Reports

Boltwoodite, a New Uranium Silicate

The mineralogic studies accompanying the development of the uranium ores of the Colorado Plateau have already resulted in the discovery of numerous uranium and vanadium minerals new to science. The present mineral, boltwoodite, was found during a study of the mineralogy of the Delta Mine, familiarly known as Pick's Mine, on the western edge of the San Rafael Swell, Emery County, Utah.

Chemical analysis and a spectrographic study prove the substance to be a potassium uranyl silicate near $K_2(UO_2)_2(SiO_3)_2(OH)_2 \cdot 5H_2O$ in ratios. It is the only uranyl silicate known that contains an alkali as an essential cation. X-ray powder diffraction study suggests a structural relation to sklodowskite, $Mg(UO_2)_2(SiO_3)_2(OH)_2 \cdot 5H_2O$. Single-crystal x-ray and morphological study was precluded by the small size of the crystals.

Boltwoodite occurs as yellow wartlike aggregates of fibers coating fractures in sandstone. It is an oxidation product of primary black ores that contain quadrivalent uranium. Associated minerals are brochantite, becquerelite, gypsum, and coarse golden fibers of an unidentified uranyl silicate. It is optically biaxial negative, with parallel extinction and weak pleochroism; *n* X, 1.668 (colorless); *n* Y, 1.696? (yellow); *n* Z, 1.703 (yellow). The mineral may be orthorhombic or, like sklodowskite, monoclinic with the fiber elongation along the *b*-axis. The specific gravity is about 3.6. The mineral is weakly fluorescent in dull green under both long- and shortwave ultraviolet excitation. The first ten lines of the x-ray powder pattern, including the four darkest lines, are as follows: *d*, 6.81 A, I 10; 6.42, 4; 4.72, 4; 4.29, 3; 4.08, 1; 3.53, 7; 3.39, 8; 3.12, 5; 2.94, 8; 2.89, 6.

Analysis of a small sample containing brochantite and small amounts of unidentified materials gave the following results: K_2O, 8.03; Na_2O, 0.33; UO_3, 58.68; SiO_2, 12.74; CuO, 9.61; SO_3, 2.12; H_2O, 7.33; insoluble, 0.19; not determined, 0.34 (AL_2O_3, CaO, MgO, PbO, V_2O_5); total, 99.88 percent. Recalculation to 100 after deducting brochantite, $Cu_4(SO_4)(OH)_6$, with insoluble and undetermined portions, gave the following results (percentages calculated from the cited formula are in parentheses): K_2O, 9.4 (10.75); Na_2O, 0.4; UO_3, 68.5 (65.28); SiO_2, 14.8 (13.70); H_2O, 6.9 (10.27); total 100.00 percent.

The mineral is named after Bertram B. Boltwood (1870–1927), radiochemist of Yale University, who provided evidence that lead was the final disintegration product of uranium and devised the very fruitful method of measuring geologic time on the basis of the lead content of uranium minerals.

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Effect of Hypothermia on Epileptiform Activity in the Primate Temporal Lobe

According to Noell and Briller (*1*), the hypothermic brain is in a "latent preconvulsive state." In their experiments, they stimulated the lateral geniculate with an intense repetitive current. Hypothermia seemed to facilitate the production of paroxysmal afterdischarges, which followed the electric stimulus. Likewise, they concluded that the analeptic action of Metrazol, caffeine, and strychnine is enhanced at low temperatures. These observations have been confirmed by others (*2*).

This work leads one to expect that the production of afterdischarges by intense repetitive stimulation can be facilitated in hypothermic conditions. With this expectation, we began the application of hypothermia to certain experimental preparations (*3*).

Our experimental animals were two 3-year-old male chimpanzees weighing 10 and 8.2 kg, respectively. We had introduced bipolar stainless-steel electrodes into the temporal lobes of each animal. These electrodes were directed so that the uninsulated tips lay just mesial and superior to the anterior end of the temporal horn. We directed the electrodes toward the lateral horn after we had outlined it by air. After the introduction of the electrodes, we x-rayed the head of each animal in lateral and anteroposterior projections to establish the general location of the electrode tips. The electrodes were fastened to the skull by an acrylic substance and then connected to wires that passed beneath the galea to a stab wound in the midline of the neck. Then we placed subdural recording electrodes over the frontal, temporal, and parietal cortices. These were connected to subgaleal leads that emerged from the stab wound in the lower cervical region.

The operative procedures were accomplished with sterile technique under light Pentothal anesthesia. Both animals made a good recovery.

Two weeks later we began intense repetitive stimulation of the depth electrodes. The animals were stimulated while they were under light Pentothal anesthesia and in a conscious, freely moving condition. Stimulation was derived from a Grass S-4B stimulator, and its electric effects were recorded by an eight-channel Grass electroencephalograph. The details of this technique and the results of its application have been described elsewhere (*4*). The average stimulus required for the development of convulsive phenomena at normal temperatures was a series of 8-v, 60-cy/sec, 2.5-msec pulses lasting 5 seconds. After the convulsive threshhold had been determined at normal temperatures, each animal was given Pentothal and intubated. The anesthesia was accompanied by the administration of 20 mg of succinyl chloride. The anesthesia was in all respects similar to that applied at normal body temperature. Then the body temperature was reduced by means of ice packs and a Davol water mattress, and after 45 minutes the rectal temperature reached 25° to 26°C. Next, we applied repetitive electric stimulation to the depth electrodes and recorded the effects.

No epileptiform activity was observed in either hypothermic animal after repetitive stimulations within previously established parameters. In each hypothermic preparation, we applied repetitive stimuli ranging from 5 to 100 v at 60 cy/sec and 2.5-msec duration. Indeed, no epileptiform activity whatsoever was recorded in the first hypothermic animal. In the second hypothermic preparation, we did record an electrographic seizure after repetitive stimulation at 100 v. This seizure discharge was apparently localized to the ipsilateral temporal cortex. In addition, there was some electrographic abnormality in the tracing from the scalp electrode at the vertex. However, there was no evidence of epileptiform activity in the frontal, parietal, or opposite temporal cortex, nor were there any facial movements.

The hypothermia was continued for 90 minutes. Thereafter the animals were

warmed until the rectal temperature reached 36°C. This procedure required 30 minutes. During the warming, the second animal developed a spontaneous electrographic seizure localized to the right temporal cortex.

Both animals recovered without incident, and 24 hours later the repetitive stimulation was repeated. This was accomplished without anesthesia, while the animals were conscious and alert. In this condition, epileptiform activity was evoked with ease by stimulation with 20-v 60-cy/sec, 2.5-msec pulses. The clinical and electrographic effects of this stimulation were similar to those recorded before the application of hypothermia.

Finally, each animal was anesthetized, intubated, and immobilized by intravenous administration of succinyl chloride. Respiration was maintained by manual compression of the anesthesia bag. The Pentothal anesthetic was discontinued so that the animal was receiving oxygen by endotracheal tube and succinyl chloride by vein during artificial respiration.

Thirty minutes after the Pentothal had been discontinued, we began repetitive stimulation of the depth electrodes. Electrographic and clinical seizures occurred after stimulation with 12-v, 60-cy/sec, 2.5-msec pulses. The clinical seizures were confined to the face, and the electrographic tracings were quite similar to those obtained when the animal was in the unanesthetized state.

Figure 1 summarizes the electrographic recordings made at normal temperatures and under hypothermic conditions.

Actually, it was easy to establish afterdischarge by repetitive stimulation of the mesial temporal region at normal temperatures. Under the conditions of hypothermia, it was very difficult to do this.

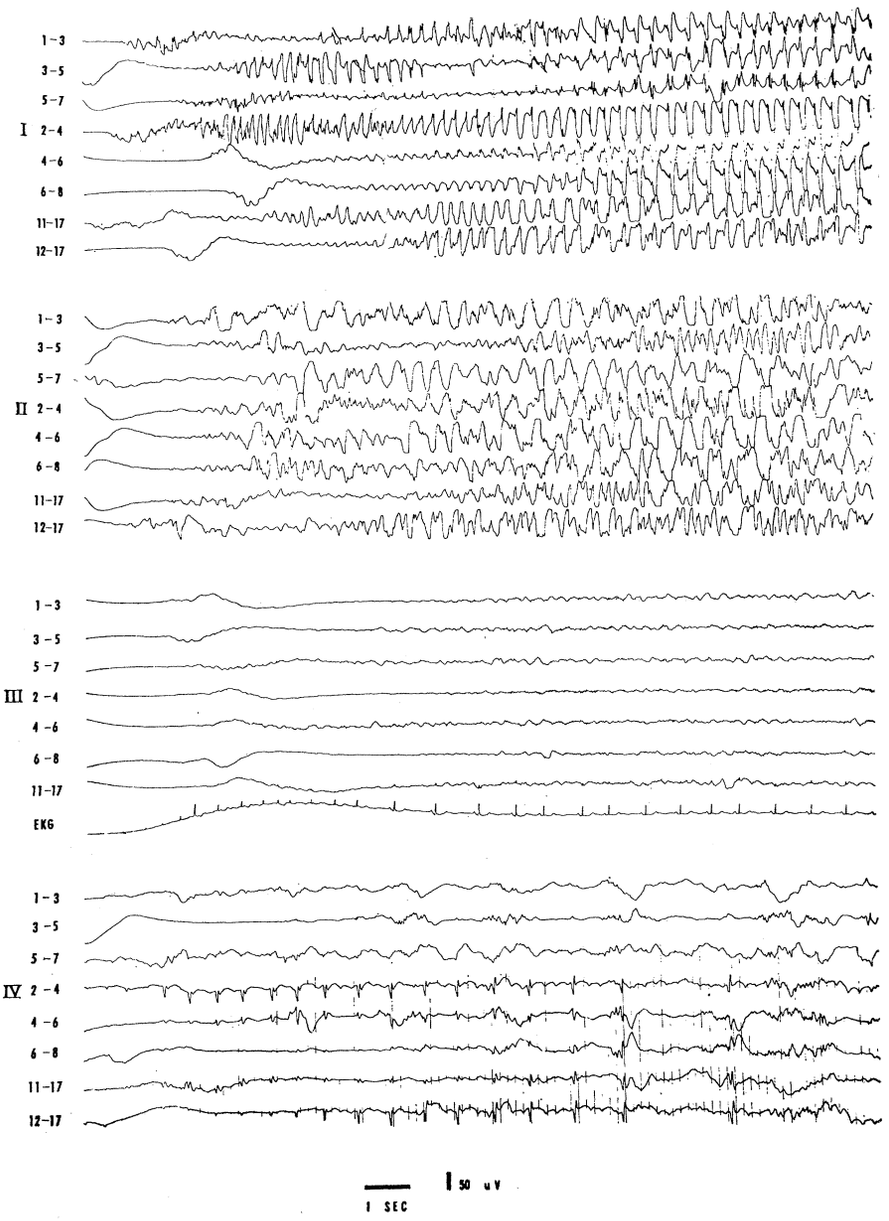

Fig. 1. Effect of hypothermia on epileptiform activity. Nos. 1 to 6, subdural electrodes on temporal cortex; Nos. 7 and 8, subdural electrodes on frontal cortex; Nos. 9 and 10, subdural electrodes over parietal cortex; Nos. 11, 12, and 17, needle electrodes inserted subcutaneously (i) over the midtemporal area (Nos. 11 and 12) and (ii) at the vertex at the midline (No. 17). Odd numbers indicate left side; even numbers, right side. Tracing I, generalized electrographic seizure in the freely moving animal following a stimulation at 10 v. Tracing II, generalized electrographic seizure in the anesthetized animal following a stimulation at 15 v. Normal temperature. Tracing III, no electrographic seizure in the anesthetized animal following stimulation at 70 v; temperature 30°C. Channel 8 is EKG. Tracing IV, localized seizure in the anesthetized animal following stimulation at 100 v; temperature 29.5°C.

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References and Notes

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2. T. S. Githens, *J. Exptl. Med.* 18, 300 (1913); F. Grosse-Brockhoff and W. Schoedel, *Arch. exptl. Pathol. Pharmakol.* 201, 443 (1943).
3. We are indebted to Clarence Hebert and Delbert Dick for skillful application of anesthesia and hypothermia.
4. M. Baldwin, L. L. Frost, C. D. Wood, *Neurology*, in press.

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Suspected Correlation between Blood-Group Frequency and Pituitary Adenomas

The number of cases proving that the blood group genes are not selectively neutral is increasing rapidly. Since various summaries have been published recently, only our own findings will be reported here (*1*). Blood groups of patients in Boston hospitals with duodenal ulcer and carcinoma of the stomach were analyzed in a preliminary study, in order to determine whether the racially more heterogeneous American population would give deviations comparable to those found by various groups of British workers, beginning with Aird's (*2*) pioneering study.

The frequency of blood group A was found to be as much as 42.08 percent in patients with carcinoma of the stomach ($N = 663$), as compared with a frequency in the Massachusetts population