



# Urination

**Urination** is the release of urine from the bladder to the outside of the body. Urine is released from the urethra through the penis or vulva in placental mammals<sup>[1][2]:38,364</sup> and through the cloaca in other vertebrates.<sup>[3][1]</sup> It is the urinary system's form of excretion. It is also known medically as **micturition**,<sup>[4]</sup> **voiding**, **uresis**, or, rarely, **emiction**, and known

colloquially by various names including **peeing**, **weeing**, **pissing**, and euphemistically **going (for a) number one**. The process of urination is under voluntary control in healthy humans and other animals, but may occur as a reflex in infants, some elderly individuals, and those with neurological injury. It is normal for adult humans to urinate up to seven times during the day.<sup>[5]</sup>

In some animals, in addition to expelling waste material, urination can mark territory or express submissiveness. Physiologically, urination involves coordination between the central, autonomic, and somatic nervous systems. Brain centres that regulate urination include the pontine micturition center, periaqueductal gray, and the cerebral cortex.

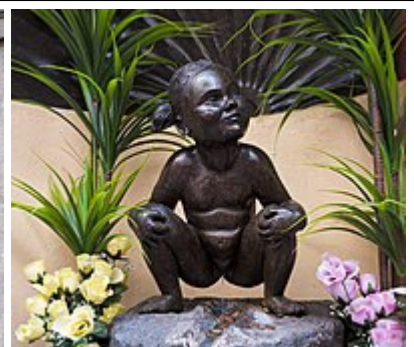
## Anatomy and physiology

### Anatomy of the bladder and outlet

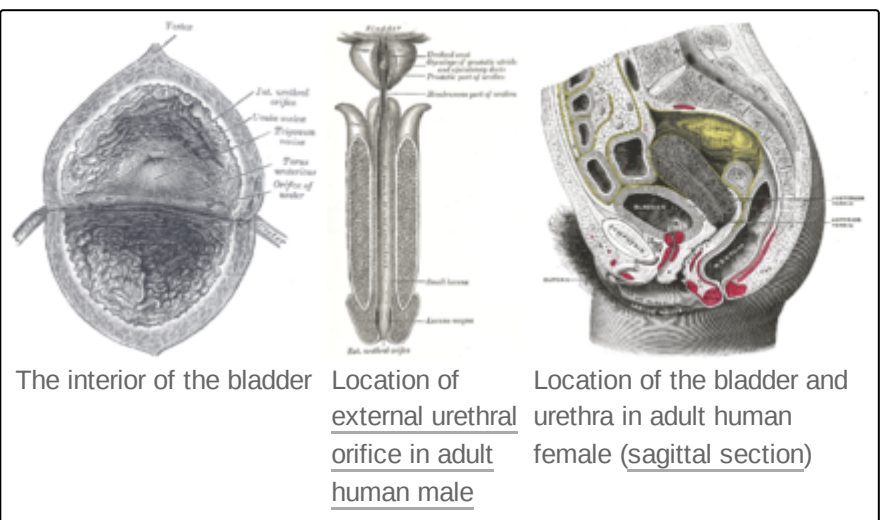
The main organs involved in urination are the urinary bladder and the urethra. The smooth muscle of the bladder, known as the detrusor, is innervated by sympathetic nervous system fibers from the lumbar spinal cord and parasympathetic fibers from the sacral spinal cord.<sup>[6]</sup> Fibers in the pelvic nerves constitute the main afferent limb of the voiding reflex; the parasympathetic fibers to the bladder that constitute the



*Manneken Pis* depicts a urinating boy (puer mingens) in a standing position.



*Jeanneke Pis* portrays a girl squatting to urinate.



The interior of the bladder

Location of external urethral orifice in adult human male

Location of the bladder and urethra in adult human female (sagittal section)

excitatory efferent limb also travel in these nerves. Part of the urethra is surrounded by the male or female external urethral sphincter, which is innervated by the somatic pudendal nerve originating in the cord, in an area termed Onuf's nucleus.<sup>[7]</sup>

Smooth muscle bundles pass on either side of the urethra, and these fibers are sometimes called the internal urethral sphincter, although they do not encircle the urethra. Further along the urethra is a sphincter of skeletal muscle, the sphincter of the membranous urethra (external urethral sphincter). The bladder's epithelium is termed transitional epithelium which contains a superficial layer of dome-like cells and multiple layers of stratified cuboidal cells underneath when evacuated. When the bladder is fully distended the superficial cells become squamous (flat) and the stratification of the cuboidal cells is reduced in order to provide lateral stretching.

## Physiology

The physiology of micturition and the physiologic basis of its disorders are subjects about which there is much confusion, especially at the supraspinal level. Micturition is fundamentally a spinobulbospinal reflex facilitated and inhibited by higher brain centers such as the pontine micturition center and, like defecation, subject to voluntary facilitation and inhibition.<sup>[8]</sup>

In healthy individuals, the lower urinary tract has two discrete phases of activity: the storage (or guarding) phase, when urine is stored in the bladder; and the voiding phase, when urine is released through the urethra. The state of the reflex system is dependent on both a conscious signal from the brain and the firing rate of sensory fibers from the bladder and urethra.<sup>[8]</sup> At low bladder volumes, afferent firing is low, resulting in excitation of the outlet (the sphincter and urethra), and relaxation of the bladder.<sup>[9]</sup> At high bladder volumes, afferent firing increases, causing a conscious sensation of urinary urge. Individual ready to urinate consciously initiates voiding, causing the bladder to contract and the outlet to relax. Voiding continues until the bladder empties completely, at which point the bladder relaxes and the outlet contracts to re-initiate storage.<sup>[8]</sup> The muscles controlling micturition are controlled by the autonomic and somatic nervous systems. During the storage phase, the internal urethral sphincter remains tense and the detrusor muscle relaxed by sympathetic stimulation. During micturition, parasympathetic stimulation causes the detrusor muscle to contract and the internal urethral sphincter to relax. The external urethral sphincter (sphincter urethrae) is under somatic control and is consciously relaxed during micturition.

In infants, voiding occurs involuntarily (as a reflex). The ability to voluntarily inhibit micturition develops by the age of two–three years, as control at higher levels of the central nervous system develops. In the adult, the volume of urine in the bladder that normally initiates a reflex contraction is about 300–400 millilitres (11–14 imp fl oz; 10–14 US fl oz).

### Storage phase

During storage, bladder pressure stays low, because of the bladder's highly compliant nature. A plot of bladder (intravesical) pressure against the depressant of fluid in the bladder (called a cystometrogram), will show a very slight rise as the bladder is filled. This phenomenon is a manifestation of the law of Laplace, which states that the pressure in a spherical viscus is equal to twice the wall tension divided by the radius. In the case of the bladder, the tension increases as the organ fills, but so does the radius. Therefore, the pressure increase is slight until the organ is relatively full. The bladder's smooth muscle has some inherent contractile activity; however, when its nerve supply is intact, stretch receptors in the bladder wall initiate a reflex contraction that has a lower threshold than the inherent contractile response of the muscle.

Action potentials carried by sensory neurons from stretch receptors in the urinary bladder wall travel to the sacral segments of the spinal cord through the pelvic nerves.<sup>[8]</sup> Since bladder wall stretch is low during the storage phase, these afferent neurons fire at low frequencies. Low-frequency afferent signals cause relaxation of the bladder by inhibiting sacral parasympathetic preganglionic neurons and exciting lumbar sympathetic preganglionic neurons. Conversely, afferent input causes contraction of the sphincter through excitation of Onuf's nucleus, and contraction of the bladder neck and urethra through excitation of the sympathetic preganglionic neurons.

Diuresis (production of urine by the kidney) occurs constantly, and as the bladder becomes full, afferent firing increases, yet the micturition reflex can be voluntarily inhibited until it is appropriate to begin voiding.

## Voiding phase

Voiding begins when a voluntary signal is sent from the brain to begin urination, and continues until the bladder is empty.

Bladder afferent signals ascend the spinal cord to the periaqueductal gray, where they project both to the pontine micturition center and to the cerebrum.<sup>[10]</sup> At a certain level of afferent activity, the conscious **urge to void** or **urination urgency**, becomes difficult to ignore. Once the voluntary signal to begin voiding has been issued, neurons in the pontine micturition center fire maximally, causing excitation of sacral preganglionic neurons. The firing of these neurons causes the wall of the bladder to contract; as a result, a sudden, sharp rise in intravesical pressure occurs. The pontine micturition center also causes inhibition of Onuf's nucleus, resulting in relaxation of the external urinary sphincter.<sup>[11]</sup> When the external urinary sphincter is relaxed urine is released from the urinary bladder when the pressure there is great enough to force urine to flow out of the urethra. The micturition reflex normally produces a series of contractions of the urinary bladder.

The flow of urine through the urethra has an overall excitatory role in micturition, which helps sustain voiding until the bladder is empty.<sup>[12]</sup>

Many men, and some women, may sometimes briefly shiver after or during urination.<sup>[13]</sup>

After urination, the female urethra empties partially by gravity, with assistance from muscles. Urine remaining in the male urethra is expelled by several contractions of the bulbospongiosus muscle, and, by some men, manual squeezing along the length of the penis to expel the rest of the urine.

For land mammals over 1 kilogram, the duration of urination does not vary with body mass, being dispersed around an average of 21 seconds (standard deviation 13 seconds), despite a 4 order of magnitude (1000×) difference in bladder volume.<sup>[14][15]</sup> This is due to increased urethra length of large animals, which amplifies gravitational force (hence flow rate), and increased urethra width, which increases flow rate. For smaller mammals a different phenomenon occurs, where urine is discharged as droplets, and urination in smaller mammals, such as mice and rats, can occur in less than a second.<sup>[15]</sup> The posited benefits of faster voiding are decreased risk of predation (while voiding) and decreased risk of urinary tract infection.

## Voluntary control

The mechanism by which voluntary urination is initiated remains unsettled.<sup>[16]</sup> One possibility is that the voluntary relaxation of the muscles of the pelvic floor causes a sufficient downward tug on the detrusor muscle to initiate its contraction.<sup>[17]</sup> Another possibility is the excitation or disinhibition of neurons in the

pontine micturition center, which causes concurrent contraction of the bladder and relaxation of the sphincter.<sup>[8]</sup>

There is an inhibitory area for micturition in the midbrain. After transection of the brain stem just above the pons, the threshold is lowered and less bladder filling is required to trigger it, whereas after transection at the top of the midbrain, the threshold for the reflex is essentially normal. There is another facilitatory area in the posterior hypothalamus. In humans with lesions in the superior frontal gyrus, the desire to urinate is reduced and there is also difficulty in stopping micturition once it has commenced. However, stimulation experiments in animals indicate that other cortical areas also affect the process.

The bladder can be made to contract by voluntary facilitation of the spinal voiding reflex when it contains only a few milliliters of urine. Voluntary contraction of the abdominal muscles aids the expulsion of urine by increasing the pressure applied to the urinary bladder wall, but voiding can be initiated without straining even when the bladder is nearly empty. Voiding can also be consciously interrupted once it has begun, through a contraction of the perineal muscles. The external sphincter can be contracted voluntarily, which will prevent urine from passing down the urethra.

## Experience of urination

The need to urinate is experienced as an uncomfortable, full feeling. It is highly correlated with the fullness of the bladder.<sup>[18]</sup> In many males the feeling of the need to urinate can be sensed at the base of the penis as well as the bladder, even though the neural activity associated with a full bladder comes from the bladder itself, and can be felt there as well. In females the need to urinate is felt in the lower abdomen region when the bladder is full. When the bladder becomes too full, the sphincter muscles will involuntarily relax, allowing urine to pass from the bladder. Release of urine is experienced as a lessening of the discomfort.

## Disorders

### Clinical conditions

Many clinical conditions can cause disturbances to normal urination, including:

- Urinary incontinence, the inability to hold urine
  - Stress incontinence, incontinence as a result of external mechanical disturbances
  - Urge incontinence, incontinence that occurs as a result of the uncontrollable urge to urinate
  - Mixed incontinence, a combination of the two types of incontinence
- Urinary retention, the inability to initiate urination
- Overactive bladder, a strong urge to urinate, usually accompanied by detrusor overactivity
- Interstitial cystitis, a condition characterized by urinary frequency, urgency, and pain
- Prostatitis, an inflammation of the prostate gland that can cause urinary frequency, urgency, and pain



Painting showing the physician Constantine the African accepting urine samples for diagnosis

- Benign prostatic hyperplasia, an enlargement of the prostate that can cause urinary frequency, urgency, retention, and the dribbling of urine
- Urinary tract infection, which can cause urinary frequency and dysuria
- Polyuria, abnormally large production of urine, associated with, in particular, diabetes mellitus (types 1 and 2), and diabetes insipidus
- Oliguria, low urine output, usually due to a problem with the upper urinary tract
- Anuria refers to absent or almost absent urine output.
- Micturition syncope, a vasovagal response which may cause fainting.
- Paruresis, the inability to urinate in the presence of others, such as in a public toilet.
- Bladder sphincter dyssynergia, a discoordination between the bladder and external urethral sphincter as a result of brain or spinal cord injury

A drug that increases urination is called a diuretic, whereas antidiuretics decrease the production of urine by the kidneys.

## Experimentally induced disorders

There are three major types of bladder dysfunction due to neural lesions: (1) the type due to interruption of the afferent nerves from the bladder; (2) the type due to interruption of both afferent and efferent nerves; and (3) the type due to interruption of facilitatory and inhibitory pathways descending from the brain. In all three types the bladder contracts, but the contractions are generally not sufficient to empty the viscus completely, and residual urine is left in the bladder. Paruresis, also known as shy bladder syndrome, is an example of a bladder interruption from the brain that often causes total interruption until the person has left a public area. These people (males) may have difficulty urinating in the presence of others and will consequently avoid using urinals without dividers or those directly adjacent to another person. Alternatively, they may opt for the privacy of a stall or simply avoid public toilets altogether.

## Deafferentation

When the sacral dorsal roots are cut in experimental animals or interrupted by diseases of the dorsal roots such as tabes dorsalis in humans, all reflex contractions of the bladder are abolished. The bladder becomes distended, thin-walled, and hypotonic, but there are some contractions because of the intrinsic response of the smooth muscle to stretch.

## Denervation

When the afferent and efferent nerves are both destroyed, as they may be by tumors of the cauda equina or filum terminale, the bladder is flaccid and distended for a while. Gradually, however, the muscle of the "decentralized bladder" becomes active, with many contraction waves that expel dribbles of urine out of the urethra. The bladder becomes shrunken and the bladder wall hypertrophied. The reason for the difference between the small, hypertrophic bladder seen in this condition and the distended, hypotonic bladder seen when only the afferent nerves are interrupted is not known. The hyperactive state in the former condition suggests the development of denervation hypersensitization even though the neurons interrupted are preganglionic rather than postganglionic.

## Spinal cord injury

During spinal shock, the bladder is flaccid and unresponsive. It becomes overfilled, and urine dribbles through the sphincters (overflow incontinence). After spinal shock has passed, a spinally mediated voiding reflex ensues, although there is no voluntary control and no inhibition or facilitation from higher centers. Some paraplegic patients train themselves to initiate voiding by pinching or stroking their thighs, provoking a mild mass reflex. In some instances, the voiding reflex becomes hyperactive. Bladder capacity is reduced and the wall becomes hypertrophied. This type of bladder is sometimes called the spastic neurogenic bladder. The reflex hyperactivity is made worse, and may be caused, by infection in the bladder wall.

## Techniques

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### Young children

A common technique used in many developing nations involves holding the child by the backs of the thighs, above the ground, facing outward, in order to urinate.

### Fetal urination

The fetus urinates hourly and produces most of the amniotic fluid in the second and third trimester of pregnancy. The amniotic fluid is then recycled by fetal swallowing.<sup>[19]</sup>



Ultrasound scan of male fetal micturition at 19 weeks of pregnancy

### Urination after injury

Occasionally, if a male's penis is damaged or removed, or a female's genitals/urinary tract is damaged, other urination techniques must be used. Most often in such cases, doctors will reposition the urethra to a location where urination can still be accomplished, usually in a position that would promote urination only while seated/squatting, though a permanent urinary catheter may be used in rare cases.

### Alternative urination tools

Sometimes urination is done in a container such as a bottle, urinal, bedpan, or chamber pot (also known as a gazunder). A container or wearable urine collection device may be used so that the urine can be examined for medical reasons or for a drug test, for a bedridden patient, when no toilet is available, or there is no other possibility to dispose of the urine immediately.

An alternative solution (for traveling, stakeouts, etc.) is a special disposable bag containing absorbent material that solidifies the urine within seconds, making it convenient and safe to store and dispose of later.

It is possible for both sexes to urinate into bottles in case of emergencies. The technique can help children to urinate discreetly inside cars and in other places without being seen by others.<sup>[20]</sup> A female urination device can assist women and girls in urinating while standing or into a bottle.<sup>[21]</sup>



In microgravity, excrement tends to float freely, so astronauts use a specially designed space toilet, which uses suction to collect and recycle urine; the space toilet also has a receptacle for defecation.<sup>[22]</sup>

## Social and cultural aspects

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### Art

A puer mingens<sup>[23]</sup> is a figure in a work of art depicted as a prepubescent boy in the act of urinating, either actual or simulated. The puer mingens could represent anything from whimsy and boyish innocence to erotic symbols of virility and masculine bravado.<sup>[24]</sup>



Woodcut of a  
puer  
mingens,  
from the  
Hypnerotoma  
chia Poliphili,  
1499



Lapis lynxurius in a medieval  
bestiary



Urinating dog statue at the  
Château de Fontainebleau



Het Zinneke in Brussels



Painting of a ram by  
Abraham Teerlink



Ein stallender  
Schimmel  
mit einem  
Bauern, der  
einen Sattel  
aufhängt by  
Francesco  
Casanova



Paard in een  
weiland dat aan een  
hek gebonden is by  
Wouter Johannes  
van Troostwijk

### Toilet training

Babies have little socialized control over urination within traditions or families that do not practice elimination communication and instead use diapers. Toilet training is the process of learning to restrict urination to socially approved times and situations. Consequently, young children sometimes develop nocturnal enuresis.<sup>[25]</sup>

## Facilities

It is socially more accepted and more environmentally hygienic for those who are able, especially when indoors and in outdoor urban or suburban areas, to urinate in a toilet. Public toilets may have urinals, usually for males, although female urinals exist, designed to be used in various ways.<sup>[26]</sup>

## Urination without facilities

Acceptability of outdoor urination in a public place other than at a public urinal varies with the situation and with customs. Potential disadvantages include a dislike of the smell of urine, and exposure of genitals.<sup>[27]</sup> It can be avoided or mitigated by going to a quiet place and/or facing a tree or wall if urinating standing up, or while squatting, hiding the back behind walls, bushes, or a tree.

Portable toilets (port-a-potties) are frequently placed in outdoor situations where no immediate facility is available. These need to be serviced (cleaned out) on a regular basis. Urination in a heavily wooded area is generally harmless, actually saves water, and may be condoned for males (and less commonly, females) in certain situations as long as common sense is used. Examples (depending on circumstances) include activities such as camping, hiking, delivery driving, cross country running, rural fishing, amateur baseball, golf, etc.

The more developed and crowded a place is, the more public urination tends to be objectionable. In the countryside, it is more acceptable than in a street in a town, where it may be a common transgression. Often this is done after the consumption of alcoholic beverages, which causes production of additional urine as well as a reduction of inhibitions. One proposed way to inhibit public urination due to drunkenness is the Urilift, which is disguised as a normal manhole by day but raises out of the ground at night to provide a public restroom for bar-goers.

In many places, public urination is punishable by fines, though attitudes vary widely by country. In general, females are less likely to urinate in public than males. Women and girls, unlike men and boys, are restricted in where they can urinate conveniently and discreetly.<sup>[28]</sup>

The 5th-century BC historian Herodotus, writing on the culture of the ancient Persians and highlighting the differences with those of the Greeks, noted that to urinate in the presence of others was prohibited among Persians.<sup>[29][30]</sup>

There was a popular belief in the UK, that it was legal for a man to urinate in public so long as it occurred on the rear wheel of his vehicle and he had his right hand on the vehicle, but this is not true.<sup>[31]</sup> Public urination still remains more accepted by males in the UK, although British cultural tradition itself seems to find such practices objectionable.<sup>[32]</sup> In Islamic toilet etiquette, it is haram to urinate while facing the Qibla, or to turn one's back to it when urinating or relieving bowels, but modesty requirements for females make it



A sign in Fortaleza, Brazil, warning that public urination is illegal



impossible for girls to relieve themselves without facilities.<sup>[33][34]</sup> When toilets are unavailable, females can relieve themselves in Laos, Russia and Mongolia in emergency,<sup>[35]</sup> but it remains less accepted for females in India even when circumstances make this a highly desirable option.<sup>[36]</sup>

Women generally need to urinate more frequently than men, but as opposed to the common misconception, it is not due to having smaller bladders.<sup>[37]</sup> Resisting the urge to urinate because of lack of facilities can promote urinary tract infections which can lead to more serious infections and, in rare situations, can cause renal damage in women.<sup>[38][39]</sup> Female urination devices are available to help women to urinate discreetly, as well to help them urinate while standing.

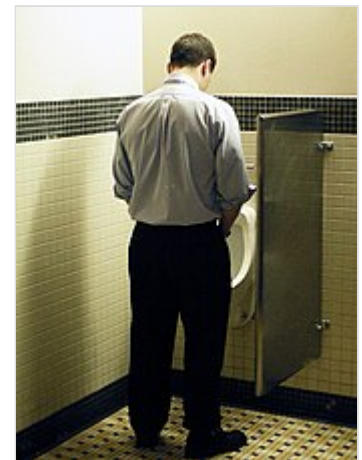
## Sitting, standing, or squatting

Techniques and body postures while urinating vary across cultures. Different anatomical conditions in men and women may presume different postures, yet these are largely shaped by cultural norms, types of clothing, and the sanitary facilities available. While sitting toilets are the most common form in Western countries, squat toilets are common in Asia, Africa, and the Arab world. Urinals for men are widespread worldwide, although women's urinals are available in some countries, recently becoming more common in Western countries. With the spread of pants among women, a standing posture became impractical, but in some regions where women wear traditional skirts or robes, an upright posture is common.<sup>[40][41]</sup>

## Males

Cultures around the world differ regarding socially accepted voiding positions and preferences: in the Middle-East and Asia, the squatting position was more prevalent, while in the Western world the standing and sitting positions were more common.<sup>[42]</sup> For practising Muslim men, the genital modesty of squatting is also associated with proper cleanliness requirements or awrah.<sup>[43]</sup> In Western culture, the standing position is regarded as the more efficient option among healthy males. In restrooms without urinals, and sometimes at home, men may be urged to use the sitting position as to diminish spattering of urine.<sup>[42]</sup>

Elderly males with prostate gland enlargement may benefit from sitting down to urinate, with the seated voiding position found superior as compared with standing in elderly males with benign prostate hyperplasia.<sup>[44]</sup>



A man uses a urinal, voiding urine in a standing position.

## Females

In Western culture, females usually sit or squat for urination, depending on what type of toilet they use; a squat toilet is used for urination in a squatting position. Women averting contact with a toilet seat may employ a partial squatting position (or "hovering"), similar to using a female urinal. However, this may not completely void the bladder.<sup>[45]</sup>

Females may also urinate while standing, and while clothed.<sup>[26]</sup> It is common for women in various regions of Africa to use this position when they urinate,<sup>[46][47]</sup> as do women in Laos.<sup>[48]</sup> Herodotus described a similar custom in ancient Egypt.<sup>[49]</sup> An alternative method for women voiding while standing is to use a female urination device to assist.<sup>[50]</sup>



Sit-down toilets are the most common type in Western countries.

## Talking about urination

In many societies and in many social classes, even mentioning the need to urinate is seen as a social transgression, despite it being a universal need. Many adults avoid stating that they need to urinate.<sup>[51][52]</sup>

Many expressions exist, some euphemistic and some vulgar. For example, centuries ago the standard English word (both noun and verb, for the product and the activity) was "piss", but subsequently "pee", formerly associated with children, has become more common in general public speech. Since elimination of bodily wastes is, of necessity, a subject talked about with toddlers during toilet training, other expressions considered suitable for use by and with children exist, and some continue to be used by adults, e.g. "weeing", "doing/having a wee-wee", "to tinkle", "go potty".

Other expressions include "squirting" and "taking a leak", and, predominantly by younger persons for outdoor female urination, "popping a squat", referring to the position many women adopt in such circumstances. National varieties of English show creativity. American English uses "to whiz".<sup>[53]</sup> Australian English has coined "I am off to take a Chinese singing lesson", derived from the tinkling sound of urination against the China porcelain of a toilet bowl.<sup>[54]</sup> British English uses "going to see my aunt", "going to see a man about a dog", "to piddle", "to splash (one's) boots", as well as "to have a slash", which originates from the Scottish term for a large splash of liquid.<sup>[55]</sup> One of the most common, albeit old-fashioned, euphemisms in British English is "to spend a penny", a reference to coin-operated pay toilets, which used (pre-decimalisation) to charge that sum.<sup>[56]</sup>

## Use in language

References to urination are commonly used in slang. Usage in English includes:

- Piss (someone) off (to anger someone; alternatively, to leave somewhere in a hurry)
- Piss off! (to express contempt; see above)
- Pissing down (to refer to heavy rain)
- Pissing contest (an unproductive ego-driven battle)
- Pisshead (vulgar way to refer to someone who drinks too much alcohol)
- Piss ant (a worthless person; in non-slang usage the term refers to several species of ant whose colonies have a urine-like odor)
- Pissing up a flagpole (to partake in a futile activity)
- Pissing into the wind (to act in ways that cause self-harm)
- Piss away (to squander or use wastefully)
- Taking the piss (to take liberties, be unreasonable, or to mock another person)
- Full of piss and vinegar (energetic or ambitious late adolescent or young adult male)
- Piss up (British expression for drinking to get drunk)

- *Pissed* (drunk in British English or angry in American English)

## Urination and sexual activity

Urolagnia, a paraphilia, is an inclination to obtain sexual enjoyment by looking at or thinking of urine or urination.<sup>[58]</sup> Urine may be consumed, or the person may bathe in it; this is known colloquially as a golden shower. Drinking urine is known as urophagia, though uraphagia refers to the consumption of urine regardless of whether the context is sexual. Involuntary urination during sexual intercourse is common, but rarely acknowledged. In one survey, 24% of women reported involuntary urination during sexual intercourse; in 66% of patients urination occurred on penetration, while in 33% urine leakage was restricted to orgasm.<sup>[59]</sup> Female kob may exhibit urolagnia during sex; one female will urinate while the other sticks her nose in the stream.<sup>[60][61]</sup>



Male mammals detect estrus from chemical signals in the female's urine<sup>[57]</sup>

Some mammals urinate on themselves in order to attract mates during the rut or urinate on other individuals before mating with them.<sup>[62]</sup> A male Patagonian mara, a type of rodent, will stand on his hind legs and urinate on a female's rump, to which the female may respond by spraying a jet of urine backwards into the face of the male.<sup>[63]</sup> The male's urination is meant to repel other males from his partner while the female's urination is a rejection of any approaching male when she is not receptive.<sup>[63]</sup> Both anal digging and urination are more frequent during the breeding season and are more commonly done by males.<sup>[64]</sup>

A male porcupine urinates on a female porcupine prior to mating, spraying the urine at high velocity.<sup>[65][66][67][68][69]</sup>

## Electric shock injuries and deaths

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In 2008 in London, a person died when they were urinating alongside a railway track at a train station and they received an electric shock.<sup>[70][71]</sup> The person received the electric shock when their stream of urine connected with the electric current from the live third rail.<sup>[70]</sup>

In 2010 in Washington state, a person who had died had received burns injuries on their body that were related to receiving an electric shock.<sup>[72]</sup> It is thought that an electric current had traveled through their stream of urine and into their body.<sup>[72]</sup> It is thought that the person had urinated into a roadside ditch and a live wire that was lying in the ditch gave the person an electric shock.<sup>[72]</sup>

In 2014 in Spain, a person died when they were urinating on a lamp post and they received an electric shock.<sup>[73]</sup> It was reported that an electric current may have traveled through the stream of urine and into the person's body.<sup>[73]</sup>

## Other species

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While the primary purpose of urination is the same across the animal kingdom, urination often serves a social purpose beyond the expulsion of waste material.<sup>[74][75]</sup> In dogs and other animals, urination can mark territory or express submissiveness.<sup>[57]</sup> In small rodents such as rats and mice, it marks familiar paths.



The urine of animals of differing physiology or sex sometimes has different characteristics. For example, the urine of birds and reptiles is whitish, consisting of a pastelike suspension of uric acid crystals, and discharged with the feces of the animal via the cloaca, whereas mammals' urine is a yellowish colour, with mostly urea instead of uric acid, and is discharged via the urethra, separately from the feces. Some animals' (example: carnivores) urine possesses a strong odour, especially when it is used to mark territory or communicate in other ways.

Felids<sup>[76][77]</sup> and canids<sup>[78] [79]</sup> scent-mark their territories using urine. Wolves mark their territories by urinating in a raised-leg posture and release preputial gland secretions in their urine. Male dogs mark their territories with urine more frequently than females.<sup>[78]</sup>

Young cattle can be toilet-trained to urinate in a "latrine" where their urine can be collected for wastewater treatment,<sup>[80][81]</sup> which could be used to reduce greenhouse gas emissions from the animals' urine in countries such as the Netherlands, the United States, and New Zealand.<sup>[82]</sup>

## See also


- Defecation
- Human positions
- Post-void dribbling
- Post micturition convulsion syndrome
- Sanitation

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## Further reading

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## External links

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- *Neurogenic Bladder* (<http://www.emedicine.com/med/topic3176.htm#>) at eMedicine, describes the neurophysiology of urination
  - "Urination" at HowStuffWorks.com (<http://health.howstuffworks.com/adam-200032.htm>)
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