Blood and Lymphatic cancers
Leukaemia CARE
supporting a quality of life

Advocacy Toolkit:

What is immunotherapy?

What is immunotherapy?

Immunotherapy treatments both use and promote the body's natural immune response to fight leukaemia cells.

Fun fact

Immunotherapies have begun to emerge within the last few decades, but there is hundreds of years of evidence for the role of the immune response in cancer. For example, in 1890, clinician William Coley deliberately infected his sarcoma patients (cancers of the bone or muscle) with bacteria to trigger an immune response. There are suggestions that his methodology led to the remission of over 25% of his patients.

The immune response and cancer

The immune response is the body's reaction to foreign (bacterial or viral) or damaged (cancerous) cells. A series of reactions and responses to leads to an increase of different immune cells, which have diverse roles and mechanisms to destroy the harmful cells.

The two most important immune cells involved in the response to cancer are white-blood cells matured from lymphoid blood stem cells.

T-Cells – These white blood cells recognise specific markers on the surface of cancer cells and attach to them. Killer T-cells release toxins that destroy the cancer cell and helper T-cells stimulate the production of the cancer cell specific antibodies.

Natural-Killer (NK) cells –NK cells can distinguish cancerous cells from normal cells and cause cancer cell death by releasing toxic chemicals. They, also, stimulate the production of cancer cell specific antibodies.

What is an antibody?

Antibodies are proteins that recognise and attach to a single specific marker (antigen) found on the surface of harmful cells. Antibodies cause destruction of cancer cells by initiating the production of toxic chemicals within the cell, or acting as a signal for other immune response cells to kill the cancer cells.

Antibodies that target specific antigens on cancer cells are naturally found within humans and other living organisms. They can be reproduced in labs using genetic techniques and non-human antibodies can, also, be engineered to be more humanised.

Alternatively, new antibodies that target different cancer markers can be developed in the lab by combining the genetic structure of human and non-human antigens (chimeric antibodies) or producing them entirely by genetic techniques.

Different types of immunotherapies

• Monoclonal antibody treatment
This is a targeted therapy that involves infusing patients with cancer specific antibodies, triggering an immune response against the cancer cells.

Or antibody-drug conjugates (ADCs)
This again involves cancer cell specific antibodies, but in this case the antibodies are joined to a drug that causes cell death. This means the toxic drug is directed to the cancer cells through specific antibody-antigen interactions.

• CAR T-cell therapy (chimeric antigen receptor t-cell therapy)
This therapy involves taking the patient's own T-cells and genetically modifying them in the lab to recognising specific markers on the cancer. This ensures that the immune response against the cancer cells is better initiated by the T-cells.

• Cytokine Treatment
Cytokines are signalling molecules essential in regulating the body's immune response. The treatment involves the use of specific cytokine variants that boost the body's immune response and can be used alongside other cancer therapies.

• Radioimmunotherapy
This alternative method of radiotherapy joins the radioactive substance to a cancer specific antibody. Once injected into the patient, the antibodies will identify the cancerous cells and radioactive substance will destroy them.
• Cancer vaccines
Vaccines help the immune system to recognise and remember harmful cells, allowing a quicker immune response when harmful cells are identified. Cancer vaccines involve the use of specific white blood cells that present antigens (markers found on the surface of cancer cells) and activate the NK cells and T-cells. If these cells then identify the specific antigen again, an immune response to destroy the cancer cells can be initiated quicker.

Why is immunotherapy important?

1) Most of the therapies are targeted to specific cancer markers, which could make them more effective at killing cancer cells and lead to fewer side effects than other non-specific treatments, such as chemotherapy.
2) The immune response memory could act as a long-term barrier against cancer reoccurrence.
3) A number of immunotherapy trials have demonstrated promising results in patients of different leukaemia types.

For example:
ALL CAR T-Cell therapy trial: https://www.sciencedaily.com/releases/2016/04/160427221202.htm
CLL CAR T-cell therapy trial: https://www.sciencedaily.com/releases/2011/12/111211222000.htm

Immunotherapies approved for treatment

Many of the immunotherapy treatments are still in clinical trial stages but there are a number of different monoclonal antibody drugs already approved for use.

Example: Rituximab for CLL

Rituximab is a chimeric antibody that targets a protein found on the surface of b-cells (white blood cells affected by leukaemia). The target of rituximab means that the immune response reacts to both healthy b-cells and cancerous b-cells. However, once the cells have been destroyed, the body can restore the healthy b-cells. One of the consequences of destroying all the b-cells, however, may be repeated infections in patients undergoing rituximab treatment.

Problems with immunotherapies

Immunotherapy treatments have been improving over the last decade, but as with any drug there are a number of obstacles for making the treatment effective. The biggest issues are:

1)Expense of personalised medicine – CAR T-cell therapy is a personalised medicine, as it involves removing the patient's t-cell and genetically engineering them to recognise the cancer specific antigen. Although, genetic techniques have been improving and cost decreasing, it is currently debated as to whether personalised medicine will be cost effective for the NHS to provide.

2) Autoimmunity – Although some antibodies target cancer specific antigens, often the antigens are found on normal cells too. This could mean that the immune system continues to trigger an immune response against normal healthy cells

Where can I find out more?

The immune system & immunotherapy

http://www.cancerresearchuk.org/funding-for-researchers/research-features/2016-08-10-biotherapeutics-where-next-for-cancer-immunotherapy?_ga=2.124407178.1825329958.1497862094-1662396816.1496410886
http://www.cancerresearchuk.org/about-cancer/what-is-cancer/body-systems-and-cancer/the-immune-system-and-cancer#treatments

Leukaemia immunotherapy and trials
https://www.cancerresearch.org/patients/patients/cancer-types/leukemia

Further questions

If you have any further questions about immunotherapy then you can contact our Campaigns and Advocacy team. They are available Monday to Friday from 9:00am – 5:30pm. If you would like to speak to them, you can:

- Call our office line on 01905 755977
- Send them an email at advocacy@leukaemiacare.org.uk
- You can also call the 24-hour CARE Line, free of charge on 08088 010 444. The team will pass your enquiry onto the Campaigns and Advocacy team.

Please note that our Campaigns and Advocacy team are unable to provide:

- Detailed medical advice or recommendations
- Legal advice
- Advocacy for a course of action which is contrary to the aims and objectives of Leukaemia CARE