

CELLULAR THERAPY

WHAT IS CAR T-CELL THERAPY?

Chimeric antigen receptor (CAR) T-cell therapy is a type of cancer treatment known as *immunotherapy*. It changes the T cells of your immune system so that they recognize and attack cancer cells. T cells are a type of white blood cell that helps the immune system find and destroy foreign objects in the body.

To create CAR T-cell therapy, a sample of your T cells is collected from your blood and sent to a manufacturing site. At that site, a chimeric antigen receptor is added to your T cells; the receptor recognizes certain markers found on cancer cells. Think of this new chimeric antigen receptor as the global positioning system (GPS) that gives your car directions to a specific location. After the CAR T cells are given back to you through an infusion in your vein, the CAR T cells (with the added GPS information) will track down the cancer cells they are programmed to find and will activate your immune system to attack and destroy them (**Figure 1**).

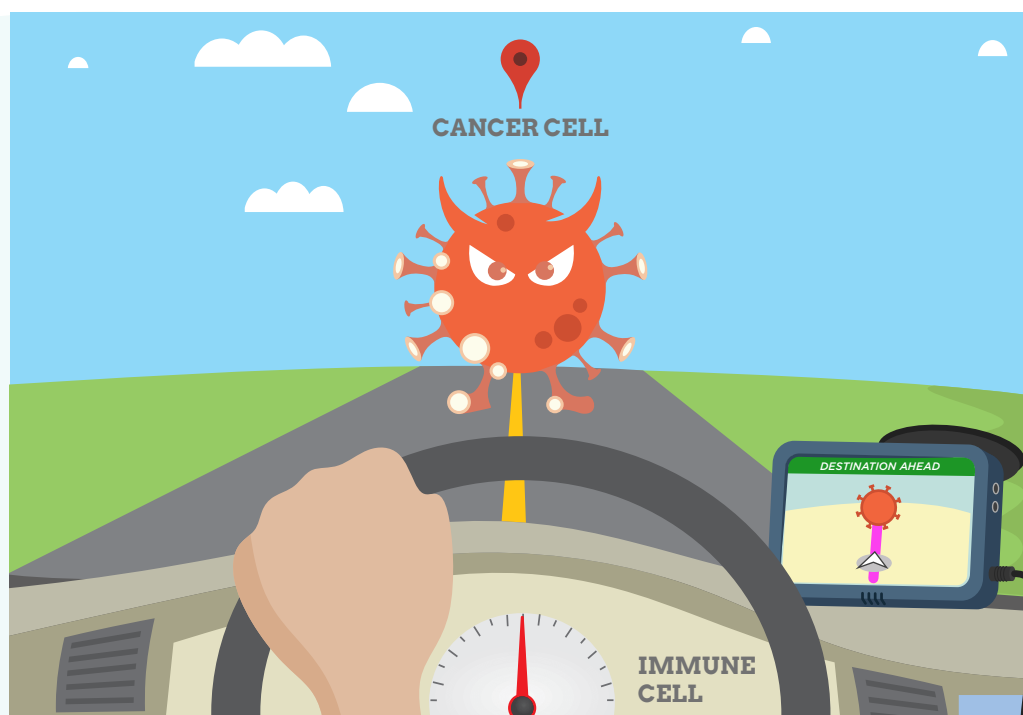


Figure 1. The chimeric antigen receptor added to your T cells is like the information in a GPS that routes your car to a certain destination. It routes your immune system to the cancer cells.

How Will My CAR T Therapy Be Given?

Several steps are taken to create and deliver your CAR T therapy:

1. **T cells are collected from your blood.** You will need to go to the hospital or clinic to have blood drawn by an apheresis machine. An apheresis machine removes blood through a needle in your arm and separates out the T cells needed to make the CAR T drug. Your blood is then returned to you through a needle in your other arm. This process usually takes 2–3 hours.
2. **CAR T cells are made.** Your T cells are then sent to a laboratory where a chimeric antigen receptor (CAR) is added to them. The addition of this receptor allows your T cells to recognize certain markers found on cancer cells. CAR T cells are copied in the lab to make sure you will have enough of them in your body to treat your cancer. It may take several weeks for the CAR T cells to be made.
3. **You are given lymphodepleting (LD) chemotherapy.** Several days (usually 2–14 days) before you receive your CAR T cells, you will return to the hospital or clinic to receive one or more chemotherapy agents. This chemotherapy decreases the number of T cells in your body to make room for the new CAR T cells. This process is called *lymphodepletion*. The lymphodepleting chemotherapy will be given to you by a nurse or another trained healthcare professional. You will receive these medications through a vein. Bendamustine is usually given daily for 2 days before the CAR T therapy. Fludarabine and cyclophosphamide are usually given daily for 3 days before the CAR T therapy (**Figure 2**).

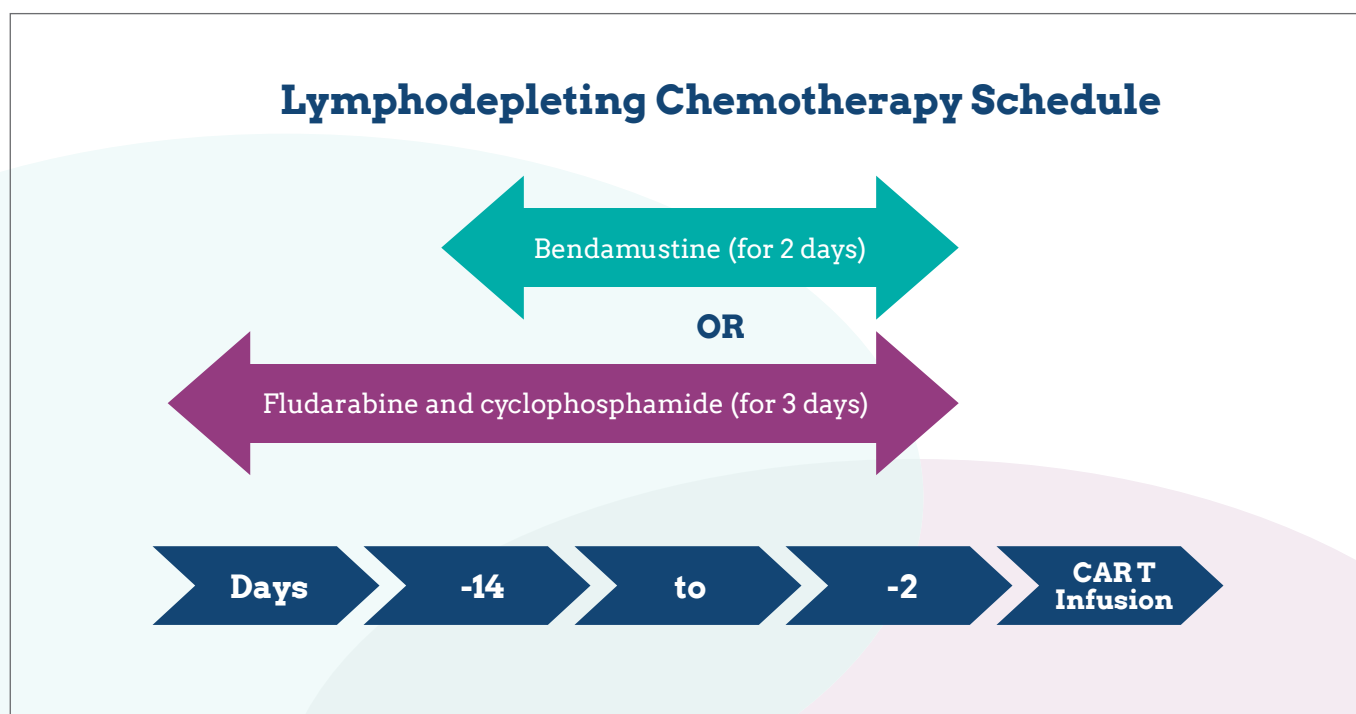


Figure 2. The lymphodepleting chemotherapy is given 2–14 days before the CAR T infusion.

4. **You are given the infusion of CAR T cells.** The CAR T infusion will be given to you through the vein. The infusion usually takes 30–90 minutes to complete. The day you receive your CAR T cells is called infusion day 0 or infusion day 1. (Note: you may be given special medications during Steps 3 and 4 to help prevent some side effects. These are discussed below.)
5. **The CAR T cells go to work.** After your CAR T therapy has been administered, the CAR T cells seek out and attack the cancer cells. Your healthcare team will monitor you closely while the CAR T cells begin their work. Usually you will be asked to stay in the hospital or near the hospital or clinic for several weeks after your infusion.

Steps 1–5 are shown in **Figure 3**.

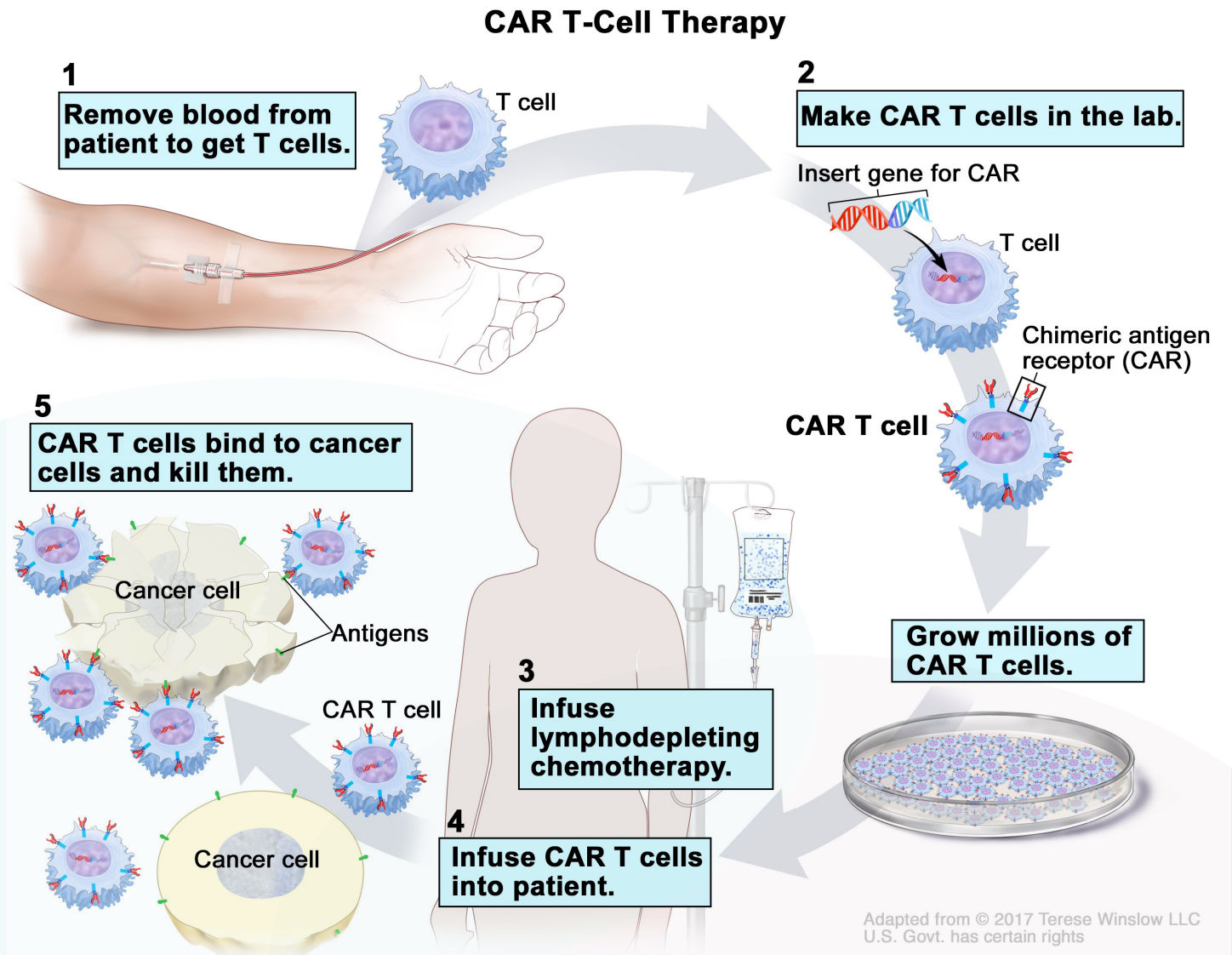


Figure 3. In chimeric antigen receptor T-cell therapy, the T cells of a person’s immune system are changed so that they recognize and attack cancer cells.

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What Can I Expect During My Treatment? What Are the Possible Side Effects?

Chemotherapy agents given during Step 3 (lymphodepletion) may cause side effects like the ones listed here:

- **Bendamustine:** low blood counts, infusion reactions (fevers, chills, itching, skin rash), nausea, vomiting, and fatigue. More serious side effects are infertility and injury to the liver.
- **Fludarabine:** low blood counts, weakness, nausea, vomiting, cough, infection, and poor appetite. More serious side effects are numbness and tingling of the hands and feet, skin rash, taste changes, and confusion.
- **Cyclophosphamide:** low blood counts, nausea, vomiting, hair loss, and poor appetite. More serious side effects are mouth sores and bladder irritation, including blood in the urine.

The CAR T therapy may also cause side effects. While you are receiving lymphodepleting chemotherapy and CAR T therapy, you may be given one or more of the following medications, called *supportive care medications*, to prevent side effects.

- **Allopurinol:** This medication helps prevent damage to your kidneys as the cancer cells break down. You will take allopurinol by mouth daily when you begin the lymphodepleting chemotherapy and for at least a week after your CAR T infusion. Some side effects of allopurinol are skin rash, nausea, vomiting, and diarrhea.
- **Antibiotic medications:** After you receive lymphodepleting chemotherapy, you will develop low white blood cell counts. During this time, you will be at higher risk of getting an infection. In order to prevent a potential infection, you will be given antibiotics.
- **Antiseizure medications:** These medications help prevent seizures. You may start one of these when you begin your CAR T therapy and continue it for 30 days. Some side effects are drowsiness, headache, anxiety, nausea, and fatigue.
- **Antiviral medications:** These medications help prevent the reactivation of herpes simplex virus (HSV) after CAR T therapy.
- **Antifungal medications:** These medications help prevent infection with a fungus after CAR T therapy.

What Should I Expect Immediately Following My CAR T Infusion?

Your CAR T cells are actively seeking out and destroying cancer cells. This can cause your body to react. You may feel as if you have the flu and have fever and chills. These symptoms are related to the release of substances called *cytokines*, and the side effect is called *cytokine release syndrome* (CRS). Cytokines help your CAR T cells become excited about destroying the cancer cells, but they can also make you feel sick. The symptoms can be minor or severe. If you develop fever, chills, or lightheadedness (symptoms of low blood pressure) or have difficulty breathing, you should contact your healthcare team immediately.

CAR T therapy may also cause changes in your neurologic system (brain, spinal cord, and nerves). You may feel confused, feel sleepy, or have trouble speaking or remembering. In severe cases you may pass out or have seizures. If you have any of these symptoms or if your caregiver notices any changes in your behavior, you should contact your healthcare team immediately.

How Long Do I Need to Stay Near the Hospital?

CAR T therapy may be given in the hospital or in an outpatient unit. Your healthcare provider will determine when it is safe for you to leave. You should plan to stay close to the hospital or outpatient treatment area for at least 4 weeks after your CAR T therapy. This is necessary in case you experience cytokine release syndrome or neurologic side effects.

It is important to have a caregiver with you during this time to help identify any side effects. This tool kit contains resources to help you and your caregiver track your symptoms.

If you experience cytokine release syndrome or have neurologic side effects, you should contact your healthcare team immediately. If the symptoms are severe, you should go immediately to the emergency room. Be sure you have your wallet card (part of this tool kit) with you so you can show the emergency room physician what CAR T therapy you received and the date of your treatment.