

# What poison killed Hamlet? --- For Shakespeare lovers!

Reza Afshari, Environmental Health Services, BC Centre for Disease Control, BC. [Reza.Afshari@bccdc.ca](mailto:Reza.Afshari@bccdc.ca)

## Solve the mystery:

### What could be the possible toxicology reason for King Hamlet's death?

Take a guess (or confirm the given diagnosis), and email in your response to be entered into the BCTOX drawing for a \$20 gift card (Deadline: June 20, 2018).

--- There is no right or wrong answer for this competition. You may select a given diagnosis or provide a new one.

- If you send just a diagnosis, you will be entered once.
- If you send the justification of your diagnosis, you will be entered twice.

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## The Tragedy of Hamlet

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### *To be, or not to be: that is the question!*

*William Shakespeare, Hamlet, Act III, Scene I*

The Tragedy of Hamlet (or Hamlet)<sup>1, 2</sup>, written between 1599 and 1602, is one of William Shakespeare's masterpieces, and probably one of the most performed and analyzed plays in the English language.<sup>3</sup>

In this play, *Prince Hamlet*, son of *King Hamlet* of Denmark, is summoned by his father's ghost to avenge his death at the hands of Hamlet's uncle, Claudius.

Claudius murdered his brother to marry his brother's widow and seize the throne.



King Hamlet –Schematic [RA<sup>©</sup>]

### The sequence of events were:

- King Hamlet of Denmark dies suddenly.
- His brother Claudius marries the widow, his sister-in-law, Queen Gertrude, a few weeks later.
- King Hamlet's ghost appears before his son, Prince Hamlet, and tells him "that adulterate, that incestuous beast" his brother, now his stepfather, has killed him.

In the process of revenge Prince Hamlet begins blurring the lines between reality and fantasy, assuming the role of a madman. He uses this to test the actual guilt of Claudius and for preparing and executing his revenge signifying the "play in the play".<sup>4</sup>

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## How did King Hamlet Die?

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The ghost of King Hamlet tells Prince Hamlet that when he was taking his regular nap in his orchard, his brother, Claudius, poured a potion into his ear. The potion was leprous distilment, a poison.

### Choice of murder technique

Shakespeare's choice of murder technique of pouring poisonous potion into the ear is peculiar<sup>5</sup> and interesting from a forensic point of view as it leaves no trace of foul play!

It is assumed that Shakespeare was probably and surprisingly aware of the connection between the ear and the throat, the Eustachio tube.<sup>6</sup>

Additionally, the King's tympanic membrane should have been ruptured (perforation of the eardrum), which was common at the time, and the amount of poison ingestion from Eustachio tube should have been enough to kill the King.

It is also alluded that the potion consists of henbane. According to the ghost, the poison:

- Curdled his blood "it doth posset/And curd ... the blood"
- Caused his skin to develop diffuse horrible changes (sores)<sup>7</sup>, body with a "lazar-like ... and loathsome crust"
- Eventually died hideously, a victim of his brother's treachery.

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## Henbane

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Henbane, which literally means hen killer<sup>8</sup>, is extracted from the seeds and leaves of *Hyoscyamus niger* (Figure 2).

*Hyoscyamus* contains the active ingredients scopolamine, hyoscyamine and other tropane alkaloids. Both atropine and scopolamine have a long history of use in traditional medicine and witchcraft.<sup>9, 10</sup> Henbane oils also existed.

Henbane consumption causes pupil dilation, bronchodilation, anti-secretion, urinary bladder relaxation, sedation, hypnotic, hallucinogenic and anti-diarrheal properties.<sup>11</sup>

Toxic exposures (high doses) lead to somnolence, restlessness, hallucinations, delirium and manic episode, pupil dilation (mydriasis), alterations in heart rate, ataxia, seizure and deaths. The active ingredient of henbane, scopolamine, is used as part of general anesthesia even today.<sup>12</sup> Scopolamine skin patches are still in use to help prevent nausea and vomiting caused by motion sickness and postoperatively.<sup>13</sup>



Figure 2. *Hyoscyamus niger* (leaf and flower) [RA®]

According to a commercial producer, it can cause confusion, disorientation, agitation, dizziness, dry mouth, hallucinations, and delusions, among others. [reference not given to avoid conflict of interest]

### Henbane poisoning as a cause of King's death [?]

Henbane poisoning is not a rapid killer, and clinical manifestation is dramatic. It is unlikely to clinically attribute King Hamlet's death to henbane. In addition, the skin lining the ear canal is limited and rigidly adhered to the underlying bone and cartilage, limiting absorption. Potential inflammation changes absorption to a limited extent.

The overall capacity of external auditory canal is 2.5 cm<sup>3</sup>, and even this limited volume should have awoken the king.

Being exposed to a large amount of potion that reaches the throat via a potentially perforated tympanic membrane is also not plausible. No account of tympanic membrane perforation is given as it should have been noticed from associated hearing loss.

Shakespeare may have gotten his inspiration of pouring poison into the ear from a common practice to treat earache at the time in which henbane and cannabis extract oils were used. It was also known that this treatment can cause strange behaviour.<sup>9</sup> --- In the unexpected death of Francis II, King of France only 17 months post-coronation, his barber-surgeon was accused of poisoning him by blowing venous powders into his ear.<sup>5</sup>

Additionally, pin pointing a poison that can actually induce fatal clotting and diffuse skin changes is difficult. It is plausible that a dissection of an executed criminal, a common practice at the time<sup>14</sup>, inspired Shakespeare's description of the King's death.<sup>7</sup> If that is true, the documentation of King's death should be considered an early forensic toxicology report of human autopsy?

Overall it seems that henbane could not be the cause of his death.

Having said that, Hamlet claims "I essentially am not in madness, but mad in craft" (3.4.189–190). Apparently madness is still not psychologically defined even today. In Hamlet, it is characterised with an embattled, tenuous sense of self and reality. They live in a world full of deceptions and plots and counterplots in which people cannot trust each other.<sup>15</sup> There is plenty of evidence in Shakespeare's Tragedy of Hamlet that he was familiar with psychology and perhaps psychological signs and symptoms of Henbane poisoning. --- Prince Hamlet was dreaming and hallucinating, and floating between reality and fantasy, leaving him unable to mourn or love.<sup>16</sup>

His hallucinations were visual, which is more consistent with chemically-induced complications compared to a psychological source. Prince Hamlet's confusion, disorientation, agitation, hallucinations, and delusions could also be due to scopolamine in henbane.

Rotstein S believes "Shakespeare's Hamlet should have a place on every psychiatrist's shelf".<sup>17</sup> Although no "ultimate truth" exists,<sup>18</sup> I would love to add "medical toxicologist's" shelf to his statement!

It is much more convincing that Prince Hamlet, rather than King Hamlet used henbane administered via his ear! Shakespeare was certainly familiar with it!

### What do you think?

--- *What fatal toxicities could happen from limited skin exposure?*

--- *What poison(s) can actually induce fatal clotting and diffuse skin changes?*

--- *Should we discard the henbane poisoning theory?*

Take a guess, and email back your response to be entered in the BCTOX drawing for \$20 gift card. --- There is no right or wrong answer for this competition. You may select a given diagnosis or provide a new one.

(Deadline Oct 30, 2018)

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