

Editorial

Oncolytic Viruses in Bladder Cancer: Old Idea to Modern Approach

Kayhan Azadmanesh¹, Sayed Mohammed Jawad Alwedaie², Milad Akbarzadeh Moallem Kolaei^{3*}

¹Department of Virology, Pasteur Institute of Iran, Tehran, Iran

²Royal College of Surgeons in Ireland Medical University of Bahrain, Manama, Bahrain

³Animal Model Integrated Network (AMIN), Universal Scientific Education and Research Network (USERN), Tehran, Iran

HIGHLIGHTS

- The idea of killing cancer cells by oncolytic viruses mainly back to the old idea in the 19th (nineteenth) century.
- Nowadays genetically engineered oncolytic viruses are considered a new and modern way to treat bladder cancer (BC).
- Some oncolytic viruses can trigger an immune response in the body against cancer.

ARTICLE INFO

Receive Date: 25 June 2022

Accept Date: 21 August 2022

Available online: 03 September 2022

DOI: 10.22034/TRU.2022.356973.1123

*Corresponding Author:

Milad Akbarzadeh Moallem Kolaei

Email: miladakbarzade@yahoo.com

Address: Animal Model Integrated Network (AMIN), Universal Scientific Education and Research Network (USERN), Tehran, Iran

ABSTRACT

Some viruses can infect and kill cancer cells. These viruses are known as oncolytic viruses (Virotherapy). The idea of killing cancer cells by oncolytic viruses mainly back to the old idea in the 19th (nineteenth) century. Scientists observed cancer cure in some patients who contracted measles or common reovirus. Nowadays, genetically engineered oncolytic viruses are considered a new and modern way to treat bladder cancer (BC) like CAVATAK (Coxsackievirus A21, CVA21) and human granulocyte-macrophage colony-stimulating factor transgene (VSVd51-hGM-CSF). Oncolytic viruses have been considered tools for straight-killing tumor cells. New research suggests that some oncolytic viruses can trigger an immune response in the body against cancer.

Keywords: Bladder Cancer; Oncolytic Virus; Virotherapy

Editorial: Some viruses have the potential for tumor cell infection and killing. These viruses are known as oncolytic viruses. Oncolytic viruses can be found naturally or can be made by genetic engineering to enhance cancer cell killing potential with less harm to non-cancer cells. Research on virotherapy proposes that oncolytic viruses can activate the immune system against

the tumor as well. Until now, the only oncolytic virus with the US Food and Drug Administration (FDA) approval is genetically modified herpes simplex virus 1, talimogene laherparepvec (Imlygic®), or T-VEC for melanoma treatment. T-VEC is made by the insertion of two copies of the human cytokine granulocyte macrophage-colony stimulating factor (GM-CSF) gene in its ICP34.5 loci,

which consequently decreases its pathogenicity while enhancing the recruitment of the immune cells in the tumor site (1).

It was in 1897 that George Dock, a physician in Michigan, reported the first Virus proposed as an effective treatment strategy for reducing leukemia in a woman after she had flu (2). Similarly, in 1971 a report of a child in Uganda with Burkitt's lymphoma was bolded whose tumor went into remission after he contracted measles (3). In the 1990s, Canadian scientists recognized demolishing potential of infected cancer cells by common reovirus (4). After that, a virologist at Arizona State University in Tempe, Grant McFadden, reported that the rabbit virus could attack human cancer cells without damage to normal cells (5).

In 2019, Nicola E. Annels and colleagues from the UK showed that the common cold virus could infect bladder cancer (BC) cells. They represent a new way to treat non-muscle-invasive bladder cancer (NMIBC). CAVATAK (Coxsackievirus A21, CVA21) was administered to 15 BC patients a week earlier than transurethral resection of a bladder tumor (TURBT). Six patients received only the virus, while the other nine, in addition to the virus, got a dose of chemotherapeutic agent mitomycin C. CAVATAK can increase the expression of ICAM-1 (Intercellular Adhesion Molecule 1) on tumor cells. ICAM-1 attaches to the CAVATAK and consequently expands its oncolytic activity. Finally, tumor demolition in all treated patients happened, and even one tumor disappeared (6).

Recently, Coby Rangsitratkul and colleagues indicated a noteworthy virus-mediated antitumor immunity of different oncolytic vesicular stomatitis virus (VSV) containing the human granulocyte-macrophage colony-stimulating factor transgene (VSVd51-hGM-CSF) in BC patient-derived organoids. They recommend that VSVd51-hGM-CSF can be a valuable policy in BC treatment (7). Numerous VSVd51 variants expressing GM-CSF have been formerly defined in several malignancies like melanoma and breast cancer (8, 9). Coby Rangsitratkul and colleagues assessed equally the human and the existing mouse variant of VSVd51-mGM-CSF power to treat bladder cancer (BC). BC cell lines were assessed for vulnerability to viral lysis and expression of immunogenic cell death (ICD) markers and immune gene signatures. They examined the immunogenicity of VSVd51-mGMCSF in the C57Bl/6-MB49 syngeneic model to recognize the fundamental in vivo immune system of these oncolytic viruses. In addition, on the BC patient-derived organoids, they check immune system triggering by of VSVd51-hGM-CSF.

Conclusions

Oncolytic viruses have been considered as a gifted tool for straight-killing tumor cells. New research suggests

that some oncolytic viruses can trigger an immune response in the body against cancer.

Authors' contributions

All authors contributed equally.

Acknowledgements

None.

Conflict of interest

The author declares that there is no conflict of interest.

Funding

There is no funding.

Ethics statement

Not Applicable.

Data availability

None.

Abbreviations

BC	Bladder cancer
FDA	Food and Drug Administration
NMIBC	Non-muscle-invasive bladder cancer
VSV	Vesicular stomatitis virus

References

1. Bommareddy PK, Patel A, Hossain S, Kaufman HL. Talimogene laherparepvec (T-VEC) and other oncolytic viruses for the treatment of melanoma. *American journal of clinical dermatology*. 2017;18(1):1-15.
2. Brown C. Scientists are harnessing viruses to treat tumours. *Nature*. 2020;587(7835):S60-S.
3. Bluming A, Ziegler J. Regression of Burkitt's lymphoma in association with measles infection. *Regression of Burkitt's lymphoma in association with measles infection*. 1971:105-6.
4. Strong JE, Tang D, Lee PW. Evidence that the epidermal growth factor receptor on host cells confers reovirus infection efficiency. *Virology*. 1993;197(1):405-11.
5. McFadden G. Poxvirus tropism. *Nature Reviews Microbiology*. 2005;3(3):201-13.
6. Annels NE, Mansfield D, Arif M, Ballesteros-Merino C, Simpson GR, Denyer M, et al. Phase I Trial of an ICAM-1-Targeted Immunotherapeutic-Coxsackievirus A21 (CVA21) as an Oncolytic Agent Against Non Muscle-Invasive Bladder Cancer. *Viral Targeting of Non-Muscle-Invasive Bladder Cancer*. *Clinical Cancer Research*. 2019;25(19):5818-31.
7. Rangsitratkul C, Lawson C, Bernier-Godon F, Niavarani S-R, Boudaud M, Rouleau S, et al. Intravesical immunotherapy with a GM-CSF armed oncolytic vesicular stomatitis virus improves outcome in bladder cancer. *Molecular Therapy-Oncolytics*. 2022;24:507-21.
8. Lemay CG, Rintoul JL, Kus A, Paterson JM, Garcia V, Falls TJ, et al. Harnessing oncolytic virus-mediated antitumor immunity in an infected cell vaccine. *Molecular Therapy*. 2012;20(9):1791-9.
9. Ramsburg E, Publicover J, Buonocore L, Poholek A, Robek M, Palin A, et al. A vesicular stomatitis virus recombinant expressing granulocyte-macrophage colony-stimulating factor induces enhanced T-cell responses and is highly attenuated for replication in animals. *Journal of virology*. 2005;79(24):15043-53.

Author (s) biosketches

Azadmanesh K, MD, Department of Virology, Pasteur Institute of Iran, Tehran, Iran.

Email: azadmanesh@pasteur.ac.ir

Alwedaie SMJ, MD, Royal College of Surgeons in Ireland Medical University of Bahrain, Manama, Bahrain.

Email: Alwedaie@gmail.com

Akbarzadeh Moallem Kolaei M, MD, Animal Model Integrated Network (AMIN), Universal Scientific Education and Research Network (USERN), Tehran, Iran.

Email: miladakbarzade@yahoo.com

How to cite this article

Azadmanesh K, Alwedaie SMJ, Akbarzadeh Moallem Kolaei M. Oncolytic Viruses in Bladder Cancer: Old Idea to Modern Approach. *Translational Research in Urology*. 2022 Sep 4(3): 104-106.

DOI: [10.22034/TRU.2022.356973.1123](https://doi.org/10.22034/TRU.2022.356973.1123)

URL: https://www.transresurology.com/article_155053.html

