

EDITORIAL

CAN A LETHAL PARASITE BE LIFE SAVOR FOR CANCER PATIENTS?

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Cancer is a fatal illness produced by an unexpected alteration in genes that has the destructive potential to degrade healthy human cells in a healthy individual. This disease is distinguished by an uncommon molecular alteration that promotes unregulated cell proliferation in the human body, which can quickly spread to other sites in the body. Several variables can cause cancer in humans; these factors might be biological or environmental. Cancer-causing agents are found in biological elements such as viruses, parasites, bacteria, and protozoans, which are responsible for producing carcinogenic agents in human healthy cells. They are also referred to as cancer cell promoters. Carcinogenic agents are those that contribute to the growth of abnormal cells and the eventual death of healthy cells, a condition known as carcinogenesis.

Tumors exist in different forms. When cells grow abnormally, they might develop into benign or malignant tumors. Benign tumors are unlikely to do any harm to the human body. Malignant tumors, on the other hand, have the destructive ability to cause death and also spread to the other tissues of the body.²

Until recently, parasites such as *Opisthorchis viverrini*, which causes liver cancer, and the *fluke Clonorchis*, which causes liver, gallbladder, and bile cancer, have been proven to cause disease in humans. However, other parasites were revealed to be defenders against cancer cells in cancer patients. Tumor treatment is necessary for cancer treatment, and enhanced tumor treatment efficacy can help in

the battle against a variety of cancers. In other terms, the death of a tumor represents the life of a patient.³

For years, researchers, biologists, and scientists have been attempting to discover how the immune system can be a breakthrough to cure lethal diseases such as cancer, a process known as immunotherapy. With recent discoveries that scientists can harness the immune system for chronic illnesses, immunotherapeutic treatments are more successful than ever.^{1,2} Immunotherapy is proven to be an effective and successful cancer treatment technique because the immune system can prevent uncontrolled cell development in human tissues. Tumors, like other viruses and bacteria, can change in such a way that the immune system cannot recognize and eliminate them. To prevent uncontrolled cell replication, tumors must have a robust activated immune response to be detected by immune treatment of checkpoint blockade therapy.^{1,4}

The working concept of checkpoint blockade treatment is based on the blocking of checkpoint protein, which sends an off signal by connecting with other proteins, allowing T lymphocytes to readily target and kill cancer cells with tumors. This therapy is extremely successful in the treatment of a variety of cancers. However, this treatment, like all immunotherapies, fails on cold tumors, because they are surrounded by immune response suppressors. Therefore, cold tumors are undetectable by immune checkpoint blockade therapy. Cold tumors are common in prostate, ovaries, and breast.¹

KEYWORDS: Cancer; Tumors; Immunotherapy; Parasites; Bacteria; Viruses; *Toxoplasma gondii*.

Cite as: Shahzadi M, Bilal M. Can a lethal parasite be lifesaving for cancer patients [editorial]?. Gomal J Med Sci 2021 Oct-Dec; 20(1):1-2. <https://doi.org/10.46903/gjms/20.01.1026>

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Date Submitted: 06-08-2021

Date Revised: 17-09-2021

Date Accepted: 24-09-2021

Toxoplasma gondii, a microscopic protozoan that is often hosted in cats and can cause toxoplasmosis in humans, is an infection-inducing parasite. More than one-third of the world's population has been affected by this parasite.⁵ This parasite is less harmful than other parasites and is frequently associated with mild flu symptoms.² It can, however, cause disease in pregnant women and immune-deficient individuals.⁵ Along with all its adverse effects, this parasite has the potential to be a lifesaver in the treatment of cancers.^{2,6}

This parasite can destroy several types of cancer cells in prostate, ovaries, and breast. To validate this discovery, multiple studies are conducted with encouraging results. This parasite has the potential to be a game-changer in the battle against all forms of cancer.^{2,3} Investigating how this parasite functions can help us understand how it is effective against cancer treatment. *Toxoplasma gondii* is more robust than other parasites, and it also produces proteins that render the immune system ineffective against the parasite, allowing it to survive, thrive, and replicate.³

According to one research, for cancer therapy, the parasite's disease-causing protein was eliminated using gene-editing technology and then injected directly into cancer tumors in mice. The introduction of a parasite into the cold tumor triggered a strong immune response that not only increased in the cancer cells but also in the neighboring cells. Consequently, cold tumors shrunk, showing that cancer cells were eliminated successfully. The study also demonstrated a two-fold immune response when immune checkpoint blocking treatment was also used. This method not only lengthened the lives of the mice but also halted the tumor from growing. This medication is successful in the treatment of melanoma, colon, and lung cancer.²

Recent findings have the potential to alter the future of immunotherapy. Findings demonstrated that mice had a high percentage of survival and tumor shrinkage. At this stage, research is being carried out purely on mice; no human trials have been carried out. However, it can be evidence of the therapeutic

use of parasites in the treatment of chronic illnesses until this treatment is used on cancer patients.

REFERENCES

1. Wang Y, Wang M, Wu HX, Xu RH. Advancing to the era of cancer immunotherapy. *Cancer Communications* 2021 Sep;41(9):803-29. <https://doi.org/10.1002/cac2.12178>
2. Zhu YC, Elsheikha HM, Wang JH, Fang S, He JJ, Zhu XQ, et al. Synergy between *Toxoplasma gondii* type I ΔGRA17 immunotherapy and PD-L1 checkpoint inhibition triggers the regression of targeted and distal tumors. *J Immunother Cancer* 2021 Nov;9(11):e002970. <https://doi.org/10.1136/jitc-2021-002970>
3. Hany Elsheikha. The Conversation. A dangerous parasite could be used to treat cancer - new research in mice [assessed 2021 5/12/2021]. Available from: <https://theconversation.com/a-dangerous-parasite-could-be-used-to-treat-cancer-new-research-in-mice-171022>
4. Esfahani K, Roudaia L, Buhlaiga NA, Del Rincon SV, Papneja N, Miller WH. A review of cancer immunotherapy: from the past, to the present, to the future. *Curr Oncol* 2020 Apr;27(Suppl 2):S87-S97. <https://doi.org/10.3747/co.27.5223>
5. Sasai M, Pradipta A, Yamamoto M. Host immune responses to *Toxoplasma gondii*. *Int Immunol* 2018 Mar;30(3):113-9. <https://doi.org/10.1093/intimm/dxy004>
6. Caner A. *Toxoplasma gondii* could have a possible role in the cancer mechanism by modulating the host's cell response. *Acta Trop* 2021 Aug;220:105966. <https://doi.org/10.1016/j.actatropica.2021.105966>

CONFLICT OF INTEREST

Authors declare no conflict of interest.

GRANT SUPPORT AND FINANCIAL DISCLOSURE

None declared.

AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	MS
Acquisition, Analysis or Interpretation of Data:	MS, MB
Manuscript Writing & Approval:	MS, MB

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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