the ice for procuring drinking water and to cook a meal every other day, so that the living temperature of the hut for the winter was from 5° F. to 10° F.

They recognized the fact that the nearest they could

approach a state of hibernating, the better were their chances of getting through. Only those employed as cooks and hunters exerted themselves much, and they were given a double ration; the rest of them occupied their sleeping-bags, and slept sixteen to eighteen hours out of the twenty-four. In answer to complaints of hunger, Dr. Pavy's motto was, "*Qui dort, diné*;" which was philosophical, without being filling.

There seemed to be but little acute suffering from the lack of food. It was only after the introduction of food into the stomach that the craving became great. For days they went without food without actually suffering; the deaths seemed to take place finally from heart trouble (*hydrops pericardii*); the feet and face became œdematous; for a day or so the individual would complain of pains over the heart, have a spasm of pain over præcordia, a slight general convulsion, and all would be over. Their chief suffering during the winter was from constipation. Many went eight to ten days without a stool, and one as long as sixteen days; the fæces became so hardened and impacted in the rectum that at each operation they were obliged to dig the fæces out with their fingers, the abdominal muscles being too weak to extrude the mass. Nearly every one would faint, after having a stool, from sheer exhaustion.

When it is considered that for nine months they were on the ration as detailed, had nothing but brackish water to drink, no artificial warmth, living in a temperature of 5° F. to 10° F. for the winter, with a cubic air space of seventy feet per man, the condition in which the survivors were found will not be wondered at. There were but seven out of the twenty-five found alive; these were: A. W. Greely, first lieutenant U. S. A.; Henry Beiderick, hospital steward; D. L. Brainard, sergeant U. S. A.; Thomas Connell, private U. S. A.; Joseph Ellison, sergeant U. S. A.; Julius Fredericks, sergeant U. S. A.; Francis Long, sergeant U. S. A. The four first mentioned were taken on board the Flagship *Thetis*, and placed under my care, and with them this paper will principally be concerned.

On landing at the camp, the condition of the party was so desperate that a delay of two hours was necessary to restore them sufficiently to permit their being removed on stretchers to the boats and taken off to the ships. Thomas Connell, private, was "in extremis," was pulseless, unconscious, and unable to swallow, limbs cold, and respirations barely noticeable; auscultating over the heart, the sounds were heard very indistinctly. By propping him up, forcing open the jaws, a teaspoonful of brandy was slowly poured into the back of the throat. The effect of the stimulant was soon noticeable, as a faint pulse appeared at the wrist; in ten minutes he could make an effort to swallow, when more brandy was administered, followed by some warm condensed milk at intervals. The rest of the party were served with brandy, milk, and beef essence, and finally transported to the ships.

The time and space would hardly be allowed me to give more than a brief detail of the cases; and as they closely resembled each other both in symptoms and treatment, I will confine myself to the case of Lieutenant A. W. Greely more particularly, alluding to anything peculiar in the other cases.

June 22d, eleven P. M. A. W. Greely, lieutenant United States army, aged forty. Disease, asthenia. On admission fainted, after being carried below, in the ward-room, and vomited. Administered ammonia spts. aro-

mat. m. x., renewed in ten minutes; placed in the berth; given a teaspoonful of raw fresh beef, minced; his clothes were carefully cut off, and heavy red flannels, previously warmed, substituted.

On examination his body emitted a sickly, offensive odor, as of stale urine; emaciated to a degree. Skin hanging from limbs in flaps; face, hands, and scalp blackened with thick crust of soot and dirt (had not washed or changed clothing for ten months).

Nervous system: Excitable and irritable. At times almost irrational, eyes wild and staring; insists on talking, craving news, and demanding food; complains of no pain.

Digestive system: Tongue dry and cracked; heavy brownish black coat; ravenously hungry; abdominal cavity empty, and lying almost in contact with vertebral column; no movement of bowels for six days; liver, dullness on percussion, confined to right hypochondriac region.

Respiratory system: Respiration 12 per minute; auscultation and percussion reveal no abnormal condition of lungs; vesicular murmur puerile.

Circulatory system: Pulse 52, soft and compressible; auscultation shows marked murmur (blowing) in systole over base of heart.

Integumentary system: Skin cold and clammy, sickly odor emanating from it, shriveled and fallow. Temperature 97.2° F. (under tongue).

Locomotor system: Great muscular waste; unable to move or stand without support. Body, weight 120 pounds. Weight before leaving Fort Conger in August, 1883, 168 pounds.

Urinary system: No specimen obtainable.

Treatment: From eleven P. M. till eight A. M., alternating every half hour, teaspoonful of raw fresh beef, minced, with teaspoonful of milk punch. Enjoined strict quiet. Pulse then rose to 60 per minute, soft. Temperature 97° F.

June 23d. **Nervous system:** Mind still active and restless; compelled to allow him some home letters to read, after which became more composed; has not closed his eyes; talks rationally, but shows loss of memory, as often repeats himself.

Digestive system: Had a small, highly offensive stool; felt quite faint afterward; passed considerable wind from bowels; abdomen tympanitic; tongue still dry and coated.

Circulatory system: Pulse slightly stronger, 60 per minute. Respiration 12 per minute.

Integumentary system: Same offensive odor. Temperature: A. M. 97.8° F.; P. M. 98° F.

Locomotor system: Still unable to raise himself up without help; muscles very soft and flabby. Some stiffness and pain in the joints.

Urinary system: Urine passed in twenty-four hours. 1630 cc., specific gravity 1014, acid, highly albuminous ($\frac{1}{10}$ tube).

Treatment: Continue raw fresh beef at intervals of an hour with a raw onion, finely cut up, added; also milk punch one ounce every two hours; no medication.

June 24th. No sleep; mind more tranquil, but too active; great desire to talk and read; less persistent in demanding food; complains of soreness in limbs; tongue presents a moister appearance; bowels slightly distended with gas; no stool; pulse 62, not so thready; heart sounds stronger, still a pronounced anæmic murmur; blood examined microscopically shows large increase of white corpuscles, at first the field ($\frac{1}{10}$ object-

ive) appeared filled with the nucleated corpuscles; close examination showed the proportion to be about one to twenty red; the red corpuscles show but little disposition to cohere and run into "roleaux," and lacked the distinctive biconcave disk shape; edges full and round (not ragged); urine passed in twenty-four hours, 1660 cc., highly albuminous; no casts revealed by microscope; skin clammy, dirty mottled yellow; temperature: A. M. 97.6° F.; P. M. 98° F.; muscles sore; slight œdema of hands and ankles.

Treatment: Sponging with tepid water, afterward briskly rubbed with flannels and a little lin. sapo.; small quantity of oatmeal, thoroughly boiled, four ounces allowed in morning; beef essence Liebig's $\frac{3}{i}$. in hot water every four hours; continue scraped beef and onion; no medication.

June 25th. Marked improvement; mind more tranquil; talks quietly without excitement; slept two or three hours naturally; awoke refreshed; tongue beginning to clean; had a large, dark semi-solid stool, odor offensive in the extreme; evidently but little biliary secretion poured into alimentary canal; pulse 65, some strength; respiration 14, principally costal; skin losing clammy feel; emanations still sour and offensive from it; temperature: A. M. 98.2° F.; P. M. 98° F.; muscles sore, ankles puffed.

Treatment: Shampooing muscles with dry cloths; no change in diet; no medication.

June 26th. Allowed to sit up in bed and read a little; slept six hours soundly during the night; mind tranquil; has a loss of memory of words; tongue cleaning, still heavy coat at the back; bowels moved twice; stool pitchy and offensive; abdomen tympanitic, considerable borborygmus. Pulse 65; heart sounds stronger, murmur still pronounced. Urine passed in twenty-four hours 1800 cc., specific gravity 1016, albumen not decreased; no change in condition of skin. Temperature: A. M. 98° F.; P. M. 98.8° F.

Treatment: Sponging and friction; same dietary with tr. ferri muriat. five c. c. t. i. d.

June 27th. Still extremely weak; voice stronger; mind easier; amnesic aphasia marked; appetite still morbid, always hungry; considerable flatulency; no stool. Aspect of skin somewhat improved in appearance, still dirty yellow (no spots). Temperature: A. M. 98.4° F.; P. M. 98.8° F.; pulse 66; respiration 14. Urine albuminous ($\frac{1}{10}$ tube), 1950 cc. in twenty-four hours, specific gravity 1018. Muscles beginning to fill out; very soft.

Treatment: Dietary increased to eight ounces broiled steak in morning; continued tr. ferri muriat.

June 28th. Gaining strength; dressed and sat up for a couple of hours, then felt exhausted and returned to bed. Mind quite tranquil; slept well; appetite still morbid; bowels moved; no change in character of stool; liver still inactive. Pulse 66, fairly good tone; anæmic murmur not so marked. Temperature: A. M. 98.2° F.; P. M. 98° F. Urine passed in twenty-four hours 1860 cc., specific gravity 1018; albumen present.

Treatment: Takes food at five stated intervals: six A. M., oatmeal, four ounces, broiled steak, eight ounces; ten A. M., Liebig's beef essence, one drachm in teacup of warm water; two P. M., one soft-boiled egg, with milk toast; six P. M., raw minced beef and onion; ten P. M., Liebig's essence of beef. Continue tr. ferri muriat., six c. c. t. i. d.

June 29th. Dressed and assisted to walk in ward-room a few steps. Muscles soft, very weak; limbs fill-

ing out; body weight, 129½ pounds (gain of nine and one half pounds for the week); pulse 68; urine 1650 cc. in twenty-four hours, albumen less; temperature, A. M. and P. M., normal; bowels moved naturally, stool still pithy and offensive.

Treatment: Continue the same.

June 30th. Sleeps naturally, and awakes refreshed; allowed to read and talk; walks around for an hour or so with support; limbs filling out; feet œdematous toward night; appetite still morbid, unable to be satisfied with his allowance; good movement of bowels; albumen disappearing; heart sounds stronger; temperature normal. Continue restricted diet and iron.

July 1st. Felt quite refreshed on awaking; had slept well during the night; enjoyed morning meal, and ate without asking for more; as the sun was shining brightly, was assisted on deck, and sat in the air, well bundled up, for an hour; had but little appetite for midday meal. At four P. M. a small, dark, offensive stool; strained considerably, and was much exhausted afterward (nearly fainted). Administered spts. frumenti, half ounce, in aqua, at six P. M. Complained of severe pains in abdominal muscles and over the region of the liver (pains resembling hepatic colic); considerable febrile disturbance; pulse 98; temperature 100.2° F. Administered quin. sulph., at eight P. M.

July 2d. Feels much prostrated and weak; muscular pains and soreness over abdomen and back; complexion sallow; appetite poor; temperature: eight A. M. 98.8° F.; twelve M. 99° F.; four P. M. 99.2° F. Exhibited hydrang chlorid. mit., three cc., at eight A. M. Repeated dose at two P. M. Bowels moved three times; last evacuation watery; felt weak, but free of cramps; headache disappeared. Light diet of oatmeal and milk. Discontinued tr. ferri muriat.

July 3d. Still weak; muscular soreness over abdomen; no sharp pains; two loose evacuations from bowels; appetite returning; pulse 68; temperature normal; whiskey toddy, half ounce, t. i. d.

July 3d. Considerable improvement; pains have disappeared from muscles; tongue cleaner; complexion better; allowed to sit up to his meals; urine much improved, albumen ($\frac{3}{10}$ tube) specific gravity 1022; resume tr. ferri muriat.; also vin. Portense ʒi. t. i. d. before meals.

July 4th. Gaining strength gradually; muscles soft; knees weak; encouraged to take some exercise daily, weather permitting, in the open air; digestion good; appetite under better control; liver still torpid; regular movement of bowels; skin clearing; lost clamminess; sleeps well; continue same. From this time forth gradual improvement; blood again examined microscopically shows marked diminution of white corpuscles. On July 8th no albumen found in urine. On July 12th anæmic murmur very indistinct. On July 17th arrived at St. John's; condition sufficiently to warrant his going ashore for exercise; muscles still weak and sore; filled out rapidly.

July 19th. Had a slight attack of intestinal indigestion; was living ashore at the consul's, and committed an error in diet; suffered for two days.

July 25th. Allowed to eat three full meals daily, with certain articles restricted; encouraged to exercise in open air. On the trip from St. John's to Portsmouth, N. H. (July 26th, August 1st), ran into damp moist weather; felt much prostrated, and muscles ached; given quin. sulph. 18 cc. every night during the pas-

sage. On being transferred at Portsmouth, his body weight was 169 pounds, representing a gain of 49 pounds in six weeks: 9½ pounds first week, 15 pounds second week, 8 pounds third week, 7 pounds fourth week, 5½ fifth week, 4 pounds sixth week.

Remarks: Vital depression as exhibited by the tempt. not marked; digestion fairly good all the time; nervous system soon calmed; microscopic examination of blood disappointing, exhibiting no unhealthy character of red blood globules; albumen disappearing; anæmic murmur disappearing, showing simply due to hydræmic condition of blood; liver not secreting; large gain in weight, due to rapid assimilation of food; owing to great muscular waste large urinary excretion (1950 cc. in one day), due doubtless to almost total inactivity of sudorific glands.

CAUSES OF DISCOLORATION IN GOLD FILLINGS IN TEETH.

BY WILLIAM HERBERT ROLLINS.

As pure gold is not supposed to discolor, the causes must be other substances which may be introduced in one or more of several ways: they may be present in or on the gold foil when received from the makers; they may be introduced by the operator in making the fillings; they may be present in the mouth itself.

The best way to begin the investigation was evidently to collect the discolored portions of fillings and analyze them. As yet no satisfactory result has been reached in this way, because the quantities were too minute.

The fillings themselves were next examined. Iron, silver, tin, and mercury were found. In which of the ways mentioned did these metals get into the fillings? The first attempts made to answer this question were to get samples of gold foil from the prominent makers, number them, and send them to Dr. Hills, of the Harvard Medical School, to be analyzed. The results of these analyses showed that none of the samples were pure. This was unexpected, as the makers guarantee their foils to be one thousand fine, or absolutely pure. Silver was found in every sample and iron in some. Extensive analyses made by the same chemist a year later showed the same results. The gold prepared by R. S. Williams always contained the least impurities. As the gold when received from the makers was always found impure, a short description of the manufacture may be of value as showing how impurities may be introduced.

The gold out of which foil is made is the mint gold, containing about two parts in a thousand of impurities. The makers dissolve this in aqua regia, filter, precipitate with ferrous sulphate, or more rarely with oxalic acid, wash the precipitate, melt it, and after casting roll to ribbons between steel cylinders. It is then beaten to the required thickness between pieces of glued skin, which are never clean.

Gold in this form I shall call plain foil, to distinguish it from the forms in use. Plain foil is not in the market. It must be obtained by special order. To get this plain foil into the numerous varieties required by those who fill teeth, it passes through several processes and then becomes soft gold, cohesive gold,