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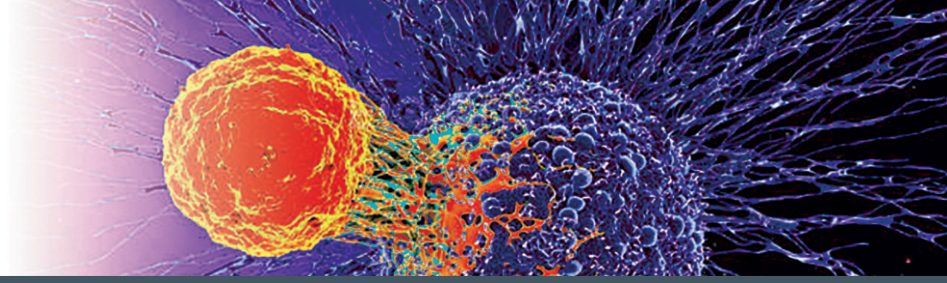

CANCER IMMUNOTHERAPY RESEARCH

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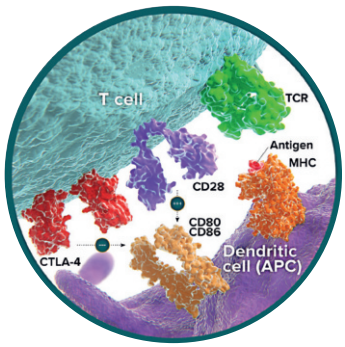
CTLA-4/CD28 Signaling Network



Cytotoxic T Lymphocyte Antigen 4 (CTLA-4; CD152) is an immune checkpoint receptor expressed on the surface of activated T cells. During immune response, T cell activation is initiated when an antigen is presented to the T cell receptor (TCR) by the major histocompatibility complex (MHC) on antigen-presenting cells (APCs). Antigen presentation alone, however, is not sufficient to induce an immune response. Completing the activation process requires a second signal. To maintain activation of an immune response, the primary costimulatory receptor on T cells CD28 binds to the ligands CD80 (B7-1) and CD86 (B7-2) on APCs. When CTLA-4 is upregulated, it competes with CD28 and has a greater affinity for CD80/86. Binding of CTLA-4 to CD80/86 inhibits T cell activation, preserving balance when the immune system is overactive.

CTLA-4 can also be found on regulatory T cells (Tregs), where it is a key driver of their ability to suppress T cell activity. With an almost indefinite lifespan, memory T cells provide long-term immunity. After they have been exposed to tumor antigen, memory T cells immediately mount an immune response against the tumor. The presence of memory T cells is associated with long-term survival and low risk of tumor recurrence in cancer. Tumor cells utilize the CTLA-4 pathway to suppress initiation of an immune response, resulting in decreased T cell activation and a reduced ability to proliferate into memory T cells. Inhibiting CTLA-4 can restore an immune response through the increased accumulation, function and survival of T cells and memory T cells, as well as the depletion of Tregs, and consequently improve the antitumor response.

Recently, CTLA-4 has been studied in dendritic cells and tumors, showing that CTLA-4 plays nonredundant and critical roles in thymic development, T cell priming, peripheral tolerance, and a variety of other critical immunoregulatory functions.

SELECTED REVIEWS: Current understanding of CTLA-4: from mechanism to autoimmune diseases: M.M. Hossen, et al.; Front. Immunol. **14,** 1198365 (2023) • Soluble CTLA-4 - A confounding factor in CTLA-4 based checkpoint immunotherapy in cancer: P. Azimnasab-Sorkhabi, et al.; Immunol. Lett. **272,** 106965 (2025) • CTLA-4-two pathways to anti-tumour immunity? F.J. Ward, et al.; Immunother. Adv. **5,** ltaf008 (2025)

Biologically Active CTLA-4 Proteins

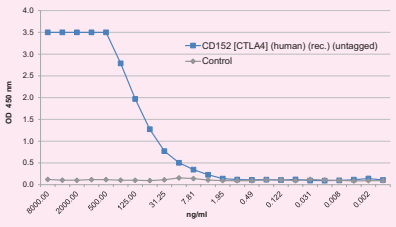
NEW

CD152 [CTLA-4] (human) (rec.) (untagged)

AG-40B-0232 50 µg

Source: HEK 293 cells **Endotoxin:** <0.01EU/µg **Biological Activity:** Binds to human CD80.

FIGURE: CD152 [CTLA-4] (human) (rec.) (untagged) is coated on an ELISA plate at 1 µg/ml overnight at 4°C. CD80 (human):Fc (mouse) (rec.) (blue line) or a control mouse Fc (Prod. No. AG-35B-0008) (grey line) is incubated (starting at a concentration of 8,000 ng/ml with a twofold serial dilution) during one hour at RT and the interaction is then detected using a goat anti-mouse-(HRP).

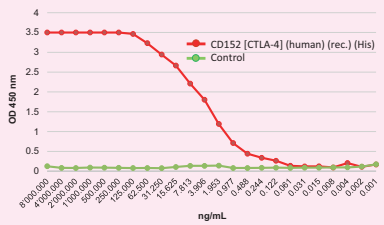


CD152 [CTLA-4] (human) (rec.) (His)

AG-40B-0228 50 µg

Source: HEK 293 cells **Endotoxin:** <0.01EU/µg **Biological Activity:** Binds to human CD80.

FIGURE: CD80 (human): Fc (mouse) (rec.) (Prod. No. CHI-HF-211CD80) is coated on an ELISA plate at 1 µg/ml overnight at 4°C. CD152 [CTLA-4] (human) (rec.) (His) (Prod. No. AG-40B-0228) (red line) or a control protein (His) (green line) is incubated (starting at a concentration of 8,000 ng/ml with a two-fold serial dilution) during one hour at RT and the interaction is then detected using an anti-His-(HRP).



Biologically Active Recombinant Proteins

PROTEINS	PID	SIZE	SOURCE	ENDOTOXIN	SPECIES
CD28 (mouse):Fc (mouse) (rec.)	CHI-MF-110CD28	200 µg	CHO cells	<0.06EU/µg	Ms
CD28 (human) (rec.) (His)	CHI-HF-201CD28	100 µg	HEK 293 cells	<0.06EU/µg	Hu
CD28 (human):Fc (human) (rec.)	CHI-HF-210CD28	200 µg	CHO cells	<0.06EU/µg	Hu
CD28 (human)-mulg Fusion Protein	ANC-508-020	25 µg	CHO cells	n.d.	Hu
CD80 (mouse):Fc (mouse) (rec.)	CHI-MF-110CD80	100 µg	CHO cells	<0.06EU/µg	Ms
CD80 (human):Fc (human) (rec.)	CHI-HF-210CD80	100 µg	CHO cells	<0.06EU/µg	Hu
CD80 (human):Fc (mouse) (rec.)	CHI-HF-211CD80	100 µg	CHO cells	<0.06EU/µg	Hu
CD80 (human)-mulg Fusion Protein	ANC-510-020	25 µg	CHO cells	n.d.	Hu
CD86 (mouse):Fc (mouse) (rec.)	CHI-MF-110CD86	100 µg	CHO cells	<0.06EU/µg	Ms
CD86 (human):Fc (mouse) (rec.)	CHI-HF-211CD86	100 µg	HEK 293 cells	<0.005EU/µg	Hu
CD86 (human)-mulg Fusion Protein	ANC-509-020	25 µg	CHO cells	n.d.	Hu
CD86 (var) (human)-mulg Fusion Protein	ANC-589-020	25 µg	CHO cells	n.d.	Hu
CD86 (P2) (human)-mulg Fusion Protein	ANC-579-020	25 µg	CHO cells	n.d.	Hu
CTLA-4 (mouse):Fc (mouse) (rec.)	CHI-MF-110A4	100 µg | 500 µg	NS1 cells	<0.06EU/µg	Ms
CTLA-4 (mouse):Fc (mouse) (rec.) (non-lytic)	CHI-MF-120A4	100 µg | 500 µg	NS1 cells	<0.06EU/µg	Ms
CTLA-4 (human):Fc (human) (rec.)	CHI-HF-210A4	100 µg | 500 µg	CHO cells	<0.06EU/µg	Hu
CTLA-4 (human):Fc (human) (rec.) (non-lytic)	CHI-HF-220A4	100 µg | 500 µg	CHO cells	<0.06EU/µg	Hu
CTLA-4 (human):Fc (mouse) (rec.)	CHI-HF-211A4	100 µg	CHO cells	<0.06EU/µg	Hu
CTLA-4 (human)-mulg Fusion Protein	ANC-501-020	25 µg	CHO cells	n.d.	Hu

Related Antibodies from Ancell & RevMab

Ancell Immunology Research Products

RevMAb Biosciences

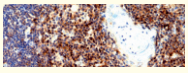
ANTIBODIES	PID	SIZE	ISOTYPE	APPLICATION	SPECIES
anti-CD28 (human), mAb (ANC28.1/5D10)	ANC-177-020	100 µg	Mouse IgG1κ	FACS, FUNC	Hu
anti-CD80 (human), mAb (P1.H1.A1.A1)	ANC-110-020	100 µg	Mouse IgG1	FACS, FUNC	Hu
anti-CD86 (human), mAb (BU63)	ANC-307-020	100 µg	Mouse IgG1	FACS, FUNC (Blocking)	Hu, Primate
anti-CTLA-4 (human), mAb (ANC152.2/8H5)	ANC-359-020	100 µg	Mouse IgG1κ	FACS, FUNC (Blocking)	Cat, Cow, Dog, Hu, Pig

IHC GRADE

anti-CD28 (human), Rabbit Monoclonal (RM404)

REV-31-1290-00 100 µl

FIGURE: IHC staining of FFPE human thymus tissue section using Clone RM404 at a 1:200 dilution.



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www.adipogen.com

EUROPE/REST OF WORLD
AdipoGen Life Sciences
TEL +41-61-926-60-40
FAX +41-61-926-60-49
info@adipogen.com

NORTH & SOUTH AMERICA
Adipogen Corp.
TEL +1-858-457-8383
FAX +1-858-457-8484
info-us@adipogen.com

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