

## The historical relevance of urine and the future implications

### History and future of the urine

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#### ABSTRACT

The relevance of urine examination has been reported since the ancient times. Urine was connected to religious traditions attracting the interest of the people as “the elixir of long life”. Indeed, it seems that urine was not considered as a waste product but rather as a distilled product selected from the body. Many different sources (the Sanskrit book ‘Shiwambu kalpa’, Sumerian, Assyrian- Babylonian, Egyptians, Esseniens, Jewish-Christians, Greek and roman philosophers) reported a number of evidences not only regarding uroscopy but also about the use of urine as therapy. Humans produce 10 billion liters of urine and in a lifetime a human can fill an Olympic swimming pool with the urine produced. Urine is used as electric generator, space fuel, storage battery, and fertilizer. The introduction of mass spectrometry in the study of urine could represent a goal for identify diagnostic biomarkers for kidney diseases.

**KEYWORDS:** Uroscopy, Urinotherapy, Urine Mass Spectrometry

## Introduction

In the ancient times urine was considered a sacred element and were related to Hindu's ceremonies and to Tantric religious traditions (1). Urine was not considered as a waste product of the body but a distilled product selected from the blood. The Sanskrit book **Shivambu' kalpa Vidhi** (5000 years bC) reported that urine can be useful product for the humans. Sumerian doctors were the first to use uroscopy as depicted in graphic clay tablets (4000 years bC) , whereas Assyrian- Babylonian mixed the urine of woman with alcohol to diagnose pregnancy (1). Egyptians were the first to diagnose diabetes using "urine excess". **Libri Ermetici of God Thoth**, Egyptian source from the late second century bC, reported the description of the different urine characteristics as white, black, fat, foggy, and foamy (1).

Egyptians seemed to use urine of a woman to water some seeds as a pregnancy test: if the seeds sprouted, the test was considered positive (likely due to the presence of growth factors) (1). Essenians, Jewish, and Christians used urine to body massage. In Susruta Samhita book there was a description of 10 different types of (1). In China and India dropping urine to the ground was used as a possible test for diabetes, whether ants were attracted and gathered on the urine drops due to the presence of sugar.

Early Jewish-Christian traditions reported their interest on urine related to urinotherapy. In **The Bible** (Prov: 5:15-19, Jesus 36, 16) urine was interpreted as image of peace and prosperity. Urinotherapy was also reported in the **Apocalypse** too.

## Uroscopy and Urinotherapy

Pythagoras (580-495 bC), Hippocrates (460-377 bC) diagnosed gonorrhoea, and tuberculosis taking advantage of the different color of urine. Diodorus from Sicily (90-27 bC) in the volume 33 of his "Bibliotheca" reported that at his time urine was used as to improve teethes health (1).

Galen (129-201 aC) pointed his attention toward urine and blood using systematically uroscopy; thus, the first systematic approach seems to be starting in the ancient Greece (1).

Galen, Plinius (23-79 aC), and other Greek physicians recommended the therapeutic use of urine to cure burns, inflammations, and skin diseases. Theophilus (813-842 aC), famous in Byzantium in VII century, reported urine modifications associated with different pathological states. In Roman Empire, there were persons named "fellones" who were collecting urine from house to house because urine was recommended for the treatment of ulcers. Moreover urine was also used to whiten senator's togas (1-3). In antique Pompeii, there was a public officer named "latrinario", who was operating under emperor mandate that obliged the men to urinate in public facilities; if they do not urinate in public facilities "the latrinario" squeezed their testicles (1-3).

Catullo (84-54 bC), the famous Roman poet, reported that Celtibers used urine to brush teeth and that the pharmacist of Cicero cured toothache with berry brew with urine collected from virgin woman. Moreover the Roman women made beauty masks using donkey urine (1).

In medieval time, it was common to taste urine to identify the presence of sugar and diagnose diabetes. Paracelsus (1493-1541) underlined the diagnostic importance of the urine and recommended morning urine collection to be performed for the visit (1). In the Renaissance, German biologist Burk reported some patients recovering from skin cancer using urine from people who eat cabbage (1). In Japan urinotherapy was known since fourteen century used for the treatment of asthma, diabetes, hypertension and, more recently, for cancer and AIDS (1).

Shamans drank their own urine after ingestion of hallucinogens to prolong the hallucinogenic effects. Even now people from Siberians were drinking their own urine after hallucinogens

mushrooms ingestion as well.

In Paris at the beginning of the eighteen century, dentists used to prescribe urine for the treatment of several dental diseases (1-3). In Europe it was used to drink urine as a defense from plague (1).

In the book **Englishman Treasure** published in 1841 there was a method described to clean injuries with urine (1). Drinking urine was common among American Indians, Tuareg from Sahara for native of Australia, and Lama from Tibet for re-hydration purpose.

Currently NASA spent more than 250 million of dollars to construct a machine capable to produce 23 liters of water per day recycling and reutilizing astronaut's urine and the starship humidity (1). Today urinotherapy is still used by millions of people in the world in different ways such as orally, injection, inhalation, gargle, enema, friction, and massage for the treatment of several diseases. In the last century many authors reported positive effect of urinotherapy (Table 1).

**Table 1 : Urine use in the last century**

- 1915: James Wilson from Belfast describes the bactericidal properties of urea. W.Jymmens and T.J. Kirk discovered that wounds of urea-treated soldiers hunt faster than others (ref n.1)
- 1918: Charles H Duncan from New York describes cases of various diseases treated with oral urinary therapy and by subcutaneous route (ref n.1)
- 1938: "The Lancet" publishes a study on the treatment of urea crystals wounds capable of rapidly reducing the smell of infected wounds (ref n.1)
- 1941: US doctors demonstrate that urine acts as an antacid and facilitates healing of gastric ulcers (ref n.1)
- 1951: A Swedish study shows that urine blocks the growth of Kock's bacilli (ref n.1)
- 1961: Americans Schlegel and Kay describe the properties of urine against Infections (ref n.1)
- 1965: A Japanese study confirms the Swedish study (ref n.1)
- 1968: Walser states that urea can be used for protein synthesis (ref n.1)
- 1974: Danopolus reports that urea treatments make the liver tumors regress (ref n.1)

*Urine use in the last century*

Two international conferences (in Goa India in 1996 and in Gersfeld, Germany in 1999) were held where researchers, physicians and people from more 50 countries shared their experiences on urine therapy diabetes, asthma, hypertension, cancer and AIDS (1). It is very important to underline that a large numbers of substances were founded in the urine (Table 2): some have been already extensively studied however other are still unknown.

**Table 2: Substances discovered in the urine**

Urokinase
Directin (action on the cancer cells)
3-Methyl Glioxal (scavenger of the cancer cells)
HII (inhibition of cancer cell growth)
Dhea (anti-obesity)
Prostaglandin
Allantoin (enhancer of tissues)
Melatonin
Somatostatin
Enzymes
Coenzymes
Topoisomerase II (responsible for cell memory)

*Substances discovered in the urine*

### Urine future implications

The future implications of urine are related not only to scientific research but also to social and economic aspects. In fact clinical proteomics in mass spectrometry has been applied to urine. Some authors reported a urine proteome as a prominent tool in the clinical of bioanalysis (4). Several recent experiments report the urinary proteome as biomarker discovered in renal disease including nephropathies, diabetic, IgA, focal segmental glomerulosclerosis, lupus nephritis, membranous nephropathy, acute kidney injury, renal Fanconi syndrome, and renal allograft rejection (4-6). Mass spectrometry based urinary proteomics has great potential in the development of non-invasive diagnostic in the future (4-8).

The social and economical application of the urine has been also studied. Four African girls generated electric force from urine by electrolysis and hydrogen generation. Whereas a Dutch researcher have discovered a bacterium capable of transforming urine ammonia into hydrazine producing fuel for vehicles (9, 10). University of Sassari, Italy, is developing a project to replace fuel for motor vehicles from urine. A Korean manufacturer produced a portable battery that can recharge using urine: a single fuel cell and 600 ml of urine produce enough energy for 3 hours phone calls by a Smartphone (9,10). The student Peter Trumble has created very robust chairs using urine substances (9, 10). Through urine it is possible to understand the climate changes that has occurred in the past studying urine hydrax in biomarkers (9). An interesting and future perspective use of the urine could be its use as fertilizer for agriculture. In fact the substances content in the urine could replace chemical fertilizers after solving the urinary smell (11). This solution could avoid the pollution of the hearth by chemical fertilizer use and could represent a biological method to fertilize.

In conclusion the quote of Heraclitus of Ephesus (535-475 aC) "nothing is created, nothing is destroyed everything is transformed" could be used to lead the future of the urine use.

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