



Medical Services Branch,
370 Catherine Street,
Ottawa, Ontario.
K1A 0L3

July 30, 1975

Your file Votre référence
151-1-M (N3)
Our file Notre référence
C-15

Dr. R.D.P. Eaton,
Medical Services,
Northwest Territories Region,
14th Floor Baker Centre,
10025 - 106 Street,
Edmonton, Alberta.
T5J 1H2

Dear Dr. Eaton:

Reference our telephone conversation of this date concerning the urine arsenic analysis results.

I am sending you the following results and related information:

Table 1 - this table lists the analysis results as obtained from Bondar-Clegg laboratories. The analytical results in the table have not been corrected for specific gravity.

Table 2 - this table contains the urine arsenic results corrected for specific gravity according to the two methods recommended by NIOSH, namely, method 10.1.2 and 10.1.3. Please note that in the application of method 10.1.3 " ...the use of such a correction factor can lead to unusually or erroneously high results."

On Page 246 of one of the latest issues of Occupational Safety and Health Reporter (also attached) an attempt was made to clarify this situation by proposing that all urine samples whose specific gravity was less than 1.010 be discarded on the basis of their unreliability. If this proposal were applied here, 19 of the urine samples would be unacceptable.

Attached for your information is a letter we received from Dr. H.E. Stokinger. You might be interested in his comments on the reliability of arsenic levels in hair and urine samples as measures of exposures.

Yours truly,

J.P. Farant,
Chemist.

TABLE 1

UNCORRECTED ANALYTICAL RESULTS

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	SPECIFIC GRAVITY	MEASURED CONCENTRATION OF ARSENIC IN URINE ug/litre
50269	2480	1.008	4
270	1970	1.025	68
271		1.015	52
272	200	1.014	12
273	1510	1.011	38
274	2440	1.006	62
275	1850	1.005	64
276	1000	1.023	42
277	3030	1.004	22
278	1520	1.015	86
279	3040	1.003	52

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	SPECIFIC GRAVITY	MEASURED CONCENTRATION OF ARSENIC IN URINE ug/litre
280	670	1.026	22
281	1340	1.015	82
DOB 5/2/11	1020	1.021	14
282	2340	1.004	2
283	965	1.018	48
284	3250	1.007	14
285	2100	1.004	16
286	1450	1.014	60
287	1100	1.011	2
290	1650	1.023	40

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	SPECIFIC GRAVITY	MEASURED CONCENTRATION OF ARSENIC IN URINE ug/litre
291	2730	1.005	35
292	2050	1.008	140
293	2080	1.012	59
294	1070	1.024	59
295	1285	1.020	108
296	1310	1.011	60
297	570	1.022	54
298	1000	1.014	16
299	550	1.022	98
300	2500	1.006	34

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	SPECIFIC GRAVITY	MEASURED CONCENTRATION OF ARSENIC IN URINE ug/litre
301	1120	1.022	56
302	2970	1.004	16
303	2080	1.010	46
304	1100	1.018	58
305	2300	1.004	26
306	2700	1.001	44
307	3800	1.002	10
308	1550	1.022	52
309	1600	1.005	44
310	3400	1.004	36

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	SPECIFIC GRAVITY	MEASURED CONCENTRATION OF ARSENIC IN URINE ug/litre
50311	900	1.017	80
312	950	1.019	102
313	2000	1.006	14
314	900	1.021	<2
315	900	1.019	198
316	850	1.021	68
317	1400	1.018	26
318	1500	1.018	38
319	1650	1.013	6
320	500	1.027	32
321	1100	1.013	16

URINE SAMPLE NUMBER
50322
323
324
325
326
327
328
329

VOLUME OF URINE/24 HRS. millilitres
2000
1350
1500
500
1000
1300
1550

SPECIFIC GRAVITY	MEASURED CONCENTRATION OF ARSENIC IN URINE ug/litre
1.013	16
1.008	156
1.012	20
1.010	40
1.016	36
1.016	56
1.017	88
1.016	38

TABLE 2

ANALYTICAL RESULTS CORRECTED FOR SPECIFIC GRAVITY

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	CONCENTRATION OF ARSENIC IN URINE ug/litre	
		METHOD 1	METHOD 2
50269	2480	4	12
270	1970	68	65
271		53	83
272	200	12	21
273	1510	39	83
274	2440	63	248
275	1850	65	307
276	1000	42	44
277	3030	22	132
278	1520	87	138

URINE SAMPLE NUMBER

VOLUME OF URINE/24 HRS. millilitres

CONCENTRATION OF ARSENIC IN URINE. ug/litre	
METHOD 1	METHOD 2

50282

2340

2

12

283

965

48

64

284

3250

14

48

285

2100

16

96

286

1450

61

103

287

1100

2

4

290

1650

40

42

291

2730

36

190

292

2050

142

419

293

2080

60

118

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	CONCENTRATION OF ARSENIC IN URINE ug/litre	
		METHOD 1	METHOD 2
50294	1070	59	59
295	1285	109	134
296	1310	61	138
297	570	54	60
298	1000	16	27
299	550	98	107
300	2500	35	81
301	1120	56	61
302	2970	16	96
303	2080	47	110

URINE SAMPLE NUMBER
50304
305
306
307
308
309
310
311
312
313

VOLUME OF URINE/24 HRS. millilitres
1100
2300
2700
3800
1550
1600
3400
900
950
2000

CONCENTRATION OF ARSENIC IN URINE ug/litre	
METHOD 1	METHOD 2
58	77
27	156
45	1056
10	120
52	57
45	211
37	216
81	113
103	129
14	56

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	CONCENTRATION OF ARSENIC IN URINE ug/litre	
		METHOD 1	METHOD "
50314	900	< 2	< 2
315	900	199	250
316	850	68	78
317	1400	26	35
318	1500	38	51
319	1650	6	11
320	500	32	28
321	1100	16	21
322		16	30
323	2000	158	468

URINE SAMPLE NUMBER	VOLUME OF URINE/24 HRS. millilitres	CONCENTRATION OF ARSENIC IN URINE ug/litre	
		METHOD 1	METHOD 2
324	1350	20	40
325	1500	41	96
326	500	36	54
327	1000	56	84
328	1300	89	124
329	1550	38	57
279	3040	53	416
280	670	22	20
281	1340	83	131
DOB-8-2-11	1025		

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June 17, 1975

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D-7.2

Mr. C. R. Ross, P. Eng.
Consultant, Occupational Environments
Health and Welfare
Medical Services Branch
370 Catherine Street
Ottawa, Ontario, Canada K1A-0L3

Dear Mr. Ross:

In response to your letter of June 11 requesting documentation for the TLV for ARSENIC, we are pleased to enclose a copy of the documentation for Arsenic Trioxide Handling and Use and one for Arsenic Trioxide Production.

The distinction of the separate industrial air standards was made on the basis that different types of exposure occur under different conditions of industrial operations, requiring, according to a new policy established by the Threshold Limits Committee, the tailoring of the industrial air standard (TLV) to the particular industrial operation.

This is in distinct contrast to the NIOSH recommendation for inorganic arsenic. NIOSH's Criteria Document on Inorganic Arsenic makes a blanket air standard for all inorganic compounds of arsenic, and, furthermore, is proposing in a document yet to appear, an unrealistically low level of $2 \mu\text{g}/\text{m}^3$ as arsenic.

Thank you for sending on the copy of your recent results of arsenic levels in the hair of residents in Yellowknife. They seem to bear out very well the degree of exposure of mine and mill workers vs. other residents of Yellowknife.

We might, however, offer a word of caution in the use of hair analyses as a measure of trace metal exposure, particularly in the case of arsenic, which, as you know, is a ubiquitous element occurring in many dietary items. In connection with this, we had occasion to analyze the nails of a number of our staff here some time ago for their arsenic contents. To everyone's surprise, the arsenic content of the nails of my wife was approximately 100 times the

Page 2 - Mr. C. R. Ross

average of the workers in our facility here and that of mine was more than 130 times the average. Neither of us, to our knowledge, had any peculiar exposure to arsenic other than dietary, possible contributors being wines and seafood. On analyzing our nail specimens a few months later, the arsenic content had gone down respectively to 17 and 30 times normal. During this period and to date, we have been in perfect health these many years (my wife is a physician).

What we make of these fluctuating arsenic levels in dermal appendages is that unless the dietary intake of arsenic is uniform, all sorts of unexplained levels can occur, and urinary values are of no use as a measure of exposure unless a method is developed, which has not yet been done, to separate organically bound arsenic from inorganic arsenic.

Sincerely yours,

A handwritten signature in cursive script, reading "H. E. Stokinger".

Herbert E. Stokinger, Ph.D.
Chairman
Committee on Threshold Limits

2 Enclosures