Humoral and cell mediated immunity pdf

Immunotherapies such as CAR T-cell therapy and immune cell storage are viable treatment options for diseases such as cancer. According to research, CAR T-cell therapy has a 93% efficacy rate for treating leukemia patients. Due to age-related changes, the optimal time to store your immune cells is between 15-60 years of age. While there is no "perfect time" to store, the earlier is recommended by immunologists. The human immune system has always worked to ward off viruses and diseases, but certain conditions require a second line of defense. With new advancements in technology, researchers have discovered how to harness the power of the immune system into immunotherapy—revolutionizing treatment for diseases like cancer. People can now access immunotherapies that alter their cells and store them for future use in cancer treatment. Banking cells can be particularly useful for people with a family history of diseases. "Cancer, we know in large, is a genetic disease. When people have a family history, that means they are categorized as a high-risk group," Chris Xu, PhD, immunologist and chief executive officer for ThermoGenesis, tells Verywell. "So for them, storing those healthy cells are important." Although storing immune cells is a fairly new concept, it shows future promise as a viable treatment option, according to Xu. While currently, the only immunotherapy approved by the Food and Drug Administration (FDA) is for cancer treatment, Xu says there are ongoing clinical trials to develop potential immunotherapies to treat COVID-19. Immune cell storing utilizes healthy cells to treat diseased ones, such as cancer cells. Immune cells can specifically scan the body for mutations potentially linked to cancer. When they do find those mutations, the cells work to destroy them. The process entails drawing 200 milliliters (mL) of blood from the donor's arm, just like a regular blood donation. Once the blood is drawn, it is sent to a lab where the cells are then isolated and modified to recognize diseased cells. The cells are isolated using a multi-component automated separation system (MCASS), which is a proprietary automated cell processing technology that can be used to process and extract immune cells from whole blood. They are then stored at cord blood banks and hibernate at negative 320.8 degrees F. Cord blood banks are like safety deposit boxes—they can store your cells for years. Preserved cells can be stored for 21 to 23.5 years. "Currently, there are over 450 cord blood banks around the world storing blood every single year," Xu says. Over 600,000 cord blood units are stored for transplantation worldwide. When a person gets sick, they can request to have their cells taken out of storage. The cells can then be transferred back into the human body. To date, more than 30,000 cord blood transplantations have been performed. One form of immunotherapy treatment available is called chimeric antigen receptors (CAR) T-cell therapy, which gained FDA approval in 2017. It was the first FDA-approved gene therapy. T-cells play a critical component in immunity and can be manipulated to express CAR receptors. CAR enhance a cell's ability to recognize an antigen located on the surface of a cancer cell, making it an effective treatment option. A recent study found that 93% of lymphoblastic leukemia patients who received CAR T-cell therapy achieved complete remission, a sign that all symptoms of cancer have disappeared. "These therapies are used to treat cancer patients who failed radiation and who failed chemotherapy," Xu says.   While CAR T-cell therapy is associated with high remission rates, some reasons people may not be able to access CAR T-cell therapy and other immunotherapies include: Standard cancer therapies such as chemotherapy and radiation can destroy a person's immune system, and a healthy immune system is required for efficacy.In advanced cancer stages, tumors may metastasize, invading healthy cells that are needed for CAR T-cell therapy. If you have a family history of genetic diseases, you can store your cells for future immunotherapy use. Immunotherapy might not be for everyone. To learn more about immune cell storing and whether this treatment plan is right for you, consult with your physician or oncologist. While there is no "right time" to store your cells, Xu suggests storing them as early as 15 years of age because cells are maturing, decreasing the susceptibility of infections. Xu recommends storing your immune cells earlier in life because the immune system deteriorates over time. "Once you pass 60, your immune system starts to decay," Xu says. Your immune system gradually loses its ability to protect your body against infections, and cancer and vaccine responses may become impaired. "Today's immune system is better than tomorrow," Xu says. Any person with healthy immune cells is eligible to have their cells stored for future use. Unfortunately, individuals who have received chemotherapy treatment or are immune-compromised may not be able to store cells due to the volume of healthy cells needed to complete immunotherapy. Check with your provider if you are unsure about whether you would be eligible to receive immunotherapy treatments like CAR T-cell therapy. "That is why we started the immune cell storage," Shen says. "We want to provide a mechanism for people to stay healthy." According to Xu, storing cells and getting your blood drawn can cost less than TV cable and gym memberships. It varies between $30 to $40 per month. "We certainly want this to benefit a lot of people," Xu says. The reinfusion portion of treatment, on the other hand, can cost anywhere from $300,000 to $400,000, according to Joseph Shen, MBA, chief operating and marketing officer at ImmuneCyte, a clinical stage immunotherapy company. As the operations officer, Shen works with stakeholders to bring costs down. "We are still looking to reduce the manufacturing costs of the therapies so that it can become a lot cheaper and more affordable and accessible to the general population," Shen tells Verywell. Xu and Shen are working to lower the cost by designing and providing additional coverage outside of standard insurance. "I don't want them to think that cell therapy was only designed for the rich," Xu says. They hope to offer a coverage plan by early next year. The manual manufacturing process for CAR T-cell therapy is what keeps costs so high. Purchasing automated machines that store the cells and blood is expensive. Therefore, "using automated technology is going to become a major factor" in keeping costs low, Shen says. Scientists have discovered a previously undocumented group of immune cells that interact with the nervous system to play a key role in obesity. They suggest that the breakthrough may lead to new targets for obesity treatments.Share on PinterestObesity is a growing problem, but researchers may have found a new way to treat it by identifying a new group of immune cells.The researchers – led by Ana Domingos, Ph.D., from the Instituto Gulbenkian de Ciência in Portugal – describe the new immune cells, which they call sympathetic neuron-associated macrophages (SAMs), in a new paper published in the journal Nature Medicine.Obesity is a global epidemic whose prevalence has more than doubled since 1980. In 2014, more than 600 million people, or around 13 percent of adults, were obese.Overweight and obesity pose major health risks because they raise the likelihood of developing type 2 diabetes, heart and circulation diseases, cancer, and other chronic diseases.The worldwide epidemic of obesity and the health problems associated with it has increased scientific research into the underlying biology of the condition.In their study paper, Dr. Domingos and colleagues describe an area of research that is debating how a link between the immune system and the nervous system might affect fat breakdown.Previous studies have suggested that macrophages that are active in obesity-related inflammation in fat tissue could be involved.Macrophages are the "big eaters" of the immune system. They can be found in every type of tissue, where they eat up dead cells, bacteria, and other pathogens, and where they also trigger inflammation.However, the mechanisms linking the action of macrophages to the nervous system and fat breakdown have not been studied in depth.In previous work, Dr. Domingos' team had discovered that fat, or "adipose tissue," has a supply of nerves made up of sympathetic nerve cells, or neurons, that release the neurotransmitter norepinephrine to trigger the breakdown of fat.In the new study, they found that SAMs interact with, and influence the triggering of, the neurons that release the norepinephrine that triggers fat breakdown.The team also discovered that SAMs dispose of norepinephrine and that obese mice have a much higher quantity of SAMs attached to neurons in fat tissue than lean mice.The team suggests that this shows that SAMs play a key role in obesity by reducing norepinephrine in fat tissue, which, in turn, blocks the process of fat reduction.Further investigations using genetically engineered mice uncovered more details about the underlying molecular mechanisms.These showed that SAMs alone have a protein called Slc6a2 that latches onto norepinephrine. As far as they know, the researchers say that SAMs are the only type of immune cell that have this transporter protein.The team also discovered that blocking this transporter protein in SAMs increased fat breakdown, energy use, and weight loss in the mice.Finally, by analyzing nervous system samples from humans, the researchers discovered that we have an equivalent mechanism for clearing out norepinephrine.Dr. Domingos suggests that targeting the norepinephrine transporter in SAMs may offer a way to overcome the "noxious off-target effects of several known drugs that block this molecular target.""Overall, our results identify SAMs as a potential new molecular and cellular target for obesity therapy."

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