John Ryan is just one of the miracles to emerge from the Johns Hopkins cancer unit in Baltimore. An immunotherapy treatment – highly effective in a minority of patients – saved his life after a lung cancer diagnosis.

The retired military nuclear reactor specialist will celebrate his 74th birthday in July, and his battle with cancer illustrates the promises and failures of immunotherapy.

Immunotherapy is one of two major categories of drugs against cancer. The best-known is chemotherapy, which has been used for decades and aims to kill tumours but is so toxic that it attacks healthy cells, leading to major side effects like weakness, pain, diarrhea, nausea and hair and weight loss. Mr. Ryan went through all that in 2013, and his tumour persisted.

Exhausted by chemo and wracked with pain, Mr. Ryan was accepted into a last-ditch clinical trial using nivolumab (brand name Opdivo) in late 2013. The drug was delivered intravenously at the hospital, at first every two weeks, then once a month. His tumour rapidly disappeared, and 104 injections later, the main side effect has been itching.

Recently, a mysterious mass appeared in his right lung. It was treated with radiation.

Immunotherapy trains the body’s natural defences – immune cells, also known as T-cells – to detect and kill cancer cells, which otherwise can adapt and hide.

Some experts are cautious, having been disappointed numerous times by other newfangled approaches to fighting cancer. But many consider immunotherapy as a turning point. Over 30 immunotherapy drugs are in development, and 800 clinical trials are under way, according to Otis Brawley, medical director of the American Cancer Society.

In recent years, a series of clinical trials have shaken up the cancer world, showing it was possible to better treat and even cure some of the most difficult forms of cancer.

A spectacular example concerns breast cancer. A study presented at the American Society of Clinical Oncology conference showed that for thousands of women, surgery and hormone therapy were enough to keep cancer away.