



Neenu Rachel Santhosh  
Pharm D Candidate, National College of  
Pharmacy Kozhikode, Kerala, India  
Email – neenurachel123@gmail.com

## COMMON COLD VIRUS – A NEW WEAPON FOR BLADDER CANCER

### Introduction

Bladder Cancer: A common form of cancer that begins in the lining of the bladder. <sup>1</sup> Bladder cancer is the 6th most common cancer among men .It is less common in women. The estimates for bladder cancer in United States for 2019 are about 80,470 new cases of bladder cancer and about 17,670 deaths from bladder cancer. <sup>2</sup>

The most common form of bladder cancer is non-muscle-invasive bladder cancer (NMIBC).In United States, 75% of all newly diagnosed bladder cancer is NMIBC, which have a low metastatic potential. The remaining 25 percent of bladder cancer are muscle invasive (MIBC) which often have metastasized at the time of presentation. <sup>3</sup>

### Treating bladder cancer

SLNO	NMIBC	MIBC
1	Transurethral resection of bladder tumor (TURBT)	Bladder removal (cystectomy) with chemotherapy or without chemotherapy
2	Intravesical immunotherapy (intravesical BCG)	Chemotherapy with radiation

3	Intravesical chemotherapy using mitomycin	
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Current treatments for this cancer are troublesome. TURBT, that removes any visible lesion has a high recurrence rate (between 50% and 70%) and a high progression rate (between 10% and 20%).<sup>4</sup> A common treatment for NMIBC is intravesical BCG , but it has no effect on one-third of patients and has been found to have serious side effects. These include the frequent urge to urinate, painful urination, fever, blood in the urine, and body aches.<sup>5</sup>Therefore there is an urgent need for new therapies.

### New tactics for bladder cancer

Researchers at the University of Surrey in England found that a certain strain of the cold virus- coxsackievirus (CVA21) is capable of inducing immunogenic cancer cell death in the bladder. Though the use of viruses isn't new in fighting cancer, a cold virus is used for the first time for the treatment of early-stage bladder cancer. In the study, 15 patients who had been diagnosed with NMIBC were given the cancer-killing CVA21 through a catheter one week before the surgery.<sup>6</sup> Post-surgical tissue samples indicated that the virus was highly selective **attacking cancerous cells, rather than healthy ones**. Once cancer cells are killed, the newly replicated infecting virus continued to induce apoptosis of other cancerous cells in the organ. <sup>7</sup>

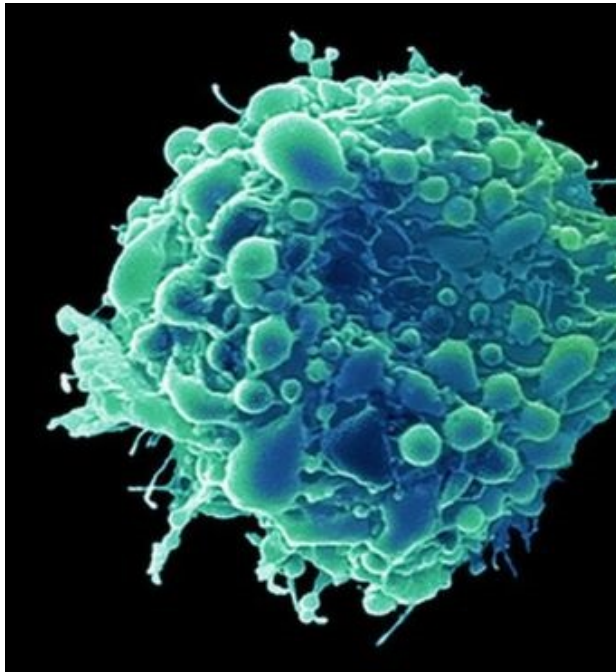
Reduction of tumor burden was observed in all patients. No trace of the cancer was found in one patient .None of them suffered significant side effect.

### Replicate and Attack

CVA21 is one of the viruses that cause the common cold, which is a small fairly primitive virus that occurs in nature and needs assistance of a protein called ICAM-1 for cellular entry.



ICAM-1 is seen in very low levels in membranes of leukocytes and endothelial cells but at very high levels in bladder cancer.<sup>8</sup>



**CVA21 induced immunogenic apop**

Inside the cancer cells, cold virus replicates and triggers a protein that leads to an immune response. Once those cancer cells had died, the virus replicates and then infiltrates and attacks other cancer cells. Tumors in the bladder are cold. They do not have immune cells, so the body doesn't always flag the cancer. But the deed of the virus causes lytic infection and immune cell stimulation to create immunological heat. Hot tumors are more likely to be rejected by the immune system. The patients after the viral infusion experienced zero side effects, which means the virus is very specific in targeting the cancer cells.<sup>4</sup>

## Conclusion

While viruses have the ability to cause devastating illnesses, it is refreshing to see many of these viruses have recently been used in medicine to improve overall health condition by attacking cancerous cells. Oncolytic virotherapy using coxsackievirus could create a diversion from well-established treatments such as chemotherapy and help revolutionize treatment for bladder cancer. Proof of viral targeting, replication and cancer cell death indicate that CVA21 be potentially considered as a new weapon for bladder cancer.

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