OKLAHOMA

Agricultural Experiment

STATION.

BULLETIN NO. 7. JULY, 1893.

WATER ANALYSES.

STILLWATER, OKLA.

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OKLAHOMA

EXPERIMENT STATION,

STILLWATER, OKLAHOMA.

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WATER ANALYSES.

——BY——

GEO. L. HOLTER, CHEMIST.

The work in connection with this bulletin was undertaken for the purpose of determining and answering the oft repeated question: Does Oklahoma have good drinking water?

What would be pronounced good water by one person might be condemned by another. This is simply a matter of taste.

To a person who has always lived in a mountainous country where good spring water is easily obtained, the well and spring water of this country would not be judged good. If by good water we understand it to be cool, clear and sparkling, then the question must be

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answered in the negative. In giving this reply I do not wish to be understood as saying that there is no such water in the territory, for such a statement I am not prepared to make, since the samples for this bulletin have nearly all been taken in Payne Co., which is not the whole territory by any means.

I have sampled some water that was fairly cool and yet not so cold as mountain water. But the question of temperature should not be too prominently considered, since cold water, which at the same time may be clear and sparkling, quite often is found to be very impure. If the water in this country should prove to lack nothing to make it good but a low temperature, we may consider ourselves fortunate.

No effort has been made to get the best samples, neither have I tried to get the poorest, the samples being drawn from different parts of the county and represent, in my judgment, fairly the conditions as they are. It will be shown later in the analyses that the water is generally good from a sanitary point of view, and where a poor sample was found the source of the impurity was not hard to locate.

I found a few wells very poorly walled and some very badly located, and in one or two instances the locations could not have been worse, had the question been carefully studied, a thing I shall not accuse the person concerned of doing. In one or two cases what might have been good spring water, were in reality, excellent mud puddles. Very much to my satisfaction this lack of care and judgment was observed but few times, and evidently is due to thoughtlessness, rather than willful negligence.

Some of these remarks may be considered rather

severe, but when the health of a family is at stake, I feel justified in saying most anything that will call attention to what is nearly equivalent to criminal negligence.

In one particular case the drainage from the barn yard ran directly into the well, giving the water a decidedly disagreeable taste and the analysis show it to be entirely unfit for any use except as liquid manure.

The persons using this water were notified immediately as to its impurity.

With few exceptions I collected every sample analyzed and am fairly acquainted with the condition of the domestic water supply in the surrounding country.

I have been requested on one or two occasions to come and get a sample of a given water and test it to see what "mineral" it had in it, since it acted as a cathartic and was supposed to have other wonderful medicinal properties. It not infrequently happens that the supposed "mineral" is none other than an unfortunate jack-rabbit which has found its way into the well.

In the analyses I have determined free and albuminoid ammonia, oxygen consumed, chlorin and solids.

The ammonias are reliable indications of organic impurity. Much albuminoid with little free ammonia and a small amount of chlorin indicates very certainly vegetable contamination.

When free ammonia is in excess, it is invariably due to sewage pollution. Chlorin is present chiefly as common salt. In small quantities it is generally considered harmless but its presence is indication of sewage contamination.

This last statement should be modified somewhat for

in a new country like this, a considerable amount of sewage has not had time to accumulate. Also we naturally find considerable chlorin in the water, the source of which is salt water and not sewage. Unless it is a case of a well near a barn yard or privy vault the chances are the chlorin does no come from sewage.

Oxygen gives a further indication of organic impurity and means the amount of oxygen necessary to destroy all the carbon present in the sample. Average water contains from .03 to .07 parts albuminioid ammonia per million, and no sample should exceed .12 parts per million. Oxygen should not exceed 3 parts per million and chlorin 16 parts. A safe limit for solids is 40 parts per million.

Sanitary chemists differ considerably in their interpretation of results, and with some eminent authorities, the degree of importance that should attach to a somewhat arbitory chemical stannard of purity is yet an open question.

The above standards have been adopted since they represent the average, obtained from the results of some of the more conservative sanitary chemists.

None of the samples were filtered before determining solids, and since a great many of them contained matter held mechanically in suspension, the amounts of solids great than they would naturally be were this mechanical suspension not present.

Figures indicate parts per million.

Sample Number.	REMARKS.	Depth of Well. Feet.	Water in Well. Feet.	Free Ammonia.	Albumonoid Ammonia.	Oxygen consumed.	Chlorin.	Solids.
75	Drawn from Lester's well, west of College Farm...	56	46	.122	.130	4.2	11.9	.9
76	Drawn from Metcalf well N. W. of College Farm.			.092	.120	1.9	.6	27.9
77	Drawn from spring on Broadwell farm.			0	0	.2	.1	24.6
78	Drawn from Carpenter well 1 mile N. W.....	31½	25	0	0	0	.2	22.7
93	Drawn from well 5 miles W. and 2½ N.....	20	8	0	0	.4	1.	20.6
94	Drawn from G. W. Sharp's well 5m west, 2m north	30	12	0	0	.2	1.3	28.4
95	Drawn from well on the Emerson farm 8½ W. ½N.	24	4	tr	.024	2.	.9	86.4
96	Drawn from well 5½ miles west and ¼ mile north.	30	12	0	tr	.2	1.6	41.3
97	Drawn from well on Bilyeu farm 4 miles west.....	42	34	tr	tr	.4	.9	15.8
98	Drawn from well 2 miles west.....			0	tr	.2	2.1	32.4
99	Drawn from Little Stillwater Creek, 7 miles east..			.016	.040	2.6	.7	27.8
100	Drawn from town well at Ingalls.....	30	20	.004	.036	.4	.5	5.2
101	Drawn from well on James Potter's farm.....	18	6	.064	.012	.3	.7	11.3
102	Drawn from Stillwater Creek, 1 mile N. of Clayton			.032	.272	3.6	2.9	40.0
103	Drawn from town well at Clayton.....	41	3	.032	.032	1.	2.1	22.0
104	From Spring on G. W. Clark's farm 4½ miles south.			.122	.032	2.8	1.7	15.3
105	Drawn from Stillwater Creek 1m. S. of Stillwater,			.080	.084	3.8	3.4	47.9
106	Drawn from town well at Perkins.....	40	3	.088	.036	.4	.9	19.8
107	Drawn from Cimmarron river 2½ m. S. W. Perkins.			.032	.112	2.8	1.33	278.4

108	From spring on Dr. Ackley's farm 2½m sw Perk..			tr	0	.8	.9	27.1
109	From J. N. Mullennix's farm 3m W. Perkins.....			0	0	.4	.8	19.6
110	From well on F. A. Coke's farm	25	17	tr	0	.2	4.7	39.6
111	From town well at Payne Centre.....			0	0	.6	1.3	27.7
112	Drawn from well on Hon. J. K. Allen's farm.....			0	tr	.6	2.1	25.4
113	From well on L. Thomas farm 2m north, 1m east.	40	2	0	0	.4	1.6	40.4
114	From well on T. Nation's farm 2¾m nor. ½ east.	18	6	.620	.800	6.4	3.5	34.3
115	Drawn from well			.53	.800	6.2	11.2	64.2
116	From well on Clyde Gardenhire's farm 2 W. 2 N...	19½	6	0	0	.3	.8	7.9
117	Drawn from well on Adam Lair's farm.....			tr	tr	.2	1.5	64.5
118	Drawn from well 6 miles west ½ mile south			.600	0	.5	3.1	39.6
119	From well on Eli Moody's farm ¼ m. E. Marena..	12	3	0	tr	1.4	tr	9.8
120	From spring on Augusta Weggen's farm			0	.220	6.5	tr	13.0
121	From well on Sylvester's farm 1m N. 1 E. Clarkson	50	14	0	.136	1.0	.6	18.3
122	Drawn from town well at Clarkson	81	2	0	.120	.8	.3	21.4
123	From well on Thos. Carr's farm 3m E. Clarkson..	75	3	0	.144	.6	4.8	33.1
124	From well on J. Hughes' farm 5E. 1 S. Clarkson.	54	3	0	0	0	.4	11.1
125	From well on W. Ropp's farm 6m east Perkins..	40	6	0	tr	1.5	5.4	29.3
116	From well on Lytton's farm 7 miles south.....	35	20	0	tr	.3	.8	15.9
127	Drawn from well at Wharton.....			tr	.024	.3	20.7	95.2
128	From spring on J. W. Duck's farm 3 miles north..			0	.04	0	4.3	41.1
129	From well at Shively's barn Orlando.....	60	25	0	.032	.8	09.6	379.4
130	Duplicate of No. 75 taken one month later.....			tr	.068	.2	14.3	44.4
131	Drawn from well on Main Street, Stillwater			tr	.088	.2	6.7	51.6
132	From well on H. D. Eldridge's farm 2m west.....			0	.092	.3	6.5	785.6
133	From same farm as above, but different well.....			0	tr	.4	6.6	149.0
134	From well on Stallard's farm 1 mile east.....	71	61	0	.7		2.3	17.4

It is not necessary to comment on every analysis for an examination of the table will pretty clearly indicate the quality of the sample. There are some few samples however to which attention may be specially called.

Sample No 75 was taken from a well which had not been drilled a week, yet the water is bad. Sample. No. 130 is taken from the same well one month later. The well is on high ground and set near buildings.

Sample No 76 is from a new well also, and yet shows presence of organic matter.

Sample No 102 taken from Stillwater creek is not fit for domestic use. No 105 taken from the same stream on the same day and ten miles further west (the stream flows S. E.) is somewhat better than No 102. It is evident the creek receives considerable impurity between the points of sampling.

The lower solids in No 102 shows a deposit of the material mechanically held in suspension, as the stream flows.

SampleNo 107 from the Cimarron river while not rich in organic matter, is not, on account of the salt present, a very desirable water to use.

I am told this stream changes its state of impurity as frequently as it changes the quick-sand in its bed, but as this is simply an opinion based on nothing but superficial examination, the statement carries with it not even an element of scientific truth.

Samples No 114 and 115 both represent waters unfit for domestic purposes and their use should be discontinued.

Sample No 118 is not good. The well from which this sample was taken is located on the bank of a slug-

gish stream, and the bottom of the well is below the dead water in the stream. It is not difficult to determine source of supply for the well.

Sample No 120 was drawn from a spring the water of which came from under some large sand-stone rocks. I could see no cause for pollution.

Sample No 121 shows presence of vegetable contamination. This is true also of no 122 and 123. These wells are apparently properly located and no doubt were they cleaned, the water would be much better than at present.

Samples No 109 and 110 representing spring and well water respectively; Are, when we consider chemical purity, as well as taste, clearness and temperature, the best samples thus far examined.

As clear cold water is not necessarily pure, great care should be taken to keep the wells and springs clean, paying particular attention to both animal and vegetable contamination.

If possible the water should be free from any foreign matter held mechanically in suspension. Should the water have a disagreeable smell after having been kept in either an open or closed vessel any considerable length of time, something is radically wrong and the source of pollution should be immediately looked up and removed without delay.

A rat or rabbit may have fallen into the well. Vegetable pollution may have its source in the roots of trees Crickets, Frogs and numerous other undesirable creatures have a mysterious way of getting into wells.

Do not invite pollution by locating a well near a cess-poll or barn yard. In the various sections of the territory through which I collected samples, very little

clear water was obtained. Muddy water is frequently made by dropping a bucket to the bottom of the well thereby stirring up a sediment which takes a long time to settle.

While a systematic examination of the solids, contained in the samples analyzed, has not been made, the soluble salts are principally the chlorides and sulfates of sodium, magnesium and calcium. Sodium chlorid (common salt) is most always in greatest abundance.

Sample No 132 is an excellent example of sodium sulfate.

Should you dig a well on your farm and find poor water, try elsewhere and continue trying until you get good water. Here on the college farm 10 wells were put down before water fit for use was obtained.

Those of you who have not permanently located your buildings, would do well to first find a supply of good water—I believe it can be obtained—then build near the water. This suggestion could be remembered with profit by those who contemplate taking claims in the new countries, which it is hoped will be opened to civilization at the earliest possible date.

Should there be wells or springs in any part of the territory believed to contain water injurious to health I would like to have the person or persons, as the case may be, communicate with me and I will give directions how to draw and send samples for analysis.

Such analyses will be made free of charge and reported upon as soon as possible.

While this generous offer will hold good until further notice all persons are specially requested not to send samples for examination out of mere curiosity for a con-

tinued abuse of the offer will necessitate its withdrawal.

As has been mentioned before, the samples noted in this bulletin are somewhat local, from a territorial point of view, so before closing this work I will speak of my experience elsewhere-

On a recent excursion through the Strip, Pawnee and Osage countries and Cherokee nation, to Coffeyville Kan., and back to Stillwater, traveling over four hundred miles in the two weeks we were out, not one person in our party of nine suffered any ill effects from the water used. On several occasions we had to use water which did not have a very pleasing appearance. When we came to a well or spring we drank freely and while it was not, in a great many case, an ideal water, no bad result, from its generous use, were noted.

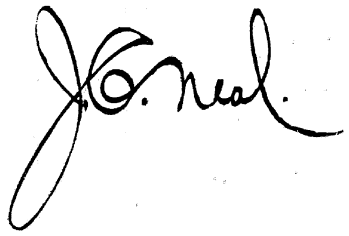
I have been told of places in the territory where the famous "Gyp" water is all that could be obtained. How great an effort had been put forth to get good water? It is not fair to condemn any section of the country because a few wells may have produced bad water.

BULLETIN FREE.

OKLAHOMA

Experiment Station,

STILLWATER, OKLA.



Director.