Research Note

Testing the Waters: Heavy Metal Levels in Urine and Municipal Supply

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Urine Therapy Research Initiative

Urine Therapy Research Initiative Aims

This discussion is part of the Urine Therapy Research Initiative which has two specific research aims – human urine-derived stem cells (USCs), and the detoxification potential of urine in relation to toxins and heavy metals (HMs). The overarching research initiative also has an education component as urine is not yet known for its far-reaching health benefits.

This research note is part of a series of short discussions on various topics to highlight the potential to apply urine studies to a broader range of topics.

This draft document has not yet been revised by outside readers, nor experts in various fields. This work is by definition exploratory and interdisciplinary.

Testing the Waters: Heavy Metal Levels in Urine and Municipal Supply

Introduction and Context

As part of a larger research review on the possible health benefits and implications of Uropathy, the questions being addressed in this section are: (1) what can be learned from an analysis of a heavy metal (HM) test done on the urine of a Uropathy practitioner[1]; and (2) whether drinking urine is problematic or dangerous because of toxins in urine. The long-held understanding is that all the elements, chemicals and metabolites, that can be detected in urine will be reabsorbed if drunk. However, consumption does not equal absorption, and the elements would necessarily be in an altered state to when they entered the body. It is unknown whether urine consumption could increase toxic load in the body.[2,3]

As a first step, the HMs in the urine test are compared to HM standards in drinking water. Water is a relevant comparison because urine is 95% water. Acceptable levels of HMs based on concentration in water are highly studied. This basic analysis of the concentrations found in the example HM test provides starting information.

This analysis is based on one test, from one person. This analysis is therefore limited, and also worth developing. No conclusions can be drawn from one test; however, further lines of inquiry can be advanced. The comparisons are drawn using the water safety standards for municipal water set in Canada in 2024. As well, US based Environmental Protection Agency (EPA) and World Health Organization (WHO) values are used secondarily.

Challenges

The main challenge to this work and analysis is that no similar supporting studies currently exist. There are many studies that analyze what can be detected in urine. There are no studies on what can be detected in the urine of people who drink their urine, neither is there a study on the general health of people who drink their urine. This lack of data cannot be redressed without a long-term study. Until such time, this example provides some specifics to begin the discussion.

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[1] The author is providing access to a urine HMs test from October 2024 as an example for this paper. For HM testing to provide a holistic picture, it is ideal to perform hair, urine and blood tests, as well as to repeat the tests at set intervals. As hair and blood tests are completed, this example will be added to with those results. These are the first tests the author has had done since beginning Uropathy protocols in 2013. Two of the largest doubts around Uropathy, from those who do not practice, are about long-term practice and the re-ingestion of toxins. The daily practices of drinking at least 250ml a day since 2013 provides a good example for discussion, until a broader study can be completed. At the very least, this example demonstrates that daily consumption is not immediately dangerous.

[2] Specifically, when people undergo detox protocols, and the concentrations of toxins increases such that it can be detected in the urine, the understanding is that this urine would be counter to promoting health. However, studies also indicate, that substances in the body undergo many processes as they pass through the organs and are subjected to bonding, conjugation and other reactions. A comprehensive study is indicated to examine urine during detox. In particular, what is the state of any HM as it exists the body, and what is the effect of drinking urine on the HM and toxic loads of the individual?

[3] The HMs themselves are of interest, and a detailed breakdown is beyond the scope of this current example. A longer discussion of HMs and their taxonomy is included in the longform of this research.

The test provided for this analysis is a start for discussion, but is not indicative of total toxic load. It is only indicative of what was being excreted from the body that day. This test is the first HM test performed on the subject since beginning daily uropathy practice in 2013. This provides a first look at whether there are any discernable signs of toxic load that might have built up with consistent ingestion and other protocols.[4] Neither the test nor the analysis is conclusive as there is too little data.

As with any HM testing a possible limitation is molecular and ion mimicry, which would only be borne out in repeated studies and interventions to redress mimicry.[5]

Test Subject

As there is one urine test, on one practitioner, the parameters are limited. Taking into account the details below, we can analyse the test within these parameters.

- The subject has been drinking urine daily since 2013 (other protocols have also been done regularly, but we are restricting this analysis to a water comparison and are therefore focussing on drinking).
- Daily consumption averages 750ml a day (a general range of 250ml to 1500ml a day has been ingested since 2013)
- The subject has drunk filtered water almost exclusively since 2013 (gravity filtration system[6]), and distilled water since 2021.
- The subject has had no signs of HM related illnesses, toxic load increase, nor had any other health issues that have been linked in any way with HM or toxins since starting this practice.
- The general diet and medication history of the subject[7]:
    - takes no medications and has never taken daily, weekly or monthly pharmaceuticals;
    - does not smoke (linked to higher instances of arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni), and lead (Pb));
    - has a diet high in plants, local foods and has been vegetarian since 2018; and

[4] There are two questions that are most often asked. The question from those unfamiliar with urine practice: does drinking urine increase the HM load in the body? And the question from holistic practitioners and urine therapy practitioners: does drinking urine help to remove HMs from the body? These questions can both begin to be addressed by this analysis and future analyses of this kind.

[5] Molecular and ion mimicry is a potential line of further inquiry, "Ionic mimicry refers to the ability of a cationic form of a toxic metal to mimic an essential element or cationic species of an element at the site of a transporter of that element. Molecular and ionic mimics can also be sub classified as structural or functional mimics" (p. 274). See Bridges, C. C., & Zalups, R. K. (2005). Molecular and ionic mimicry and the transport of toxic metals. *Toxicology and Applied Pharmacology, 204*(3), 274–308. https://doi.org/10.1016/j.taap.2004.09.007

[6] The ceramic system from Radiant Life includes a guarantee of the following specs: 0.5 Micron absolute, >99.9% Efficiency at 0.2 micron, Meets or Exceeds NSF/ANSI Standards 42 & 53 for the following: >99% Chloramine reduction, >99% Chlorine reduction, >99% Lead reduction, >99% Herbicides and Pesticides reduction, >99% Glyphosate reduction, >98% VOC's reduction, >96% Pharmaceutical reduction, >98% Heavy metals reduction, >98% THM's (Trihalomethanes) reduction, >92% Nitrates reduction, >97% Fluoride reduction, >99% Fluorinated Organic Acids (PFOA & PFOS), >99% Micro plastics. Radiant Life: https://radiantlifecatalog.com/ss-gravity-filter-replacement-filters-accessories/

[7] We are not in a position in this analysis to take into account the diet of the subject in terms of testing and monitoring ingestion. However, these points are relevant as we are not expecting to find higher concentrations because of a known source of HMs, such as seafood.

- ingests seafood (primarily marine seafood) less than 10 times a year (fish and seafood linked to higher Cd, mercury (Hg), Pb, As, and Cr.

Methods

One urine sample was collected and sent to the Medivere lab in Mainz, Germany. The kit provided by Medivere contains the instructions and all materials needed to collect the biospecimen. The sample was collected on 14.10.2024 and the test results published on 23.10.2024.

The lab provided two data sets: HM Concentrations in Urine at µg/l Raw Values) and HM Concentrations Correlated to Creatinine in Urine at µg/g. The raw values are used as a comparison for municipal drinking water. As the urinary creatinine concentration was known, the raw values are relevant for comparison to water HM concentrations.

The test returned values for 15 HMs: Aluminium (Al), Antimony (Sb), Arsenic (As), Lead (Pb), Cadmium (Cd), Chrome (Cr), Iron (Fe), Cobalt (Co), Copper (Cu), Nickel (Ni), Palladium (Pd), Platinum (Pt), Mercury (Hg), Silver (Ag), Thallium (Tl), Zinc (Zn), Tin (Sn). Not all of these HMs have standards for water concentrations. The analysis is limited to the HMs included in the three standards for HM in water provided by the WHO, the EPA, and the Guidelines for Canadian Drinking Water Quality (2024).[8]

The purpose of municipal water standards is to address potential exposure levels in drinking water. The comparison of municipal water standards to urine is therefore to determine whether a practitioner of urine therapy could increase their toxic load by drinking urine. We are not seeking to understand the body's exposure to HM nor the possible HM load of this individual. The focus is strictly on the hypothetical of what volume of urine would have to be drunk to approximate the acceptable concentrations of HM by set by drinking water standards.

Toxicity

Toxicity is not determined by the 'substance or element' but by the dose. Therefore, we are focussed in this example on the possible and hypothetical dose that could be ingested by an individual drinking their own daily urine.

The background to this statement come from the father of toxicology, Paracelsus, and his fundamental principle that: "All substances are poisons; there is none that is not a poison. The right dose differentiates a poison from a remedy." (Paracelsus 1538)[9] Or said more simply – the dose makes the poison. The logic of this statement present toxicity not as an inherent quality of an element, but directly linked to the quantity and context of the situation. When this principle is implemented, even substances usually held as toxic can be used in small doses. Modern pharmacology, Ayurvedic Medicine, Traditional Chinese Medicine, holistic western medicine, herbalism, naturopathic, and allopathic medicine, all hold to this principle.

[8] Health Canada. (2024). *Guidelines for Canadian drinking water quality—Summary tables.* Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch.

[9] A detailed discussion of toxicity is included in the longform of this research. For our purposes here, a short explanation of Paracelsus research. Klaassen, C. D., & Watkins, J. B., III (Eds.). (2015). Casarett & Doull's essentials of toxicology (3rd ed., p. 2). McGraw Hill.

Applying this to urine therapy naturally challenges conditioning about waste. To fully follow the logic, it becomes necessary to view urine as any other substance, with the potential to be a remedy. As a remedy, its constituent parts can be analyzed, taking into account possible doses of the over 5000 metabolites found in urine (see the note on the Human Metabolome Database for more detail.) As urine is 95% water, 2.5-3% urea/uric acid, that leaves 2.5-3% volume for trace volumes of all other metabolites, many of which are already bound or biologically neutralized. Following through with the logic of Paracelsus, we understand that consuming one's own urine does not inherently increase toxic load, nor the absorption of toxins. Urine therapy can therefore be viewed as a practice that works synchronistically with the body's regulation and elimination pathways. The "dose makes the poison" adage allows for more openness to further investigation.

Goals

The aim of this discussion is to show the promise of further research in this area. Specifically, that consuming urine is not likely to endanger anyone who practices urine therapy. Eventually, the goal of the research is to demonstrate that urine consumption can help the body to better process and release the HMs and toxins that are present.

Discussion

The comparisons in **Table 1** are to the Health Canada guidelines. These are based on municipal water standards. **Table 2** provides the WHO and EPA standards as well. The comparison across the three standards shows some variance. The Canadian standards are used for the majority of the discussion because they were updated in 2024. As well, the subject of the test was living in Canada throughout most of the eleven years of Uropathy practice before the Medivere test.

Table 1

Summary Table of Results. Canadian Municipal Drinking Water Standards (CND)

Metal	***Concentration Norm* µg/L**	***Concentrations in Urine sample* µg/L**	**CND Standard mg/L**	**Urine Volume (L) CND**
Aluminium (Al)	*<20.0*	*16.5*	2.9	176
Antimony (Sb)	*< 0.25*	*<0.25*	0.006	24
Arsenic (As)	*< 25.0*	*7.7*	0.01	1.3
Lead (Pb)	*< 4.5*	*0.53*	0.005	9.4
Cadmium (Cd)	*< 0.50*	*0.14*	0.007	50
Chrome (Cr)	*< 1.00*	*<0.04*	0.05	125
Copper (Cu)	*2.0 – 80.0*	*5.0*	2.0	400
Nickel (Ni)	*< 3.30*	*2.54*	0.02	7.9
Mercury (Hg)	*< 2.3*	*0.2*	0.001	5

Table 2

Summary Table of Results. EPA, CND and WHO Water Standards

Metal	***Concentration Norm* µg/L**	***Concentrations in Urine sample* µg/L**	**Urine Volume (L) CND**	***Urine Volume (L) EPA***	**Urine Volume (L) WHO**
Aluminium (Al)	*<20.0*	*16.5*	176	*12.1*	NA
Antimony (Sb)	*< 0.25*	*<0.25*	24	*24*	>80
Arsenic (As)	*< 25.0*	*7.7*	1.3	*1.3*	1.3
Lead (Pb)	*< 4.5*	*0.53*	9.4	*28.3*	18.9
Cadmium (Cd)	*< 0.50*	*0.14*	50	*35.7*	21.4
Chrome (Cr)	*< 1.00*	*<0.04*	125	*250*	>125
Copper (Cu)	*2.0 – 80.0*	*5.0*	400	*260*	400
Nickel (Ni)	*< 3.30*	*2.54*	7.9	*NA*	27.6
Mercury (Hg)	*< 2.3*	*0.2*	5	*10*	30

In **Table 1** the columns are from left to right: the chemical element and its symbol; the established concentration norms in urine for each chemical element; the concentration of each chemical element found in the test subject's urine; the Canadian standard for HM concentrations in mg/L in municipal drinking water; the volume in L of urine that would need to be drunk to approach the CND standard.

In **Table 2** the columns are from left to right: the chemical element and its symbol; the established concentration norms in urine for each chemical element; the concentration of each chemical element found in the test subject's urine; the volume in L of urine that would need to be drunk to approach the CND standard; the volume in L of urine that would need to be drunk to approach the EPA standard; the volume in L of urine that would need to be drunk to approach the WHO standard.

Observations

1. **Nine HMs were compared**:
    - Of the 15 HMs in the urine test, nine are included in Table 2, and seven were part of all three drinking water standards. Al is not part of WHO values. Ni is not part of EPA values. This could be due to the low toxicity or lack of evidence for setting limits within the frameworks of those organizations.
2. **Highest Urine Volumes**:
    - Cu requires the largest urine volume at 400 L (260 EPA) to approach CND's and WHO's standard of 2 mg/L. Cr is the next highest at 125 L (250 EPA). (Al has a large urine volume in CND values at 176 L, and a mid-range for EPA at 12.1 L)
3. **Middle Volumes:**
    - Sb, Pb, Cd, Ni values are all too high for a person to reasonably consume enough urine.
4. **Low Volumes for Arsenic**:
    - Arsenic's urine concentration is closest to all three standards of 0.01 mg/L, needing **1.3 L of urine** to match the standard.
5. **Variance for Mercury:**
    - The CND standard returns 5 L, EPA returns 10 L and WHO returns 30 L. This variance is likely based on ALARA or what is considered 'as low as reasonably achievable' – for the larger organizations.
6. **The Big Four**:
    - Arsenic, cadmium, mercury and lead, are referred to as the big four of HMs.
    - Cd, Pb, are low in the subject's sample, compared to norms. It would be impossible to drink enough urine in a short period of time, to approach the standards.
    - Hg is low, and the threshold is also low. As Hg is shown as 5, 10 or 30 L, it depends on the standard referenced. Even at 5 L it would be very hard to approach the standard by drinking urine.
    - As is the outlier as all the standards return 1.3 L as the volume needed to reach the drinking water threshold. However, As differs greatly from the other Big Four because of the kind of As detected in water, versus As in food, and in urine.

Arsenic

It is worth a slight detour to focus on As before we proceed any further. In the tables above, the volume that could be drunk is lowest for As at 1.3 L. It is possible for a person to drink 1.3 L of urine in < 2 hours. However, it is almost impossible for a person to produce 1.3 L in < 2 hours. In part because the body produces urine in small amounts with an average total amount per day of less than 2 litres.

> "Every day, all of the blood in your body (between five and six liters) passes through the kidneys about 300 times. So your kidneys filter about 1,700 liters of blood per day in total. This leads to the daily production … of primary urine (glomerular filtrate) – which later becomes urine. […] About 1.7 liters of urine are produced like this each day." [10]

Add to this, that the bladder has a limit to how much it can hold and most people get a signal to urinate at a low volume of urine: "The urinary bladder can store up to 500 ml of urine in women and 700 ml in men. People already feel the need to urinate (pee) when their bladder has between 150 and 250 ml of urine in it."[11]

Given the natural rhythm of urine production, most urine therapy practitioners drink small amounts during the day.[12] It is possible to collect small outputs throughout the day, save them, and then drink 1.3 L in a short period. However, the concentrations of most metabolites in urine are not stable throughout the day. This is also true of arsenic: "although urinary arsenic concentration is commonly used as a typical biomarker for arsenic exposure, the rapid metabolism in humans means that data from a single urine sample may limit our ability to accurately assess the average level of arsenic exposure."[13]

Arsenic Species

Beyond the mere detection of arsenic there is also the issue of which type of arsenic is being found in human urine. While many foods contain small amounts of inorganic arsenic – e.g. marine and fresh water fish/seafood, raw rice, flour, grape juice and cooked spinach – the most commonly detected urinary arsenic is arsenobetaine (also, arsenocholine), or fish arsenic:

[10] InformedHealth.org [Internet]. Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); 2006-. In brief: How does the urinary system work? [Updated 2022 Mar 29]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279384/

[11] InformedHealth.org [Internet]. Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); 2006-. In brief: How does the urinary system work? [Updated 2022 Mar 29]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279384/

[12] A commonly shared experience from people starting the practice is that drinking urine can produce more urine, more quickly than normal. This seems to be a phase that people go through at the beginning of Uropathy practice. Consistent practitioners of many years report that the rhythm balances out over time. And that people who drink urine find they are more hydrated, need to drink less water and other drinks, and generally urinate slightly less than before starting the practice. This also makes it harder to drink large amounts of urine, when producing slightly less.

[13] "Additionally, the distribution of arsenic forms differs between blood and urine, with blood arsenic potentially providing a more accurate reflection of exposure levels in target tissues and organs." Su L, Ren Y, Xu R, Zhao S, Liu W, Meng C, Zhou X, Du Z. Association between urinary arsenic and the prevalence of endometriosis in women in the United States. Front Public Health. 2025 Mar 24;13:1525986. doi: 10.3389/fpubh.2025.1525986. PMID: 40196861; PMCID: PMC11973268.

> "An important limitation to the use of total urinary arsenic as a biomarker of exposure is that arsenobetaine is excreted (unmetabolized) in urine after ingestion of certain seafoods (Brown et al. 1990; Kalman 1987; Tam et al. 1982). Since "fish arsenic" is essentially nontoxic, analytical methods based on total urinary arsenic content may overestimate exposures to arsenic species that are of health concern."

Eating marine seafood and fish can lead to higher levels of non-toxic arsenic being excreted in the following days. This is not indicative of total arsenic load. The research goes as far as to say that fish arsenics "have been found to be essentially nontoxic."[14] Even though most arsenic detected in urine is non-toxic, general tests for arsenic are limited to total urinary arsenic and do not differentiate organic from inorganic. This can be misleading, especially as recent research from 2025 shows that levels of inorganic arsenic are higher in fresh water fish and seafood than previously thought. Therefore, 'fish arsenic' does not apply equally to marine and fresh water fish and seafood.

It is the inorganic arsenic species can cause problems: "Most cases of arsenic-induced toxicity in humans are due to exposure to inorganic arsenic."[15] The sources for inorganic arsenic are varied, however, "arsenic exposure through drinking water represents the primary mechanism of human contact, with over 200 million individuals worldwide facing the threat of encountering arsenic levels surpassing safety thresholds."[16,17] Other sources of inorganic arsenic include the already mentioned foods above, flour, raw rice, and cooked spinach, as well as some seaweeds. While arsenic species are easily detectable in urine, they represent a category that has not yet been fully researched and developed. The results of the example urine test used in this research paper highlights the need for more clarity on species of arsenic. This will help confirm that drinking fresh urine is not a toxic source of inorganic arsenic.

To wrap up this discussion of urinary arsenic, a summary:

- The detectable volume of urinary arsenic demonstrates short-term, not prolonged exposure. It is relevant to recent exposure (last 24-48 hrs), and not an indication of total

[14] Agency for Toxic Substances and Disease Registry. (2020). Toxicological profile for arsenic. U.S. Department of Health and Human Services. https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

[15] Agency for Toxic Substances and Disease Registry. (2020). Toxicological profile for arsenic. U.S. Department of Health and Human Services. https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

[16] Su L, Ren Y, Xu R, Zhao S, Liu W, Meng C, Zhou X, Du Z. Association between urinary arsenic and the prevalence of endometriosis in women in the United States. Front Public Health. 2025 Mar 24;13:1525986. doi: 10.3389/fpubh.2025.1525986. PMID: 40196861; PMCID: PMC11973268.

[17] "It is generally accepted that the arsenic-carbon bond is quite strong and most mammalian species do not have the capacity to break this bond; thus, inorganic arsenic is not formed during the metabolism of organic arsenicals. In most species, including humans, ingested (or exogenous) MMA(V) and DMA(V) undergo limited metabolism, do not readily enter the cell, and are primarily excreted unchanged in the urine. This is in contrast to inorganic arsenic, which undergoes sequential reduction and methylation reactions leading to the formation of MMA and DMA. Inorganic As(V) is readily reduced to inorganic As(III), which is taken up by the cell. Within the cell (primarily in the liver), As(III) is methylated to form MMA(V), which is reduced to MMA(III); MMA(III) subsequently undergoes oxidative methylations to form DMA(V). DMA(V) is the primary excretion product in humans." Agency for Toxic Substances and Disease Registry. (2020). Toxicological profile for arsenic. U.S. Department of Health and Human Services. https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

HM load. Not only is urinary arsenic variable throughout the day, it signals normal excretion and not problematic accumulation.

- Arsenobetaine is the most common form of arsenic detected in urine. Numerous studies in various country (e.g. US, Canada, Norway, Japan) have similar findings that non-toxic arsenobetaine, is the most commonly found arsenic after eating seafood. The inorganic arsenic and toxic forms such as MMA (monomethylarsonic acid), are found in relatively small volumes in urine. In high exposure areas, with contaminated groundwater there are more cases of inorganic arsenic in urine.
- Drinking urine is unlikely to reinforce exposure to inorganic forms such as MMA, which require prolonged exposure to produce toxic effects. Fresh urine is a not a toxic input and is unlikely to contain any significant volume of inorganic arsenic unless there is a known reason for exposure.
- The most common way to report urinary arsenic has been with one number representing 'total urinary arsenic.' This number does not distinguish between organic (non-toxic) and inorganic (toxic) arsenic species. Recent research published in 2025 highlights that there are currently more species and sources of arsenic being identified:

> "Given the large differences in toxicities among various arsenic species, the detection, quantification, and identification of individual arsenic species, as opposed to measuring the concentration of total arsenic, is imperative for accurate and meaningful assessment of exposure and risk."[18]

- Given that most urinary arsenic is organic, and that very small volumes are detected in urine. And that long term uropathy practitioners do not report HM poisoning after many years of practice, neither of arsenic, nor of any other HM. There is no evidence that drinking urine, especially in a 'generally healthy person,' can lead to HM loads or toxicity.

Question 1

We return to our opening questions. What can be learned from an analysis of a urine HM test done on the urine of a Uropathy practitioner?

Given the results from this test a few pieces of information stand out. The idea that drinking urine is unsafe because of HMs and toxins is at the very least put in doubt by this example. The test subject has been drinking 250ml-1500ml of urine a day since 2013. If urine was an efficient delivery system for the re-uptake of toxins and HMs, we would assume higher levels of toxins and HMs than this sample contains. At the very least, a higher level of As might be posited as it requires much less liquid intake to approach the health standards, and excretion volumes is indicative of recent exposures.

With this information in a future study we could take up the question of whether HMs in urine behave differently than HMs in water. Are HMs in urine in an altered state because of the chemical processes in the body?

[18] Lau C, Lu X, Hoy KS, Davydiuk T, Graydon JA, Reichert M, Le XC, Arsenic speciation in freshwater fish using high performance liquid chromatography and inductively coupled plasma mass spectrometry, Journal of Environmental Sciences, 153 (2025): 302-315, https://doi.org/10.1016/j.jes.2024.12.010.

Question 2

Is drinking urine problematic or dangerous because of the toxins in urine and the potential to increase toxic load in the body?

Taken in light of the test subject's years of daily practice, the simple answer would be, no. However, this information needs to be tested against other samples from urine therapy practitioners. Tests would ideally be run on those who have been practicing for many years, as well as on those who are undergoing HM detox, or have specific known toxic loads.[19]

To deepen the understanding of the implications of drinking urine extensive testing is called for to establish the effects and affects of urine. In particular, how is it similar and how is it different from water (e.g. ion charge, metabolites, plasma state, hormones, antibodies, etc.).

For the purposes of this urine test we have assumed that 1 L of water is similar enough to 1 L of urine to run the example. However, to be more exact, tests would need to be run to determine similarities and differences, e.g. on the electrical charge in water and in urine, the chemical makeup of both, the blueprint, if you will of both substances would need to be take into account.

The answer to Question 2 is no, insofar as for most of the HMs tested, it would be impossible to drink enough liquid to reach the volume in L listed in the tables. Research into water toxemia, or water poisoning, which is excessive water intake, indicates that the kidneys can filter 800ml to 1000ml of water per hour. Anything above this disturbs the electrolyte balance and can lead to problems in brain function and ultimately, death. An example from Scientific American reports on a case where a woman drank six litres in three hours and died later that day.[20] The main issue is the shift in sodium levels in the blood.[21] There is no known example of someone consuming enough urine to create urine toxemia. Perhaps the volume would be similar to water, but perhaps it is different.

Keeping to the assumption that water and urine would be similar when drunk in large volumes, by the time a person had drunk enough urine to approach these standards (As not included), the

[19] Many anecdotal examples exist of people who were in a toxic state and used their own daily urine to achieve better health while the known toxic load was still high. There is no study on such examples to date.

[20] There are specific cases of marathon runners drinking more than the kidneys can filter while under the stress of running. On an average day 800ml to 1000ml per hour is the maximum, and this cannot be maintained for many hours per day. A major campaign has been led most people to assume that they should be drinking 1500ml to 2000ml of water per day (or six to eight cups). This does not include liquids with caffeine, high amounts of sugar or other ingredients, which many people will consume while at work. Ballantyne, C. (2007, June 21). *Strange but true: Drinking too much water can kill you. Scientific American.* https://www.scientificamerican.com/article/strange-but-true-drinking-too-much-water-can-kill/

[21] "Hyponatremia, a word cobbled together from Latin and Greek roots, translates as "insufficient salt in the blood." Quantitatively speaking, it means having a blood sodium concentration below 135 millimoles per liter, or approximately 0.4 ounces per gallon, the normal concentration lying somewhere between 135 and 145 millimoles per liter." Ballantyne, C. (2007, June 21). *Strange but true: Drinking too much water can kill you. Scientific American.* https://www.scientificamerican.com/article/strange-but-true-drinking-too-much-water-can-kill/

volume of liquid consumed would have led to water poisoning.[22,23] This only accounts for ingestion not absorption. While it is useful to compare water and urine simply based on volumes of liquid, they cannot be compared in terms of chemical makeup and possible absorption in the human body, without further study.

Conclusion

This is one example based on one test of an individual's urine. What is promising is the potential that drinking urine over many years does not lead to HM poisoning. This short example serves as a starting point to further examination, discussion and research into the effects and affects of urine practices. This first example serves to disrupt assumptions that regular drinking of fresh urine might have a negative effect on HM and toxin levels in individuals.

Further lines of inquiry coming from this first research note include:

- How do HM concentrations in urine compare to established thresholds for toxicity in biological systems, not just water?
- What is the bioavailability and absorption potential of HMs when urine is ingested — especially in their metabolized or chelated forms?
- Are the forms of HMs excreted in urine biologically active, or are they already bound to proteins or excretory compounds?
- Does repeated consumption of one's own urine alter HM excretion patterns over time?
- What anecdotal or documented evidence exists regarding toxicity symptoms among long-term Uropathy practitioners?
- How do dietary, lifestyle, or environmental factors influence HM content in the urine of urine therapy practitioners?
- What are the limitations of comparing a biological waste fluid with a regulated environmental fluid (urine vs. drinking water)?
- What would a multi-subject comparative study (urine HM levels across different practitioners and non-practitioners) reveal about variation and risk?
- How do urine-based HM tests correlate with blood HM levels in urine therapy practitioners and non-practitioners?

[22] However, we don't know that drinking high volumes of urine results in water toxemia at the same rate as with water. The electrolyte balance in urine is different, indeed given the information in the Human Metabolome Database urine could be seen as nutrition with its complex chemical makeup. The Human Metabolome Database is discussed at length in the long form of the research. The link is: https://hmdb.ca/

[23] For our purposes we are comparing HM concentrations in two different liquids. We are making a jump in this comparison, because water, in general, contains a very different list of contents than urine. According to the Environmental Working Group in the US, "found a total of 316 contaminants in water supplied to the public between 2004 and 2009." Primo Water. (2018, March 12). *9 common chemicals in tap water.* https://primowater.com/blog/9-common-chemicals-in-tap-water/

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