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Editorial

# Oncolytic Viruses in Bladder Cancer: Old Idea to Modern Approach

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## 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.

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## 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 recrutement 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 increases 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 valueable 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.

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All authors contributed equally.

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None.

**Abbreviations**

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

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