hydrolysis of the oxidized part yielded several amino acids. Hydrolysis of the carbohydrate and subsequent paper chromatography showed mannose and galactose.

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11. Supported by grants from the Netherlands Organization for Pure Research (ZWO).

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Oxidation of Dimethyl Sulfoxide to Dimethyl Sulfone in the Rabbit

Abstract. *A white, crystalline compound was obtained from a butanol extract of the urine of rabbits injected subcutaneously with dimethyl sulfoxide. The melting point and infrared spectrum of the compound were identical with those of authentic dimethyl sulfone.*

During studies involving the subcutaneous injection of estrone benzoate into rabbits, injection was carried out daily in 1.5 ml of steroid-suspending vehicle (*1*) and 0.5 ml of dimethyl sulfoxide. The dimethyl sulfoxide aided in the dispersion of the solute, and it was hoped that it would increase its absorption. Urine from twenty daily collections was extracted with ethyl acetate, adjusted to *p*H 2.0, and extracted with butanol (*2*). The butanol extract was subjected to countercurrent distribution in a mixture of ethyl acetate, butanol, and water (3 : 1 : 4), and a fraction with the partition coefficient of the estrogen conjugate under study (*2*) was removed. After three distributions in the same system, the dried fraction contained, in addition to the steroid conjugate, a crop of fine needle-like crystals.

After being thoroughly washed with ethanol, the material was twice recrystallized from ethanol and dried in a vacuum. The crystals melted at 108.5° to 110°C and gave the infrared spectrum (KBr) shown in Fig. 1, curve *A*. This suggested that the compound was dimethyl sulfone. A sample of authentic dimethyl sulfone was prepared by oxidation of dimethyl sulfoxide with hydrogen peroxide in a mixture of ethanol and acetic acid. This material melted at 109.5° to 110.5°C, and the infrared spectrum in KBr is shown in Fig. 1, curve *B*. When this sample of dimethyl sulfone was mixed with the material isolated from rabbit urine, the mixture melted at 109.5° to 110°C.

The crystals of dimethyl sulfone were not observed in the urine of rabbits when dimethyl sulfoxide was not included in the injection medium (*2*), but were found in urine from two rabbits injected with dimethyl sulfoxide in the absence of estrone benzoate and steroid suspending vehicle; this leaves no doubt that the dimethyl sulfone arose from the administered dimethyl sulfoxide. The urine was collected in metabolism cages which, while retaining feces on a screen, do permit some leaching of fecal material by the urine. The possibility that part of the dimethyl sulfone may have been excreted in the feces cannot therefore be excluded.

The infrared spectrum of the dimethyl sulfoxide used indicated that the maximum amount of dimethyl sulfone which might have been present in the starting material was 1 percent. The recovered sulfone accounted for 2.5 percent of the injected sulfoxide, even though the conditions of our experiments were designed for the isolation of a steroid conjugate (*2*) and were certainly not optimum for the recovery of dimethyl sulfone.

Boursnell *et al.* (*3*) suggested that $\beta:\beta'$-dichlorodiethyl sulfoxide might be oxidized to the corresponding sulfone by the rabbit, while Snow (*4*) found

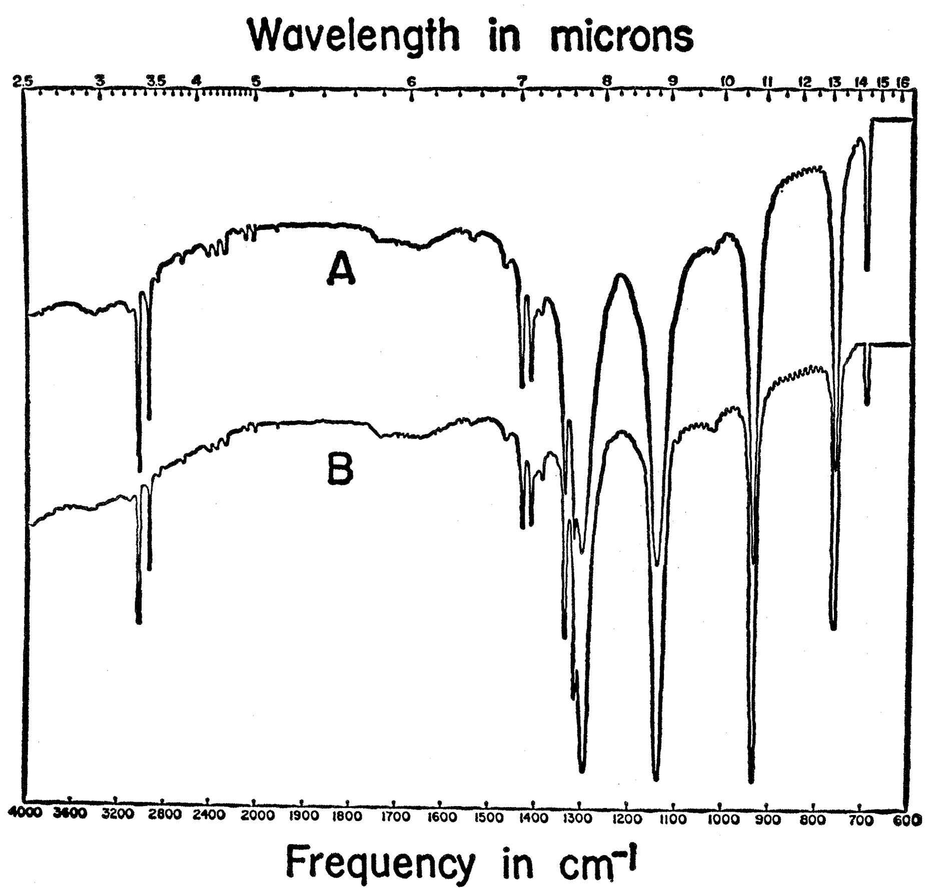

Fig. 1. Infrared spectrum in KBr of dimethyl sulfone isolated from rabbit urine after administration of dimethyl sulfoxide (curve *A*) and of authentic dimethyl sulfone (curve *B*).

that in mice and guinea pigs a minor metabolite of diethyl disulfide was ethyl methyl sulfone, the immediate precursor of which was presumably ethyl methyl sulfoxide (*5*). The fact that administration of dimethyl sulfide does not increase the urinary sulfate output in rats (*6*) suggests its oxidation to dimethyl sulfone (*5*). However, although there has been recent interest in dimethyl sulfoxide for many possible therapeutic uses (*7*), knowledge of its metabolism is lacking. DiStefano and Borgstedt (*8*) have shown the reduction of the compound to dimethyl sulfide in the cat, and our results in the rabbit demonstrate an additional metabolic route.

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3 May 1965

Cradleboard Hoods, Not Corsets

Abstract. *Utmost caution should be exercised in interpreting archeological data out of context. Certain artifacts described in the literature on human paleopathology as therapeutic corsets are in fact hoods for cradleboards. Close cooperation among specialists in various disciplines is desirable in reconstructing aspects of prehistoric culture.*

Archeology is the subfield of anthropology which is concerned with prehistoric cultures, and modern archeology is more than mere collection of antiquities, in that archeologists do everything possible to both uncover and interpret the objects of prehistory *in context.* Context means both the specific associations of an artifact at the time of discovery and the general pattern of the particular culture from which the artifact comes. Nonarcheologists who attempt to draw inferences from archeological data are frequently unaware of the necessity of such context, and sometimes draw functional inferences based solely on the observable attributes of the artifact itself in terms of their own culture. Such identifications are not necessarily incorrect, but, if made, should be used with extreme caution in drawing further inferences, and should be abandoned whenever positive proof of the real use becomes available. One such error in the literature on human paleopathology, written by medical men, is the erroneous identification of the bark hoods of prehistoric cradleboards (Fig. 1) from southwestern United States as therapeutic corsets. This identification implied that the ancient southwesterners had relatively advanced medical knowledge. Our purpose is to correct this misinterpretation and to point out the necessity for making inferences in context.

The objects in question are rectanguloids of heavy bark, about 75 cm long and 22 cm wide, bent into a U-shape. Two opposing corners are rounded, the others square. The margins of the objects are perforated.

The earliest tentative identification of one of these curved bark bands as an orthopedic corset appeared in a paper by Freeman in 1918 (*1*). It was based on examination of a specimen in the collection of the Colorado Historical Society in Denver. Freeman noted the artifact's close resemblance to modern orthopedic corsets used in the treatment of spinal lesions and stated further that the corsets "may have been used . . . for this purpose or for the treatment of rib fractures." The society's catalog gives no information on either the general provenience of this artifact or its specific associations, and questionably identifies it as a piece of bark armor.

Moodie in 1923 followed this earlier identification in both his popular book (*2*) and his scientific tome on paleopathology (*3*). In the latter he added that the band was "doubtlessly used for the treatment of spinal lesions and [suggests] . . . considerable knowledge of spinal disturbances." In 1924 Freeman (*4*) reaffirmed his earlier identification and called the object a "corset made of bark with eyelets and cord for lacing it around the body. Possibly used for some orthopedic purpose." The most recent repetition of this identification occurred at a symposium on human paleopathology in January 1965 (*5*).

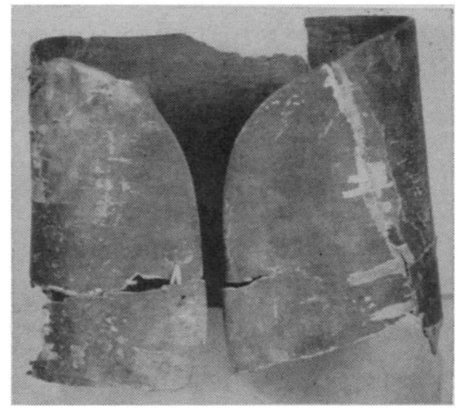

Fig. 1. Prehistoric cradleboard hood from an infant's grave at Tseahatso rock shelter. University of Colorado Museum specimen 2590.

In terms of our own culture it is not an illogical speculation that these curved bands of bark served as orthopedic devices for bracing injured backs and that the eyelets were for lacing the edges together. However, specimens for which the archeological context is known demonstrate that these artifacts were hoods for cradleboards. As for the perforations, the holes along the lower margin were for binding the hood to the backrest, and, by analogy with the prehistoric Anasazi culture from which these cradleboards come, the perforations along the front edge were not eyelets for lacing cords, but mending holes. The latter was made by drilling two holes, one on each side of a crack. A cord through the two holes bound the crack and prevented further splitting. This method was widely used by the Anasazi for repairing baskets, skin bags, and, particularly, cracked pots.

Both actual cradleboards with this type of hood and clay effigies of them have been found in several localities in southwestern United States. Their associations indicate that they date to the period known as Pueblo III (A.D. 1050–1275) and belong to the local cultural tradition known as the Anasazi. The most complete specimen was illustrated by Guernsey in 1931 (*6*). It came from an infant's grave in a dry cave in Adugegi Canyon in northeastern Arizona. This specimen is in nearly perfect condition, with the hood still attached to the backrest.