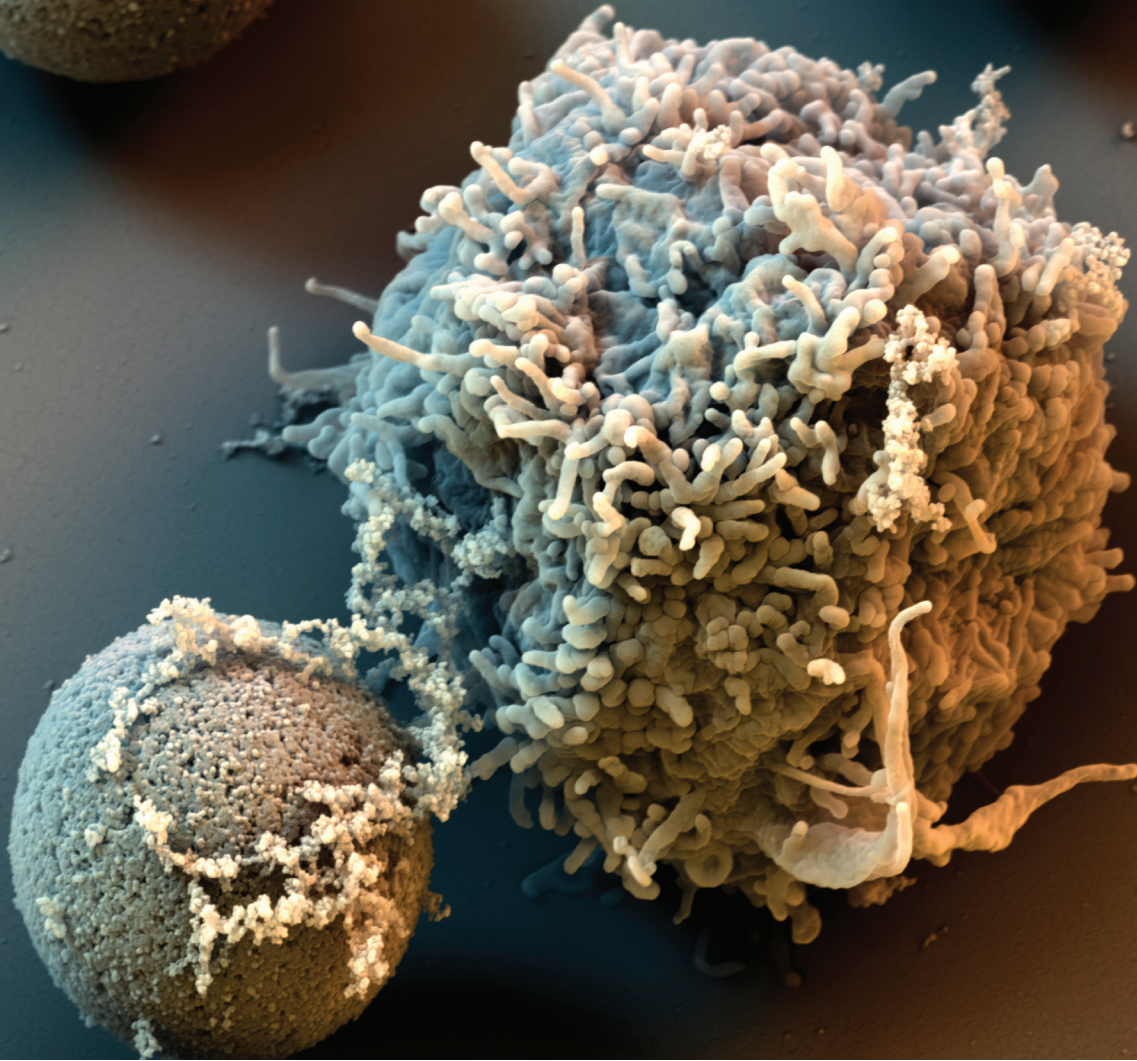


**gibco**



# Expand your T cell research

Dynabeads products for T cell activation  
and expansion

**ThermoFisher**  
SCIENTIFIC

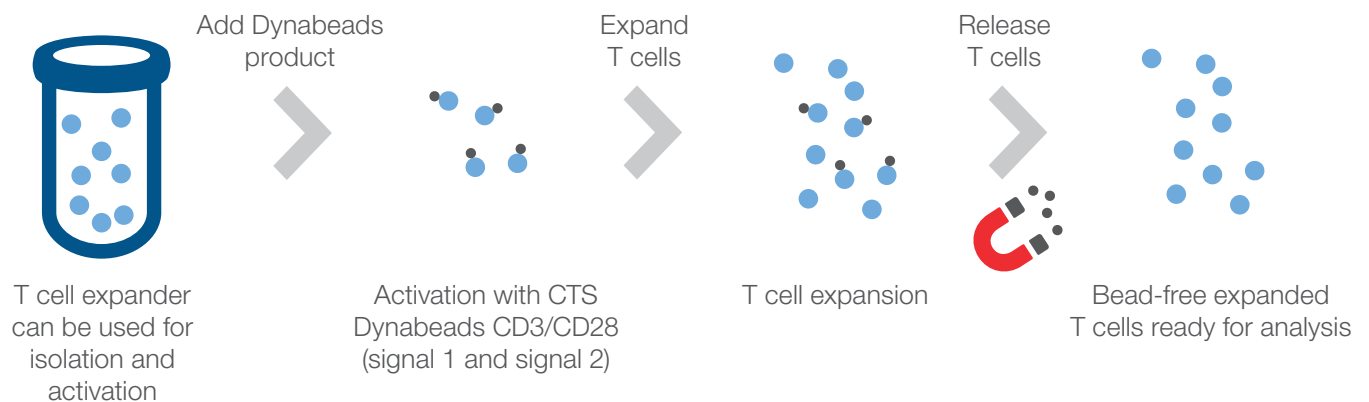
# Physiological T cell activation and expansion

Bridge the gap between mouse and human research

- Easy adaptation of activation duration and intensity
- Activated cells are functional with *in vivo*-like properties
- Restimulate T cells without maintaining APC/feeder cell cultures
- Maximal reproducibility with minimal effort
- Up to 3,000-fold expansion in just 14 days

You no longer have to tediously isolate antigen-presenting cells (APCs) for T cell activation and expansion. And you don't have to worry about loss of T cell function or antigen recognition capability, or even the potential failure to engraft after infusion.

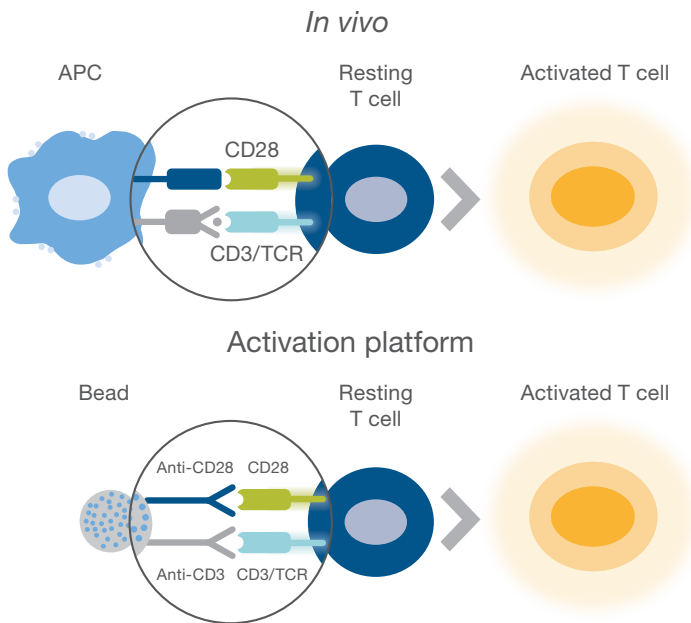
Gibco™ Dynabeads™ T cell expansion products mimic *in vivo* T cell activation by APCs. This gentle and efficient technology allows *ex vivo* physiological activation and expansion of both mouse and human T cells (Figure 1).



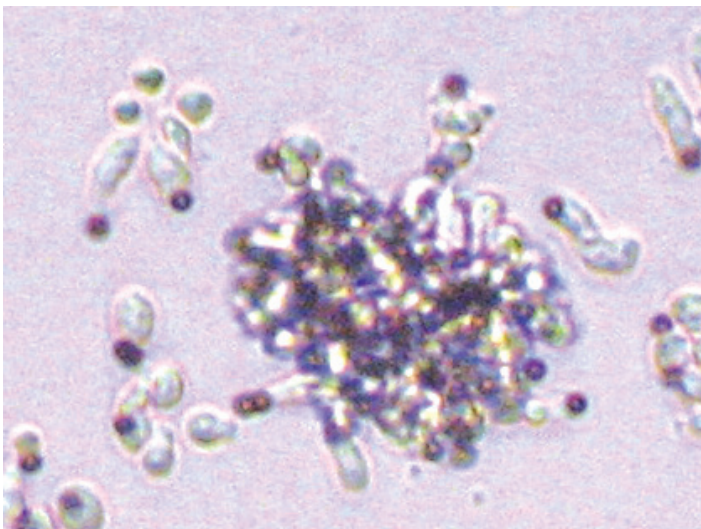
**Figure 1. Overview of the simple and efficient Dynabeads T cell activation and expansion products.** If you are using Gibco™ Dynabeads™ Human T-Expander (Cat. No. 11141D) or CTS™ Dynabeads™ CD3/CD28\* (Cat. No. 40203D), these can be used for both T cell isolation and activation/expansion.

## How it works

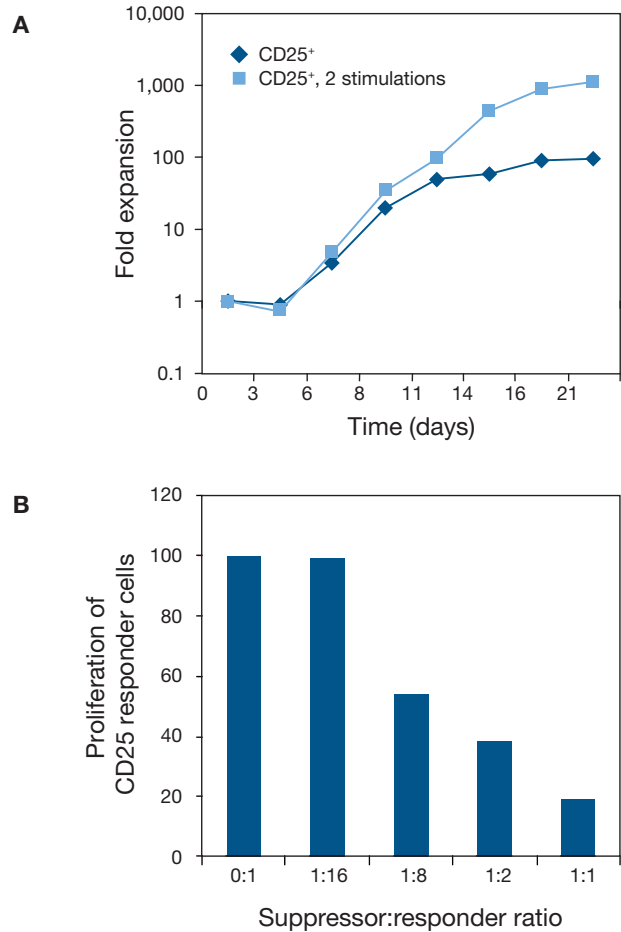
The T cell activation workflow couldn't be easier. Dynabeads products provide key signals to CD3/TCR and CD28, simultaneously (Figures 2 and 3). Following activation and expansion, the bead-free T cells retain functional properties [2]. The cells can be restimulated several times; simply change the medium and add more beads (Figure 4). The whole process is antigen-independent, gentle, and efficient.



**Figure 2. Consistent and reliable T cell activation.** Dynabeads T cell activation products offer a simple solution for mimicking the *in vivo* interaction of T cells with antigen-presenting cells (APCs) by utilizing the two activation signals present on APCs (CD3 and CD28) conjugated to magnetic beads.



**Figure 3. Dynabeads products for specific stimulation and expansion of T cells.** The image shows activated T cells and Dynabeads CD3/CD28.



**Figure 4. Expanded human regulatory T cells (Treg) retain their phenotype and functionality.** Human Treg cells were isolated using the Gibco™ Dynabeads™ Regulatory CD4<sup>+</sup>/CD25<sup>+</sup> T Cell Kit, followed by activation using Dynabeads™ Human Treg Expander. **(A)** The Treg cells are expanded 100-fold (dark blue). Higher expansion can be obtained by restimulating the cells at day 8, starting with >97% pure Treg cells (light blue). **(B)** Expanded human Treg cells were co-cultured with allogenic PBMCs for 6 days at various suppressor:responder ratios. Proliferation was measured using a standard thymidine incorporation assay. At a 1:1 ratio, 80% suppression was achieved.



### Quick, easy, and efficient

When you're using Dynabeads technology, there's no need for autologous APCs or antigen, and you don't have to worry about APC/feeder cell contamination or culture maintenance. Benefits include:

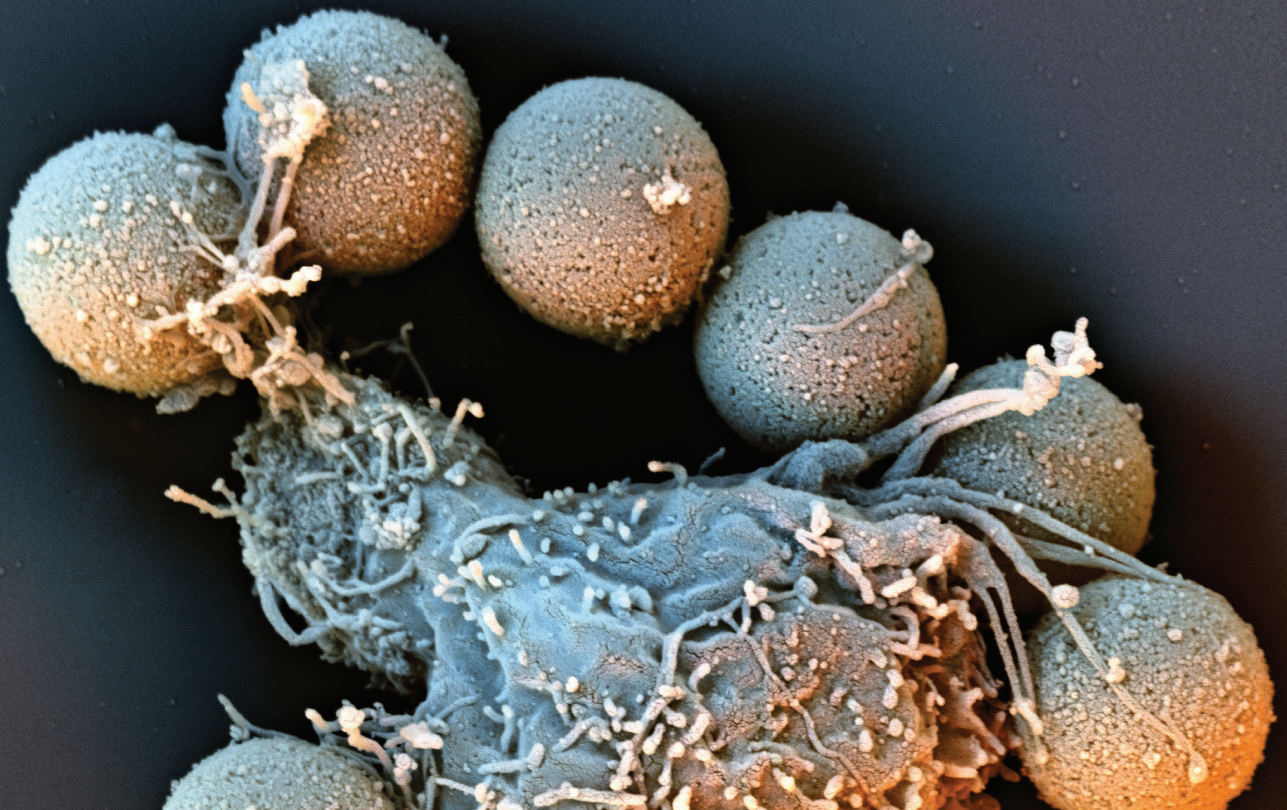
- Ease of use—just add beads
- Consistent, simultaneous signaling via CD3/CD28
- No negative signaling through CTLA4
- Expansion of CD4<sup>+</sup>, CD8<sup>+</sup>, and Treg cells
- Products ranging from mouse and human research to clinical research

### Quality and consistency

Dynabeads products bring reproducibility and robustness to T cell activation and expansion. Stable beads with precise amounts of anti-CD3 and anti-CD28 antibodies help ensure that the stimulated T cells retain their functional phenotype after proliferation. Yet there are no contaminating by-products such as antibodies, beads, or feeder cells.

The expanded T cells are induced to express a wide array of immunomodulatory molecules (including CD137 and CD40L) [2] and cytokines such as IL-2, IFN- $\gamma$ , TNF- $\alpha$ , and GM-CSF [3]. Surface CD28 and CD62L expression is maintained, and key homing receptors (e.g., L-selectin) and survival molecules (Bcl-XL) are induced [1,2]. Additionally:

- A broad T cell repertoire is maintained, securing antigen recognition capabilities [3]
- Expansion can reverse anergy and restore immunological responses [4]
- Expanded CD4<sup>+</sup> and CD8<sup>+</sup> cells retain their cytolytic and helper functions
- Expanded Treg cells retain their suppressive activity [5]
- Bead-activated T cells are easy to transduce [6]

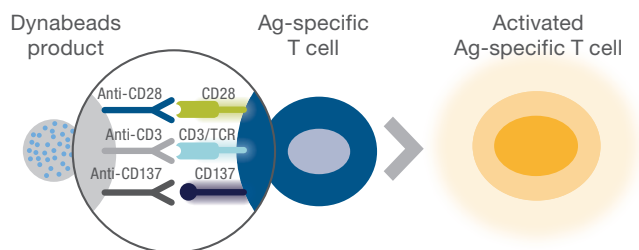


## Efficient expansion of Ag-specific T cells

The main application for these products is T cell re-stimulation and expansion of antigen-specific (Ag-specific) T cells from cell lines or cell clones, or freshly isolated/enriched Ag-specific T cells (Figure 5).

### Key benefits:

- **Physiological activation:** stimulation of CD3, CD28, and CD137 cells with agonistic monoclonal antibodies
- **Efficiency:** increased expansion and survival of Ag-specific T cells
- **Reliability:** T cells expanded with Dynabeads products maintain antigen specificity when tested in bioassays
- **Ease of use:** no need to find or prepare donor-matched APCs or antigen



**Figure 5. To enable expansion of human antigen-specific T cells, Dynabeads products are conjugated with anti-CD3, anti-CD28, and anti-CD137 antibodies.** CD137 (4-1BB) is a member of the tumor necrosis factor family, and agonistic anti-CD137 antibodies act as activating co-stimulatory molecules, especially important for effector/memory T cells, and promote the survival and proliferation of T lymphocytes. This technology allows you to activate and/or expand naïve and memory T cells, T cell clones, regulatory T cells, NKT cells, and CTLs from mouse and human samples.

## From mouse models to clinical trials

Expanded mouse T cells can be used for *in vitro* manipulations or for adoptive transfer. This is relevant for mouse models for human diseases, including the study of infectious diseases, autoimmunity, transplantation, and cancer. Immunotherapy based on antigen-specific T cells is

being applied to a growing range of disease treatments [7].

The portfolio of activation and expansion Dynabeads products also includes a clinical research-grade product, allowing you to move from mouse studies to clinical research using the same technology platform. For scale-up in translational research, the Gibco™ CTS™ DynaMag™ Magnet\*\* has been developed for optimal performance with CTS Dynabeads CD3/CD28 beads.

Dynabeads products are the gold standard for T cell research ranging from fundamental studies to T cell-based therapy and have numerous citations in scientific literature (e.g., [8-20]).

**Ordering information\***

<b>Product</b>	<b>Quantity</b>	<b>Cat. No.</b>
Dynabeads Mouse T-Activator CD3/CD28	0.4 mL	11456D
	2 mL	11452D
	5 x 2 mL	11453D
Dynabeads Human T-Activator CD3/CD28	0.4 mL	11161D
	2 mL	11131D
	5 x 2 mL	11132D
Dynabeads Human T-Activator CD3/CD28/CD137	0.4 mL	11162D
	2 mL	11163D
Dynabeads Human T-Expander CD3/CD28	10 mL	11141D
Dynabeads Human Treg Expander	2 mL	11129D
CTS Dynabeads CD3/CD28*	10 mL	40203D
CTS Dynabeads Treg Xpander*	10 mL	46000D
<b>Related products</b>		
CTS Immune Cell Serum Replacement*	50 mL	A2596101
	500 mL	A2596102
DynaMag-15 Magnet (holds 4 standard 15 mL tubes, alternatively 4 standard FACS tubes)	1 unit	12301D
DynaMag-50 Magnet (holds two 5–50 mL tubes)	1 unit	12302D
DynaMag-5 Magnet (holds 8 standard FACS tubes)	1 unit	12303D
CTS DynaMag Magnet**	1 unit	12102
CTS OpTmizer T-Cell Expansion SFM (for human T cells, bottle format) <sup>†</sup>	1 L	A1048501
CTS OpTmizer T-Cell Expansion SFM (for human T cells, bag format) <sup>†</sup>	1 L	A1048503
HulaMixer Sample Mixer (compatible with 2–50 mL tubes)	1 unit	15920D

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\* For Research Use or Non-Commercial Manufacturing of Cell-Based Products for Clinical Research. Caution: Not intended for direct administration into humans or animals.

\*\* For Research Use Only or Manufacturing of Cell, Gene, or Tissue-Based Products. Caution: Not intended for direct administration into humans or animals.

† For Human Ex Vivo Tissue and Cell Culture Processing Applications. Caution: When used as a medical device, Federal Law restricts this device to sale by or on the order of a physician.

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