

Utah State University

DigitalCommons@USU

UAES Bulletins

Agricultural Experiment Station

1-1902

Bulletin No. 74 - Lead Ore in Sugar Beet Pulp

John A. Widtsoe

Lewis A. Merrill

Follow this and additional works at: https://digitalcommons.usu.edu/uaes_bulletins



Part of the [Agricultural Science Commons](#)

Recommended Citation

Widtsoe, John A. and Merrill, Lewis A., "Bulletin No. 74 - Lead Ore in Sugar Beet Pulp" (1902). *UAES Bulletins*. Paper 96.

https://digitalcommons.usu.edu/uaes_bulletins/96

This Full Issue is brought to you for free and open access by the Agricultural Experiment Station at DigitalCommons@USU. It has been accepted for inclusion in UAES Bulletins by an authorized administrator of DigitalCommons@USU. For more information, please contact digitalcommons@usu.edu.



EXPERIMENT STATION

—OF—

THE AGRICULTURAL COLLEGE
OF UTAH.

BULLETIN No. 74.

Lead Ore in Sugar Beet Pulp.

January, 1902.
LOGAN, UTAH.

PRESS OF J. P. SMITH,
LOGAN, UTAH.

THE AGRICULTURAL EXPERIMENT STATION OF UTAH.

BOARD OF TRUSTEES.

HON. WILLIAM S. McCORNICK, President	-	Salt Lake City
HON. EMILY S. RICHARDS,	- - -	Salt Lake City
HON. D. C. ADAMS,	- - - -	Salt Lake City
HON. LORENZO HANSEN,	- - - - -	Logan
HON. ROSINA N. BAGLEY,	- - - - -	Ogden
HON. JOHN A. McALISTER,	- - - - -	Logan
HON. SETH A. LANGTON,	- - - - -	Logan

OFFICERS OF THE BOARD.

W. S. McCORNICK, President,	- - -	Salt Lake City
P. W. MAUGHAN Secretary,	- - - -	Logan
ALLAN M. FLEMING, Treasurer,	- - - -	Logan

EXPERIMENT STATION STAFF.

W. J. KERR, President of the College.

JOHN A. WIDTSOE,	- - -	Director and Chemist
F. B. LINFIELD,	- - - -	Animal Industry
JAMES DRYDEN,	- -	Meteorologist and Poultry Mgr.
G. L. SWENDSEN,	- - - -	Irrigation Engineer
LEWIS A. MERRILL,	- - - - -	Agronomist
EPHRAIM G. GOWANS,	- - - - -	Biologist
J. A. WRIGHT,	- - - - -	Horticulturist
JOHN A. CROCKETT,	- - - -	Assistant Dairyman
PETER A. YODER,	- - - -	Assistant Chemist
W. W. McLAUGHLIN,	- - - -	Assistant Chemist
WILLIAM D. BEERS,	- - -	Assistant in Irrigation

The Bulletins will be sent free to any address in the State, on written application to the Experiment Station, Logan, Utah.

Lead Ore in Sugar Beet Pulp.

JOHN A. WIDTSOE.

LEWIS A. MERRILL.

INTRODUCTION.

The recent great development of the beet sugar industry in the State of Utah, has made the matter of utilizing the sugar beet pulp an important question for Utah farmers. That beet pulp has a high feeding value, when fed in proper combinations, has been shown conclusively since the establishment of the first beet sugar factory in the State, ten years ago. The experience of other states, and of the beet sugar producing countries of Europe, has likewise demonstrated that beet pulp may be used profitably in the feeding of farm animals. It is doubtlessly true that much is yet to be learned concerning the methods by which the best results may be obtained from the use of the pulp, but several experiment stations, including the Utah Station, are working on this subject, and satisfactory conclusions will soon be obtained. So well is the value of sugar beet pulp beginning to be understood that many farmers are now having pulp shipped many miles to their farms in order that they may feed their animals in the best and most economical manner. Really, the most important problem before the sugar beet farmer is the establishment of an understanding with the manufacturer that will enable every farmer to obtain an amount of pulp equivalent to the quantity of beets sold. In that manner will the fertility of the farms be conserved, and the profits of the farmer be made larger. Sugar beet pulp should be an important factor in the animal production of the districts in which beets are produced for the factory.

Though the intrinsic feeding value of sugar beet pulp is so well established, there come to the Station frequent inquiries concerning the possible danger in the use of beet pulp as a stock feed. Complaints are sometimes made that cattle are sick and dying, and that the only unusual condition

is the beet pulp that they have been receiving. To such communications the Station has been compelled to state that, as far as known, beet pulp, of itself, is not at all harmful. In a few cases, however, circumstances have pointed strongly towards the beet pulp as being the cause, directly or indirectly, of disorders that have appeared in certain herds. The Station officers have not been able to explain, satisfactorily, such occurrences, though it has been felt that the blame was unjustly attributed to the use of beet pulp. It was, therefore, with some degree of pleasure that the report of the case described in this bulletin was received, since it enabled the Station officers to show definitely that the pulp itself was not the cause of the trouble.

As will be reported in the following paragraphs, it was discovered that beet pulp had been shipped in cars that had been used for hauling lead ore, and that the particles of ore remaining in the imperfectly cleaned cars had become mixed with the pulp, had been eaten by the stock, and had resulted in numerous cases of lead poisoning. This occurrence is placed on permanent record in this bulletin from its importance to the State. Utah is a great mining state, and there is no certainty that freight cars that may be engaged for various purposes, have not been used for carrying metallic ores of different kinds from the mines to the smelters. Then, as the value of sugar beet pulp becomes better understood, more and more will be shipped from the factories to the surrounding settlements, and the condition that resulted in the cases of poisoning here described, will be established more frequently. Moreover, there is a possibility of contamination of other food products, such as wheat, flour and potatoes, by shipping them in cars that have contained mineral ores. Therefore, the warning to ship food products, whether for man or beast, in perfectly clean cars, becomes of general application.

THE RECENT OUTBREAK.

About the middle of January complaints were received by the Station officers from stockmen in the vicinity of Layton that their cattle were dying from some unknown cause. The owners of these cattle were at first loath to connect the feeding of the sugar beet pulp with the deaths of the cattle, as they had all been fed pulp for two years previously without harmful results. As, however, only those animals which were fed sugar beet pulp became sick, the feeding of the pulp became

a suspicious circumstance. Messrs. Nalder & Son, of Layton, first called our attention to the trouble, over the telephone. This was in the beginning of the trouble, and the symptoms reported were constipation, failure to chew the cud regularly, poor appetite, dry muzzle, spiritlessness, quickened breathing with moans at intervals and the dung scanty and hard. It was reported that the sick animal would leave its fellows, recline on its left side and after a time show evidence of delirium. From these symptoms, our diagnosis was "Dry Murrain" and we prescribed accordingly. Later developments show that our diagnosis was a correct one, as the most rapidly fatal cases of Dry Murrain, (or Impaction of the third stomach) "result from over-ripe but uncured grain, vetches, or rye grass, and from *lead poisoning*.* The cases failed to yield to treatment and our attention was again called to the matter, one week later. Mr. E. P. Ellison reported that he had lost a number of beef cattle and that others were sick in the vicinity, all with the same symptoms. Mr. Ellison was invited to send a sample of the contents of the stomach of one of the animals to the Experiment Station for analysis and the results of this analysis gave the first indication of the true character of the disease. The authors made a visit of inspection to Layton and vicinity to secure samples and make a post mortem diagnosis. Messrs. Nalder and Son had started to feed pulp from the factory about Dec. 18th and the first symptoms of disease were manifest about Jan. 9th. They had lost nineteen head of cattle. Mr. Ellison had been feeding pulp about two weeks, before any harmful effects were noted.

THE PULP FED.

The beet pulp used by the parties whose animals were affected, was obtained from the Ogden sugar factory. Samples of the pulp were collected, one evening after dark, by selecting handfuls from various parts of the place where the animals had been fed. The samples were selected at random, and represented the average pulp fed to the stock. There was nothing in the appearance of the pulp to distinguish it from that ordinarily sold at the factories, unless it was that dark specks seemed a trifle more numerous throughout the mass, than is usual. The characteristic sour smell of the pulp was evident, but it was not as strong as has been observed in some pulp that is fed successfully to stock.

On mixing a handful of pulp with a quart or more of water and allowing the mass to settle for a few seconds in a tall cylinder, it was observed that a comparatively large quantity of a material that looked like black sand collected on the bot-

*The Farmer's Veterinary Adviser, Law.

tom of the cylinder. Under the microscope, this "sand" was shown to be composed of particles of yellow pyrites of iron, and of black particles that appeared very much like galenite or sulphide of lead. Samples taken from the pulp store of different feeders, gave similar results; even though the pulp showed no signs of the black specks, a careful washing would reveal them on the bottom of the cylinder. A sample of pulp, taken near the floor of the car in which it had been shipped, was so rich in the yellow and black particles that they could be picked out with the fingers.

Subjected to chemical analysis, the deposit from the pulp samples was shown to consist mainly of sulphide of lead, with an admixture of sulphide of iron. There was also the faintest trace of arsenic in all the samples. Copper, and other poisonous metals were absent. Several of the mines of Utah produce concentrates of this composition.

The results of the study of the pulp fed to the sick animals led therefore to the suspicion that the lead ore in the pulp was the cause of the sickness.

THE POST MORTEM STUDY.

Two animals were subjected to post-mortem examinations. On the one cathartics had had no effect, while the other had been purged thoroughly before death. The contents of the digestive tracts of the two animals seemed to be perfectly normal. There were no signs of fermentation or other harmful changes. The membranes of the stomachs and paunch seemed somewhat inflamed, but not enough to connect with the primary cause of death. Compactly lodged against the sides and in the folds of the organs of the animal that had resisted the action of purgatives, was, however, a black deposit, resembling the black "sand" obtained from the pulp. This was washed out, and upon examination under the microscope, was shown to consist of black particles mixed with yellow ones. Chemical analysis proved this material to be of the same composition as that possessed by the material washed from the beet pulp. From a piece of the paunch six inches square, three ounces of the lead ore were obtained. The food contents of the stomach were also permeated with small quantities of ore. It should be said that none of the afflicted animals had received beet pulp for at least one week before the death of the first animal. In the digestive tract of the animal that had been purged thoroughly, there were no visible evidences of the deposit of ore. Careful washing revealed, however, that every fold of the membranes seemed to retain a few particles of the iron and lead sulphides. Chemi-

cal analysis of the small portions of ore so obtained, demonstrated that they were of the same composition as were the materials found in the pulp, and in the animal first examined.

The evidence was thus established that the sick animals had accumulated within themselves large quantities of the lead ore, found in the pulp, and the probability became very strong that the herd was suffering from lead poisoning. The diagnostic symptoms confirmed this conclusion.

DIAGNOSTIC SYMPTOMS.

Mr. Ellison had five animals sick, and from inquiry and observation, it was found that the following symptoms were noticed. The first symptom was a refusal to drink; as the animals were eating large quantities of pulp, often one hundred pounds or more per day, this was not considered serious. Soon the animal withdrew from the rest of the herd. When lying down the head was turned toward the flank. There was a partial and, in the last stages, an entire absence of dung. There was a loss of control of the limbs when walking; twitching of the muscles, especially of the abdominal muscles; champing of the jaws; large amounts of saliva running from the mouth; a desire to push the head against the haystack or fence, and moving about in a circle. The pulse was hard and evasive. The symptoms extended over a considerable time, but ended with stupor and death.

All of the animals died with practically these same symptoms. The researches of many experimenters have shown all of these symptoms to be present in cases of lead poisoning.

THE SOURCE OF THE ORE FOUND IN THE PULP.

When it had been established beyond a reasonable doubt that the afflicted animals were suffering from poisoning, due to lead ore found in the beet pulp, the question concerning the origin of the ore became of importance. Lead ore is not mined in the neighborhood of Layton, and the owners of the afflicted herds had not bought lead ore for any purposes. Lead pipes had not been used for carrying water to the stock, and there were no indications of lead occurring naturally in the places where the animals were fed. In fact, the possibility of the pulp having been contaminated after its arrival in Layton, seemed excluded. Neither sulphide of lead nor sulphide of iron is used in the Ogden sugar factory; the sulphur dioxide necessary for the bleaching of the juices being obtained directly from elementary sulphur. The contamination of the pulp could not therefore, be attributed to the operations of the fac-

tory. The inevitable conclusion was that the ore had been added while the pulp was in transit. Investigation showed that freight cars that have been used for carrying ores, are usually sent out for other purposes, without special cleaning. Moreover, the men who had unloaded the pulp at Layton, testified that they had noticed a layer of black substance over the floors of the cars, but that they had supposed it to be coal dust which would be comparatively harmless. The wet pulp would naturally retain a large amount of any loose ore or other material that might be found on the floor or sides of the cars used for shipment; and in transferring the pulp to the feeding yards by the wagon load, the ore would be thoroughly disseminated throughout the whole pulp mass. The beet pulp that caused the death of the animals in the Layton herds, in January, 1902, was, without question, rendered unwholesome by being shipped in railroad freight cars, that had been used for carrying beet pulp, without having received, subsequently, a thorough cleaning.

The warning to be drawn from the results of this investigation is,

Beet pulp and other food materials should be shipped only in wagons or cars that have been thoroughly cleaned. In Utah, the danger from contamination with lead and other ores that remain in railroad freight cars is very great.

TREATMENT FOR LEAD POISONING.

Of course no treatment will be of avail until the cause is removed. This trouble is likely to occur at any time where the pulp is shipped in ore cars, if not perfectly cleaned. The ingestion of the poison must be stopped and an attempt made to carry from the bowels any that still remains there. In lead poisoning, Sulphate of Magnesia is an appropriate purgative, but double the usual dose should be given. For an ordinary size animal, two pounds of Magnesia Sulphate (Epsom Salts) should be given. It not only serves as a purgative, but serves the further purpose of forming an insoluble sulphate of lead. Sulphuric Acid (diluted) in one-half ounce doses should also be given with this latter purpose in view. If the animal is delirious, the brain symptoms may be relieved by giving bromide of potassium in half ounce doses every four or five hours. The application of cold water to the head also assists in controlling these symptoms. When symptoms of recovery are apparent, iodide of potassium should be given in doses of two drams each, three times a day for a week.