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Cinematic or Scientific: I do Believe in Fairies

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Abstract
In the 2003 live-action adaptation of Peter Pan, Tinkerbell collapses from poisoning, and Peter's grief triggers her revival. This paper explores beyond the narrative magic, proposing that Peter's emotional tear may have acted as a biochemical signal. By reviewing the chemical composition of emotional tears and exploring the potential for transdermal absorption, this paper considers whether a tear could temporarily relieve pain and restore movement. Ultimately, while Peter's tear may have produced an analgesic response, it would not have neutralised poison.

Keywords: *Film; Biology; Tears; Chemical Signalling; Peter Pan (2003); Tinkerbell*

Introduction
In the 2003 live-action adaptation of Peter Pan [1], the idea that the existence of fairies relies on humans' belief in their existence. One of the most emotional scenes occurs when Tinkerbell, a fairy, is poisoned and collapses in front of Peter Pan. Grief-stricken and overwhelmed with emotion, Peter Pan begins to cry, repeating the phrase "I do believe in fairies, I do, I do." until eventually she is resurrected [1].

On a narrative level, this is typically interpreted as a demonstration of the restorative power of grief, belief and hope. However, the scene raises the compelling question, "Can grief have a physical manifestation?". Rather than attributing Tinkerbell's revival solely on Peter Pan's verbal affirmation of belief, this paper proposes an alternative interpretation. It considers the possibility that the critical moment occurs when a tear falls from Peter Pan directly onto Tinkerbell [1].

By examining the biochemical composition of tears and the physiological effects of the compound within, this paper explores whether Peter's tear may have functioned as a chemical signal that is capable of producing a temporary physiological response [2].

The chemical relevance of tears

While Peter Pan's grief and repeated affirmation of belief may appear magical, there may be a scientifically plausible explanation for the significance of his tears. To understand this possibility, it is first necessary to examine the different types of human tears and their chemical composition. There are three primary types of tears: basal, reflex (reactive) and emotional, each with distinct physiological functions and chemical characteristics [2].

Basal tears are produced continuously by lacrimal glands in the eye. Their function is to maintain ocular lubrication, remove particulate matter and provide antimicrobial protection through compounds such as lysozyme and immunoglobulins [2].

Reflex tears, sometimes referred to as reactive tears, are produced when the eye encounters irritants from its environment. These irritants may include vapours from cutting onions, dust, or smoke. These tears are produced in much larger quantities and function to rapidly wash out irritants from the ocular surface [2].

Emotional tears differ significantly from both basal and reflex tears in their biochemical composition. They are a response to an intense emotional state such as joy, grief or sadness. Studies have shown that tears shed from grief are rich in leucine-enkephalin, a

natural opioid peptide that participate sin the body's natural pain-regulation system [2]. It is closely related to endorphins and acts as such by binding to opioid receptors in the nervous system to reduce the perception of pain. This chemical acts like a painkiller, which contributes to emotional relief felt after crying [3].

In addition, emotional tears also contain stress-related hormones such as adrenocorticotropic hormone (ACTH) and prolactin [2,4]. These compounds are used in the hypothalamic-pituitary-adrenal (HPA) axis, a system that governs the physiological response to stress. The presence of these chemicals in emotional tears suggests that crying is not only a psychological response, but also a biochemical process related to neuroendocrine regulation [2,4].

Proposed mechanism in Peter Pan

Peter Pan's tears are assumed to be emotional tears caused by conditions of grief. They would have contained a high concentration of leucine-enkephalin [2]. Within the narrative of the movie, when a tear dropped onto Tinkerbell it introduced the possibility of a biochemical interaction rather than a magical event [2,5].

One hypothetical mechanism in which this interaction could occur is topical exposure followed by dermal absorption. In pharmacology, certain compounds applied directly to the surface of the skin can enter the bloodstream or surrounding tissues through transdermal diffusion [5]. Though this process usually takes place over a longer timescale in humans, the extreme difference in scale between Peter Pan and Tinkerbell raises the possibility that a small volume of fluid could proportionally represent a significant dose [5].

While a potent analgesic cannot cure poison, it can significantly reduce the perception of pain associated with it. Though it would not neutralise the toxin itself [6], it would produce a temporary effect of relief allowing restored movement. This could have given the appearance of recovery despite her underlying condition remaining fatal [2,5].

Limitations

Despite the speculative appeal to this interpretation, there are several limitations that must be acknowledged. Most significantly, this argument assumes that fairy physiology closely resembles that of human physiology, but on a much smaller scale [5]. Without this assumption, it would become difficult to determine whether the compounds found in human tears would have any biological effect on a fairy organism.

Additionally, topical medications usually require time and physical absorption through the skin in order to begin to take effect. In the scene from the movie, Tinkerbell is essentially "splashed" by a tear rather than treated through a controlled application. In reality, it is unlikely that this could have been absorbed quickly enough to create an immediate physiological response [5].

Conclusion

Overall, though Peter Pan's tear could have caused a momentary analgesic event, it would not have been a life-saving intervention. While it may have relieved pain and produced brief movement, it would not have reversed the poison [6]. Thus, proving that sometimes, even a heartfelt cry is not enough to save the day.

References

[1] Barrie, J.M. (2003) *Peter Pan*. [Film] Directed by P.J. Hogan. Universal Pictures. First released 9 December 2003.

[2] Verywell Health (2025) *Emotional tears vs. reflex tears: What is in tears*. [Online]. Available at: https://www.verywellhealth.com/chemical-composition-of-tears-5194861 [Accessed: 8 March 2026].

[3] Gelstein, S., Yeshurun, Y., Rozenkrantz, L., Shushan, S., Frumin, I., Roth, Y. & Sobel, N. (2011) *Human tears contain a chemosignal*, *Science*, 331, 6014, pp. 226–230. DOI: 10.1126/science.1198331.

[4] Holinger, D.P. (2025) *What Do We Know About Tears?* [Online]. Yale University Press. Available at: https://yalebooks.yale.edu/2025/07/24/what-do-we-know-about-tears/ [Accessed: 8 March 2026].

[5] Prausnitz, M. R. & Langer, R. (2008) *Transdermal drug delivery*, Nature Biotechnology, 26(11), pp. 1261–1268. DOI: 10.1038/nbt.1504

[6] Chacko, B. & Peter, J.V. (2019) *Antidotes in Poisoning*, Indian Journal of Critical Care Medicine, 23, Suppl 4, pp. S241–S249. DOI: 10.5005/jp-journals-10071-23310