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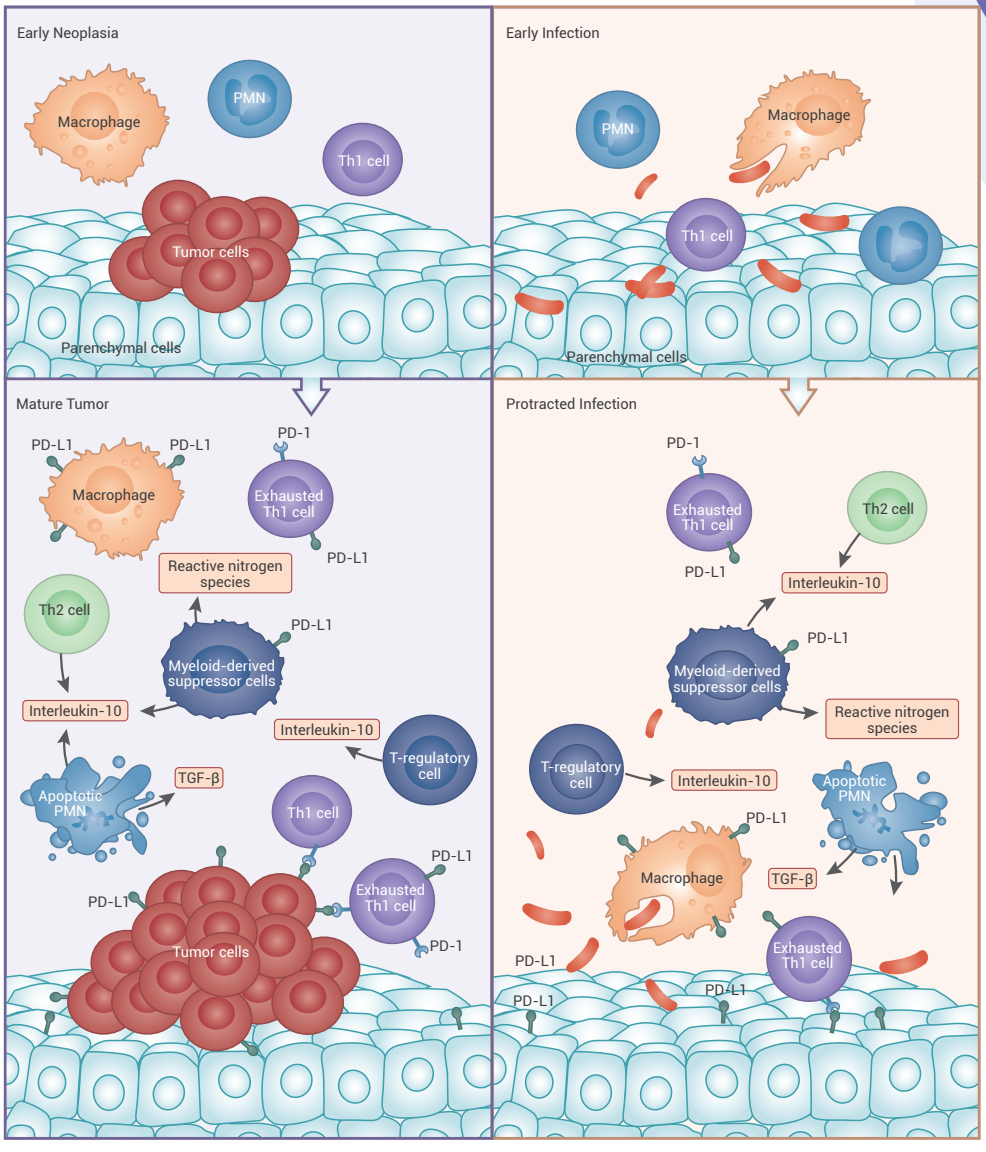
Immunology

Product Handbook



Reference:
Richard S. Hotchkiss, M.D., and Lyle L. Moldawer, Ph.D. Parallels between Cancer and Infectious Disease.

Immunology

The immune system is a complex network consists of various cells, tissues, and organs that work together to defend the body against foreign antigens ans diseases. It can distinguish between “self” and “non-self” and mount responses to a wide range of pathogens, including viruses, bacteria, fungi, parasites, and even cancer cells.

Human body has two types of immune systems: the innate immune system and the adaptive immune system. The innate immune system is the body's first line of defense, providing a rapid, pre-configured response to broad groups of pathogens. This system is active from birth and responds swiftly in the early stages of infection. In contrast, the adaptive immune system develops over time as the body encounters specific pathogens. This system provides a highly targeted response with greater specificity.

In a healthy body, immune cells are able to efficiently distinguish “non-self” from “self” substances allowing the innate and adaptive immune systems to work together to eliminate foreign materials. However, when the immune system is imbalanced, it can lead to a variety of serious diseases. An underactive immune system can result in infectious diseases and cancer, while an overactive immune system can cause autoimmune diseases such as lupus erythematosus and rheumatoid arthritis.

This brochure provides brief introductions to key topics including SARS-CoV, cancer immunotherapy, innate immunity, inflammation, and anti-infection strategies.

SARS-CoV & Antiviral immunity

Coronavirus disease 2019 (COVID-19) is a highly infectious disease that primarily affects the respiratory system, causing symptoms such as fever and pneumonia. It is caused by the SARS-CoV-2 virus, part of the coronavirus (CoV) family. CoVs are characterized by four main structural proteins: spike (S), membrane (M), envelope (E), and nucleocapsid (N) proteins[1].

The spike (S) protein plays a key role in the virus's entry into host cells. After being primed by the TMPRSS2 protease (transmembrane protease, serine 2), the S protein binds to the ACE2 receptor on the surface of host cells, facilitating fusion of the viral and host cell membranes[2]. Following entry, the viral genome replicates, and subgenomic RNA transcription takes place with the help of several nonstructural proteins, including Mpro (main protease or 3CLpro), PLpro (papain-like protease), and RdRp (RNA-dependent RNA polymerase). The structural proteins are then synthesized, assembled into new viral particles, and released from the host cell via exocytosis.

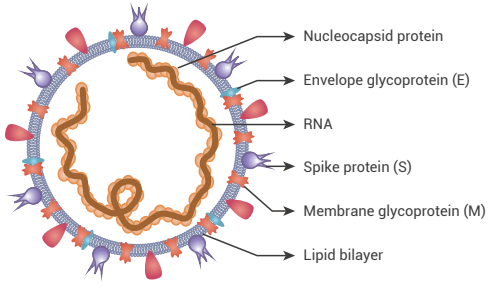


Figure 1. Structure of human coronavirus[3]

One of the major causes of mortality in severe COVID-19 cases is a phenomenon called the "cytokine storm," where the immune system releases large amounts of cytokines (such as IL-1β, GM-CSF, IL-6, and IL-10) in response to the infection, leading to excessive inflammation and organ damage.

MedChemExpress (MCE) offers over 700 small molecules for studying COVID-19. These include antiviral compounds targeting key viral proteins such as TMPRSS2, Mpro, and PLpro, as well as anti-inflammatory agents like Dexamethasone and various immune modulators.

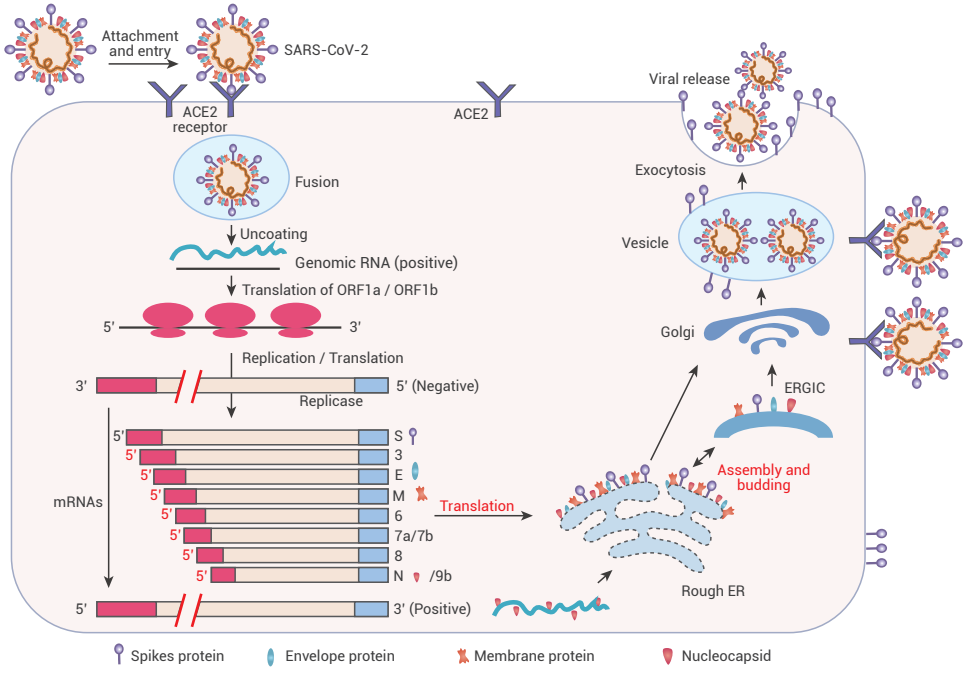


Figure 2. The life cycle of SARS-CoV-2 in a host cell[3]

Compounds

Cat. No.	Product Name	Description
HY-14648	Dexamethasone	Glucocorticoid receptor agonist, highly effective in the control of severe COVID-19.
HY-15287	Nelfinavir	Potent and orally bioavailable HIV-1 protease inhibitor, also inhibits SARS-CoV.
HY-18649A	Galidesivir	Adenosine analog, active *in vitro* against MERS-CoV, SARS-CoV, and SARS-CoV-2.
HY-117043	GRL0617	Inhibitor of SARS-CoV papain-like protease/deubiquitinase.
HY-B1123	Auranofin	Thioredoxin reductase (TrxR) inhibitor, exhibits antiviral activity against SARS-CoV.
HY-90001	Ritonavir	Inhibitor of HIV protease, used to treat AIDS.
HY-14588	Lopinavir	Peptidomimetic inhibitor of the HIV-1 protease.
HY-17589A	Chloroquine	Antimalarial and anti-inflammatory agent widely used, shows *in vitro* activity for SARS-CoV-2 infection.

Compounds		
Cat. No.	**Product Name**	**Description**
HY-B1370	**Hydroxychloroquine**	Synthetic antimalarial agent, efficiently inhibits SARS-CoV-2 infection *in vitro*.
HY-13004	**Maraviroc**	Selective CCR5 antagonist with activity against human HIV.
HY-50101	**Mavorixafor**	CXCR4 antagonist, inhibits the replication of T-tropic HIV-1.
HY-125033	**EIDD-1931**	Nucleoside analog and behaves as a potent anti-virus agent.
HY-12559	**Alisporivir**	Cyclophilin inhibitor with potent anti-hepatitis C virus activity.
HY-P2036A	**FSL-1 TFA**	Bacterial-derived TLR2/6 agonist, enhances resistance to experimental HSV-2 infection.
HY-B0240	**Disulfiram**	ALDH1 inhibitor, inhibit PIpros of MERS-CoV and SARS-CoV.
HY-13986	**Merimepodib**	IMPDH inhibitor with broad spectrum antiviral activities.
HY-14768	**Favipiravir**	Potent viral RNA polymerase inhibitor.
HY-30234A	**Clemizole hydrochloride**	H1 histamine receptor antagonist, shows antiviral activity against HCV.
HY-13512	**Camostat mesylate**	Serine protease inhibitor for chronic pancreatitis, shows antiviral activity against SARS-CoV-2.
HY-13750	**Ebselen**	Potent voltage-dependent calcium channel (VDCC) blocker, an inhibitor of HIV-1 capsid CTD dimerization.
HY-B0182	**Carmofur**	Acid ceramidase inhibitor, inhibits the SARS-CoV-2 main protease (Mpro).
HY-17026	**Gemcitabine**	Pyrimidine nucleoside analog antimetabolite and antineoplastic agent.
HY-10586	**5-Azacytidine**	Nucleoside analogue of cytidine that specifically inhibits DNA methylation.
HY-13605	**Cytarabine**	Nucleoside analog, has antiviral effects against HSV.
HY-P9917	**Tocilizumab**	Anti-human IL-6R neutralizing antibody, effective for the study of severe COVID-19.
HY-P0012A	**Aviptadil acetate**	Vasoactive intestinal polypeptide, potentially used for SARS-CoV-2 caused respiratory failure.
HY-135867D	**NHC-diphosphate**	Pyrimidine ribonucleoside, behaves as a potent anti-virus agent.

Compounds

Cat. No.	Product Name	Description
HY-D1270	Direct Violet 1	Textile dye, inhibit the interaction between the SARS-CoV-2 spike protein and ACE2.
HY-15463	Imatinib	Tyrosine kinases inhibitor, inhibits SARS-CoV and MERS-CoV.
HY-13433	Thapsigargin	Inhibitor of microsomal Ca^{2+}-ATPase, efficiently inhibits coronavirus replication in different cell types.
HY-100229	Aloxistatin	Broad-spectrum cysteine protease inhibitor, exhibits entry-blocking effect for MERS-CoV.
HY-B0190A	Nafamostat mesylate	Serine protease inhibitor, blocks activation of SARS-CoV-2.
HY-14904A	Umifenovir hydrochloride	Broad-spectrum antiviral compound, shows as an efficient inhibitor of SARS-CoV-2 *in vitro*.
HY-14393	Emodin	Anthraquinone derivative, anti-SARS-CoV compound.
HY-B0260	Methylprednisolone	Synthetic corticosteroid, improves severe or critical COVID-19 by activating ACE2 and reducing IL-6 levels.
HY-13765	6-Thioguanine	Anti-leukemia and immunosuppressant agent, acts as an inhibitor of SARS and MERS coronavirus Plpros.
HY-17470	Mizoribine	Imidazole nucleoside, inhibits HCV, SARS-CoV.
HY-17443	Sivelestat	Neutrophil elastase inhibitor, potential used in COVID-19.
HY-N0191	Andrographolide	NF-κB inhibitor, shows broad antiviral activity.
HY-N0360	Dihydrotanshinone I	Natural compound exhibits entry-blocking effect for MERS-CoV.
HY-B0372A	Bromhexine hydrochloride	Potent and specific TMPRSS2 protease inhibitor, can prevent and manage SARS-CoV-2 infection.

Compound Screening Library

Cat. No. : HY-L052

Anti-COVID-19 Compound Library

A unique collection of 1,500+ compounds that may have anti-COVID-19 activity.

Cancer immunotherapy

Immune checkpoints play a crucial role in regulating immune responses by maintaining immune homeostasis and preventing autoimmunity. One of the most promising therapeutic strategies in cancer treatment involves reactivating T cells through immune checkpoint inhibitors. This approach, known as cancer immunotherapy, uses the body's own immune system to combat cancer. Several methods, including immune checkpoint inhibitors and tumor microenvironment modulators, have proven highly successful in recent years[4].

The tumor microenvironment (TME) consists of the cellular surroundings in which tumors develop, including blood vessels, the extracellular matrix (ECM), non-malignant cells, and various signaling molecules. Research has shown that growth factors secreted by stromal cells and cancer-associated fibroblasts (CAFs) not only promote tumor growth but also suppress the immune response. Molecules associated with the TME, such as cytokine receptors and metabolic enzymes, have become critical targets in cancer immunotherapy. Key targets include RORγt, chemokine receptors (CXCR), STING, IDO, and TLR, among others.

MCE offers a wide range of cancer immunotherapy products, targeting pathways such as PD-1/PD-L1, CTLA-4, STING, IDO, and TLR.

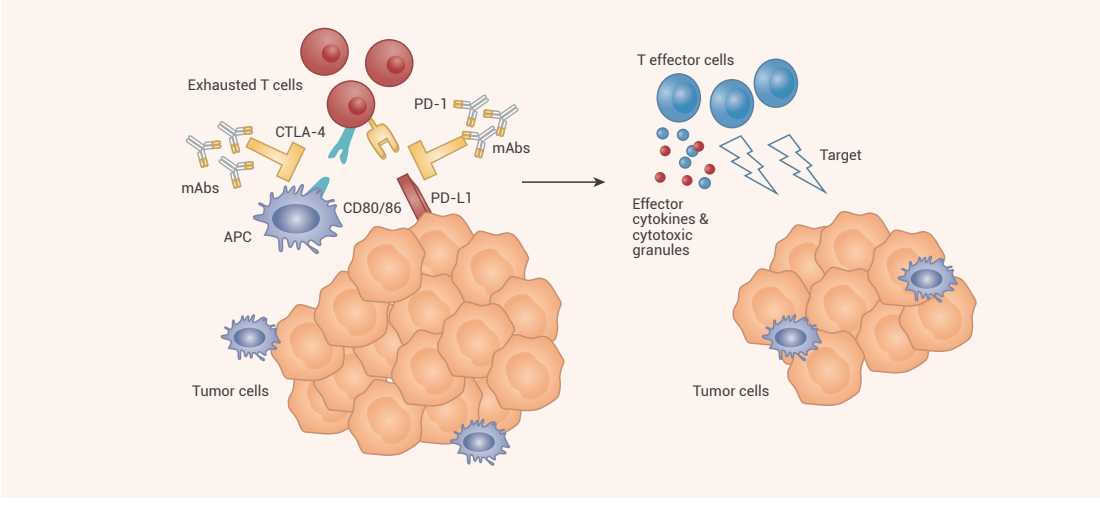


Figure 3. Immune checkpoint blockade for T-cell activation[4]

Compounds

Cat. No.	Product Name	Description
HY-12885	ADU-S100	STING activator, leads to potent and systemic tumor regression.
HY-10964	Vadimezan	Murine agonist of STING and also a potent inducer of type I IFNs and other cytokines.
HY-B0180	Imiquimod	TLR7 agonist, exhibits antiviral and antitumor effects.

Compounds

Cat. No.	Product Name	Description
HY-19776	3α-Aminocholestane	Selective SHIP1 inhibitor.
HY-120635	BMS-1001	Orally active human PD-L1/PD-1 immune checkpoint inhibitor.
HY-13740	Resiquimod	TLR7/TLR8 agonist that induces the upregulation of cytokines.
HY-16724	Indoximod	Indoleamine 2,3-dioxygenase (IDO) pathway inhibitor.
HY-101111	PF-06840003	Highly selective orally bioavailable IDO-1 inhibitor.
HY-10219	Rapamycin	Potent and specific mTOR inhibitor, autophagy activator and immunosuppressant.
HY-100453	HO-3867	Selective and potent STAT3 inhibitor, shows antitumor activity.
HY-100461	C29	TLR2 inhibitor blocks hTLR2/1 and hTLR2/6 signaling.
HY-100493	BP-1-102	Orally available inhibitor of transcription factor Stat3.
HY-100678	CGS 15943	Orally bioavailable non-xanthine Adenosine Receptor antagonist.
HY-100747	PSB-12379	Nucleotide analogue, is a potent CD73 inhibitor.
HY-108472	Loxoribine	Selective TLR 7 agonist with anti-viral and anti-tumor activities.
HY-110120	DSR-6434	SelectiveTLR7 agonist has a strong antitumor ability.
HY-110318	VUF11207 fumarate	CXCR7 agonist, induces recruitment of β-arrestin2 and subsequent internalization.
HY-110353	CU-T12-9	Specific TLR1/2 agonist,invokes an elevation of the downstream effectors TNF-α, IL-10, and iNOS.
HY-128588	STAT3-IN-3	STAT3 inhibitor with anti-proliferative activity, induces apoptosis in breast cancer cells.
HY-13245	PF-4136309	Potent, selective, and orally bioavailable CCR2 antagonist.
HY-13406	TAK-779	CCR5/CXCR3 antagonist, selectively inhibits R5 HIV-1.

Compound Screening Libraries

Cat. No. : HY-L031

Small Molecule Immuno-Oncology Compound Library

A unique collection of 500+ bioactive tumor immunology compounds.

Cat. No. : HY-L025

Anti-Cancer Compound Library

A unique collection of 8,400+ bioactive anti-cancer compounds.

Immunity & Inflammation

The human immune system is comprised of two major components: innate immunity and adaptive immunity. Innate immunity serves as the first line of defense against pathogens, while adaptive immunity provides a more specific response. Upon infection or tissue damage, pattern recognition receptors (PRRs) in innate immune cells recognize pathogen-associated molecular patterns (PAMPs) or damage-associated molecular patterns (DAMPs), which activate transcription factors like NF-κB, AP1, or IRF. This activation leads to the production of interferons, proinflammatory cytokines, and chemokines[6].

Overactivation of innate immunity is closely associated with autoimmune diseases, whereas suppressed innate immunity is often linked to cancer development. Additionally, innate immune inhibitors are commonly used in organ transplantation to prevent rejection.

MCE provides hundreds of products related to immunity and inflammation, focusing on key targets such as TLR, NLR, RLR, and cGAS/STING.

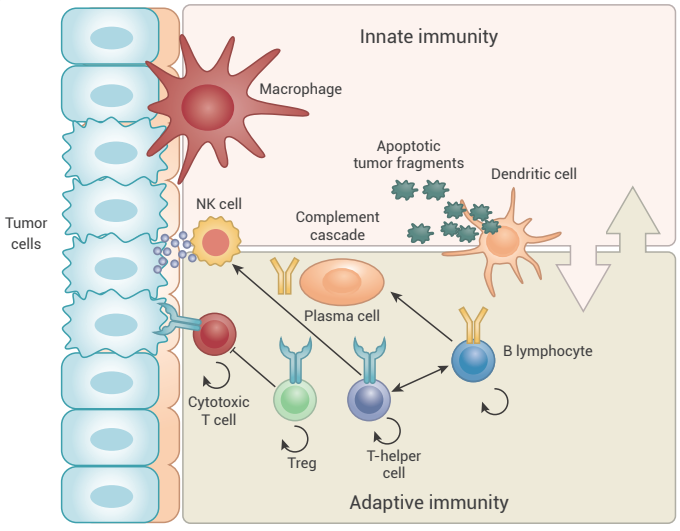


Figure 4. Immune surveillance[7]

Compounds		
Cat. No.	**Product Name**	**Description**
HY-12815A	**MCC950 sodium**	Potent, selective NLRP3 inhibitor.
HY-18739	**PMA**	Dual SphK and protein kinase C activator, induces differentiation in THP-1 cells.
HY-127105	**Iptacopan (LNP023)**	Highly selective factor B inhibitor, targets the underlying cause of complement 3 glomerulopathy.
HY-16561	**Resveratrol**	Anti-oxidant, anti-inflammatory, cardioprotective, and anti-cancer drugs, has a wide spectrum of targets including mTOR, JAK, β-amyloid, Adenylyl cyclase, IKKβ, DNA polymerase.
HY-15775	**Arginase inhibitor 1**	Potent inhibitor of human arginases I and II.

Compounds

Cat. No.	Product Name	Description
HY-100381	Nigericin sodium salt	Antibiotic from Streptomyces hygroscopicus that works by acting as an H^+, K^+, and Pb^{2+} ionophore, a NLRP3 activator.
HY-103666	CY-09	NLRP3 inhibitor, directly binds to the ATP-binding motif of NLRP3 NACHT domain.
HY-111149A	PS372424	Three amino-acid fragment of CXCL10, atc as a CXCR3 agonist with anti-inflammatory activity.
HY-103362	CCR2 antagonist 4	Potent and specific CCR2 antagonist, potently inhibits MCP-1-induced chemotaxis.
HY-107575	TLR4-IN-C34	Orally active TLR4 inhibitor and reduces systemic inflammation in models of endotoxemia and necrotizing enterocolitis.
HY-11109	Resatorvid	TLR4 inhibitor, inhibits NO, TNF-α and IL-6 production.
HY-N0283	Diacerein	Interleukin-1 beta inhibitor, is a slow-acting medicine of the class anthraquinone used to treat joint diseases.
HY-114775	RCGD423	Gp130 modulator, which prevents articular cartilage degeneration and promotes repair.
HY-N0722	Neochlorogenic acid	Orally active steroidal anti-inflammatory drug (SAID), inhibits proinflammatory cytokine activity.
HY-15614	SC144	First-in-class, orally active gp130 inhibitor.
HY-102084	LMT-28	Orally active and the first synthetic IL-6 inhibitor that functions through direct binding to gp130.

Compound Screening Libraries

Cat. No. : HY-L007

Immunology/Inflammation Compound Library

A unique collection of 5,400+ compounds with biological activity used for Immunology/Inflammation research.

Cat. No. : HY-L008

JAK/STAT Compound Library

A unique collection of 400+ bioactive compounds related to JAK/STAT signaling.

Cat. No. : HY-L014

NF-κB Signaling Compound Library

A unique collection of 800+ NF-κB signaling related small molecule compounds.

Anti-infection

Anti-infective agents are drugs designed to kill or inhibit the spread of infectious agents, including antibiotics, antibacterials, antifungals, and antiprotozoals. Antibiotics are primarily used to treat bacterial infections, with common classes including aminoglycosides, penicillins, fluoroquinolones, cephalosporins, macrolides, and tetracyclines. Novel treatments, such as photodynamic therapy (PDT) and antibacterial peptides, are emerging as alternative methods to target resistant bacteria.

Fungal infections remain a significant public health challenge due to the limited antifungal options and the high toxicity of current treatments. Most antifungal drugs target RNA synthesis, as well as cell wall and membrane components, though new antifungal targets are being explored. Antiprotozoal drugs treat infections caused by protozoa, with malaria being a major global health issue due to the resistance of *Plasmodium falciparum* to many antimalarial drugs.

The rise of antimicrobial resistance poses one of the most significant public health threats today, requiring urgent attention. MCE offers over 9,000 potential anti-infection reagents, designed to help researchers discover the next generation of antimicrobial agents.

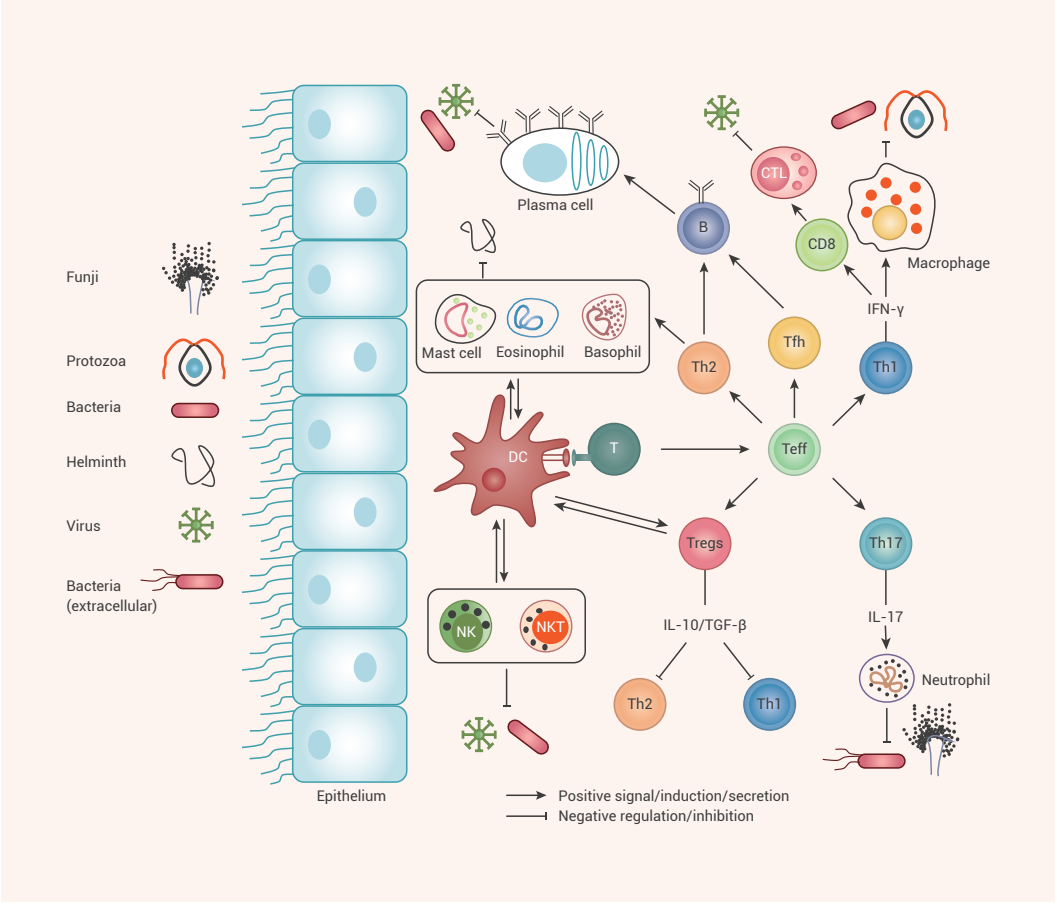


Figure 5. Schematic representation of the host immune response against microbial pathogens[8]

		Compounds
Cat. No.	Product Name	Description
HY-17006	Caspofungin	Caspofungin Acetate (MK-0991 Acetate) is an antifungal drug, and noncompetitively inhibits 1,3-β-D glucan synthase activity.
HY-10844	Pretomanid	Antibiotic used for the research of multi-drug-resistant tuberculosis affecting the lungs.
HY-B0879A	Suramin sodium salt	Competitive PTPases inhibitor, used as antiparasitic, anti-neoplastic and anti-angiogenic agent.
HY-10846	Delamanid	Mycobacterial cell wall synthesis inhibitor, inhibits the sythesis of mycolic acids.
HY-10373	Trimetrexate (CI-898)	Potent competitive inhibitor of bacterial, protozoan, and mammalian dihydrofolate reductase.
HY-17586	Dalbavancin	Semisynthetic lipoglycopeptide antibiotic with potent bactericidal activity against Gram-positive bacteria.
HY-10392	Sutezolid	Orally active oxazolidinone antimicrobial agent, acts by inhibiting bacterial protein synthesis.
HY-B1743A	Puromycin dihydrochloride	Aminonucleoside antibiotic, inhibits protein synthesis.
HY-128423	Tylvalosin tartrate	Macrolide antibiotic that can against Gram-positive bacteria.
HY-Y0055	Phenothiazine	Antibiotic, has insecticidal, fungicidal, and antibacterial activities.
HY-N0565B	Doxycycline hyclate	Antibiotic, is an orally active and broad-spectrum MMP inhibitor.
HY-16592	Brefeldin A	Lactone antibiotic and a specific inhibitor of protein trafficking.
HY-108009A	Rezafungin acetate	Next-generation, broad-spectrum, and long-lasting echinocandin, shows potent antifungal activity.
HY-B0856	Validamycin A	Fungicidal, is an agricultural antibiotic.
HY-N1347	Robinetin	Naturally occurring flavonoid with antifungal, antiviral, antibacterial, antimutagenesis, and antioxidant activity.
HY-B0490	Hygromycin B	Hygromycin B is an aminoglycoside antibiotic active against prokaryotic and eukaryotic cells.
HY-15310	Ivermectin	Broad-spectrum anti-parasite agent, a specific inhibitor of Impα/β 1-mediated nuclear import.
HY-B0318	Metronidazole	Nitroimidazole antibiotic medication used particularly for anaerobic bacteria and protozoa.

Compounds

Cat. No.	Product Name	Description
HY-15695	Puromycin aminonucleoside	Aminonucleoside portion of the antibiotic puromycin, and used in nephrosis animal models.
HY-100579	Ferrostatin-1	Potent and selective ferroptosis inhibitor, suppresses Erastin-induced ferroptosis.

Compound Screening Libraries

Cat. No. : HY-L002

Anti-Infection Compound Library

A unique collection of 3,000+ bioactive anti-infection compounds.

Cat. No. : HY-L027

Antiviral Compound Library

A unique collection of 1,300+ bioactive anti-virus compounds.

Cat. No. : HY-L048

Antifungal Compound Library

A unique collection of 300+ bioactive anti-fungal compounds.

Cat. No. : HY-L049

Antibacterial Compound Library

A unique collection of 1,300+ bioactive anti-bacterial compounds.

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