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REVIEW

Clinical Applications and Therapeutic Mechanisms of Chinese Herbal Medicine Yiaikang Capsules in Treating Acquired Immune Deficiency Syndrome

Xue Ding[1], Leilei Fan[2], Liran Xu[3], Xiuxia Ma[4], Pengfei Meng[3], Jiahe Li[3], Jingyu Yue[4]

[1]Department of Medicine, The First Affiliated Hospital of Henan University of Chinese Medicine, Zhengzhou, People's Republic of China; [2]Department of Cardiovascular, The First People's Hospital of Zhengzhou, Zhengzhou, People's Republic of China; [3]Department of the First Clinical Medical College, Henan University of Chinese Medicine, Zhengzhou, People's Republic of China; [4]Department of AIDS Clinical Research Center, The First Affiliated Hospital of Henan University of Chinese Medicine, Zhengzhou, People's Republic of China

Correspondence: Jingyu Yue, Department of AIDS Clinical Research Center, The First Affiliated Hospital of Henan University of Chinese Medicine, 19 Renmin Road, Zhengzhou, People's Republic of China, Email yuejingyu@aliyun.com

Abstract: Yiaikang (YAK) is a 22-component traditional herbal medicine, exhibiting a powerful inhibitory effect on viral replication and immunity-boosting activities in clinical applications, and is widely used to treat diseases in people living with human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) in China. In clinical studies, YAK alleviates the clinical symptoms of HIV/AIDS (eg, weakness, shortness of breath, spontaneous sweating, and diarrhea) while enhancing quality of life and improving survival rates of patients. In the molecular mechanism studies, its main therapeutic action is inhibition of HIV replication, alongside increased numbers of $CD4^+$ T cells. These are achieved through inhibition of the viral transactivator of transcription (Tat) and regulatory protein Rev, and host intercellular adhesion molecule 1 (ICAM-1). During HIV infection, the extensive destruction of CD4+ T cells consumes the Th17 subset of intestinal-associated lymphoid tissue, resulting in the loss of mucosal integrity. YAK also restores the normal expression of C-C chemokine receptor type 5 (CCR5) and C-X-C chemokine receptor type 4 (CXCR4), promotes the proliferation of natural killer cells, regulates the balance between T helper 17 cells and regulatory T cells, and maintains the integrity of the intestinal mucosal barrier. In this review, we describe the clinical applications and therapeutic mechanisms of YAK in treating AIDS, with the goal of identifying new and efficacious therapies targets and approaches and provides new clues for the clinical application of YAK.

Keywords: Yiaikang capsule, acquired immune deficiency syndrome, human immunodeficiency virus

Introduction

Human immunodeficiency virus (HIV) is the causative agent of acquired immune deficiency syndrome (AIDS), which induces the progressive depletion of $CD4^+$ T cells in humans.[1] Infection with HIV can result in life-threatening opportunistic infections and may progress to AIDS. Since the start of the HIV epidemic, approximately 88.4 million people have been infected and 42.3 million people have died from AIDS-related illnesses.[2] The Joint United Nations Programme on HIV/AIDS estimates that, in 2023, there were 39.9 million people living with HIV (PLWH), 1.3 million new infections, and 630,000 deaths from AIDS-related illnesses globally.[2] Antiretroviral therapy (ART) is an effective therapeutic approach for preventing and treating HIV, thereby promoting a healthy lifespan.[3] However, many individuals struggle with adherence to ART because of side effects, pill fatigue or aversion, and stigma.[4] Therefore, it is necessary to find new drugs or treatments, such as traditional Chinese medicine (TCM).

TCM formulations have been used to treat AIDS in China since 2004. A national trial was conducted in the 19 major provinces to investigate the effects of TCM on AIDS, in addition to a series of research studies funded by the National Natural Science Foundation of China.[5] Consequently, multiple TCM preparations have been developed to treat AIDS, many of which have demonstrated effectiveness.[6] The Shuyu pill is a classic Chinese herbal formula for the treatment of Xu Lao for more

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1800 years. Yiaikang(YAK) capsules, a modified form of Shuyu pills for the treatment of AIDS, which has antiviral and immune activities and improves the level of clinical application of symptoms and signs (eg, weakness, shortness of breath, spontaneous sweating, and diarrhea) in China.[7] The main active components of YAK capsules, which are derived from the TCM prescription known as "Shuyu-Wan", have been identified.[8] Although YAK contains a total of 22 Chinese herbs, we summarize here the six key herbs and 11 bioactive ingredients that are used to treat AIDS, with a focus on their main target pathways, mechanisms, and therapeutic effects (Table 1). Among the active ingredients, Astragaloside IV combined Ginsenoside Rg1 have synergitic inhibition on autophagy injury.[9]

Mechanisms of YAK in HIV Treatment

According to recent research,[21–27] the functions and mechanisms of YAK include the following: blocking virus binding to its receptor, increasing the $CD4^+$ T-cell count, regulating cytokine and chemokine responses, regulating the balance of T helper (Th)17 cells and regulatory T cells (Tregs), increasing the cytotoxic function of natural killer (NK) cells and maintaining the integrity of the intestinal mucosal barrier (Figure 1). According to previous studies, long-term application of Yiaikang is both safety and efficacy.[28] YAK combined with LPV/r can alleviate liver injury caused by LPV/r and combined with FTC+PMPA+RAL has no significant effect on the routine blood parameters in the treatment of SIVmac239 infected rhesus monkey AIDS model.[29] Studies shown that YAK combined with LPV/r in the treatment of SIVmac239 infected rhesus can maintain the stability of blood biochemical levels, reduce thrombocytopenia caused by ART, alleviate the side effects caused by LPV/r, and increase the efficacy of ART.[30]

Table 1 Active Ingredients, Targets/Pathways, Mechanisms, and Therapeutic Effects of the Six Major Chinese Herbs of Yiaikang (YAK) Capsules Against Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS)

Chinese Medicinal Herb	Ingredients	Targets/ Pathways	Mechanisms	Effects	Ref(s)
Panax ginseng (Rensen)	Ginsenoside Rh1, ginseng oligopeptides	PDK1/AKT, *vif* and *vpr* genes	Eliminates HIV-1 infected macrophages; increases macrophage phagocytosis capacity, NK activity, and Th secretion; extends CCR5 maintenance period; anti-oxidation	Improves $CD4^+$ T-cell count; postpones appearance of resistance mutations; regulates innate and adaptive immune responses	[10–12]
Glycyrrhiza glabra (Gancao)	Glycyrrhizic acid, glycyrrhizin, licorice saponin G2	NF-κB, p24	Antioxidation; inhibits fusion of HIV-1 membranes; modulates fluidity of plasma membrane and HIV-1 envelope; inhibits CCL2, IL-10, and TFs	Anti-HIV, immune enhancement; improves $CD4^+$ T-cell count	[13,14]
Scutellaria baicalensis (Huangqin)	Acacetin, baicalin, 5,6,7-trihydroxyflavone, β-sitosterol,	Bax, Bcl2, CASP8, p53, PI3K/AKT	Regulates inflammatory response, cytoplasm, and chromatin binding; inhibits HIV-1 reverse transcriptase	Anti-HIV, immune enhancement	[15–17]
Poria cocos (Fuling)	Carboxymethyl pachymaram	p24	Interferes with HIV adsorption, invasion, and replication	Anti-HIV	[18]
Angelica sinensis (Danggui)	Angelica polysaccharide		Antioxidation	Anti-HIV, immune enhancement	[19]
Astragalus membranaceus (Huangqi)	Astragaloside IV, isoastragaloside I		Inhibits integration of HIV-1 cDNA into genome	Anti-HIV	[20]

Abbreviations: IL-10, interleukin 10; NK, natural killer cell; TFs, transcription factors; Th, T helper cell.

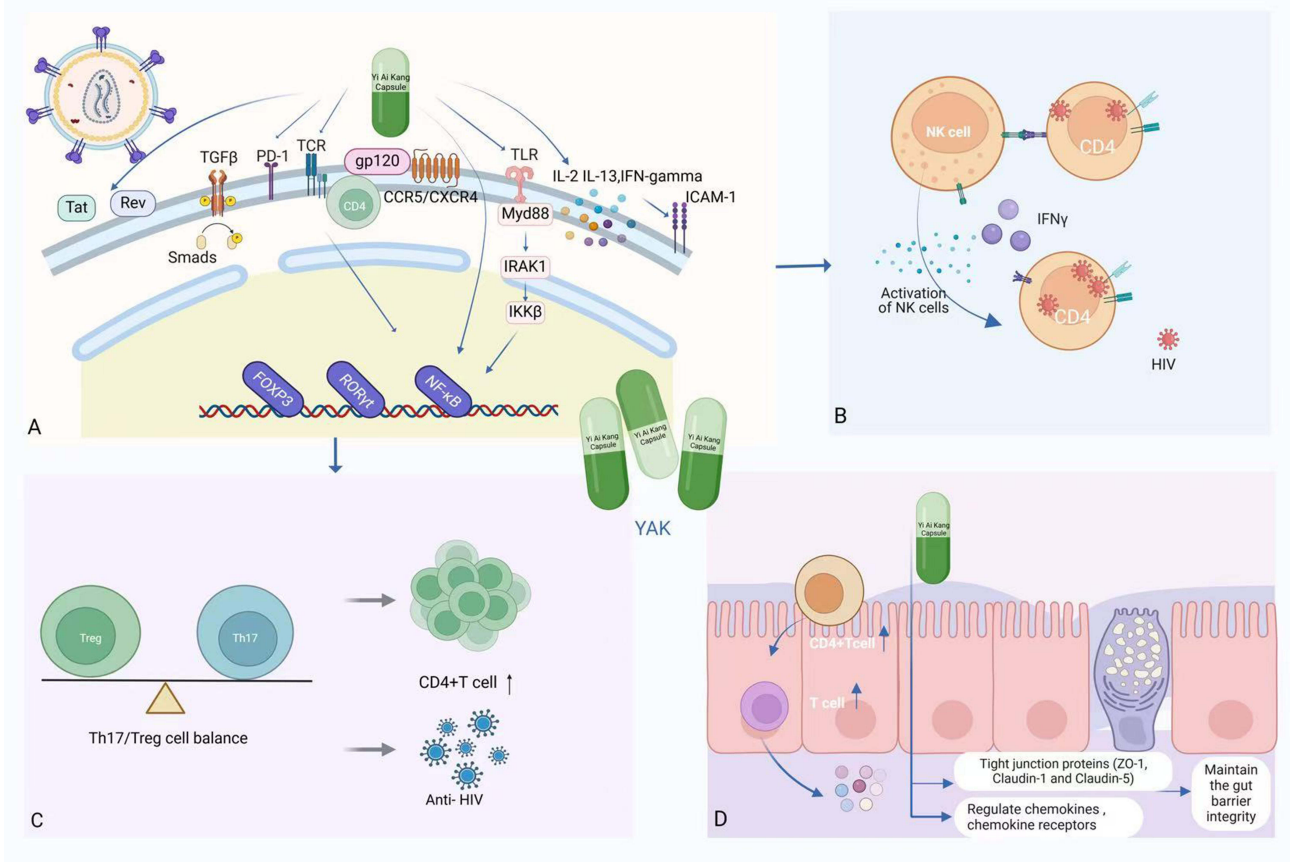

Figure 1 Therapeutic actions of Yiaikang (YAK) capsules. (**A**) YAK inhibits the viral Tat and Rev proteins as well as host intercellular adhesion molecule 1 (ICAM-1), assisting with the replication of HIV. YAK also increases $CD4^+$ T-cell counts, possibly by restoring the expression of C-C chemokine receptor type 5 (CCR5) and C-X-C chemokine receptor type 4 (CXCR4), as well as T-cell activation levels. YAK significantly inhibits interleukin (IL)-13, increases the IL-2 and interferon (IFN)-γ cytokine response, and enhances host antiviral defense. (**B**) YAK significantly promotes the proliferation of natural killer (NK) cells and increases secretion of IFN-γ, enhancing immune function. (**C**) YAK regulates the imbalance in T helper 17 (Th17) cell/ regulatory T cell (Treg) imbalance by increasing RORγt expression and reducing FoxP3 expression, enhancing host antiviral defense. (**D**) YAK maintains the integrity of the intestinal mucosal barrier through inhibition of the expression of tight junction proteins ZO-1, Claudin-1, and Claudin-5, and chemokines. Created in BioRender. Xue, D. (2025) https://BioRender.com/l95e206.

Inhibition of Viral Replication

The HIV-1 envelope consists of two noncovalently associated fragments: gp120 and gp41. During infection, gp120 binds to the CD4 receptor on the surface of the host cell, interacting through its V3 ring with a coreceptor (eg, C-C chemokine receptor type 5 [CCR5] or C-X-C chemokine receptor type 4 [CXCR4]). This induces a conformational change that activates gp41, leading to the insertion of its viral fusion peptide to promote fusion of the viral and host cell membranes.[31] The main target cells of HIV invasion and replication are $CD4^+$ T lymphocytes,[32] which are destroyed, thereby damaging the immune system.[33]

The HIV genome contains two regulatory genes (trans-activator of transcription [*tat*] and *rev*), three structural genes (*gag, pol*, and *env*), and four accessory genes (*nef, vpr, vpu*, and *vif*). HIV-1 gene expression and replication largely depend on the Tat and Rev regulatory proteins.[34] Viral mRNA transcription is driven by the long terminal repeat, regulated by Tat and several host factors. Rev is transported to the infected host cell nucleus via its nuclear localization signal, where it binds to the Rev response element on viral RNA, accelerating viral mRNA transport outside of the nucleus.[35] Li et al[36] found that *tat/rev* expression and HIV-1 load in venous blood decreased significantly in the group that administration with YAK for 6 months compared with that in the control group, which suggesting that YAK may inhibit replication of HIV-1 by reducing the expression of Tat/Rev (mRNA level).

The levels of intercellular adhesion molecule 1 (ICAM-1), a glycoprotein that participates in immune responses, are abnormally increased on the surface of various cells following HIV infection, even under ART. ICAM-1 expression

exhibits rapid upregulation in response to stimulation by cytokines, including interferon (IFN)-γ.[37] High levels of cell-surface ICAM-1 promote HIV production and virus spread,[38] and are positively correlated with HIV disease progression. ICAM-1 binds to the integrin lymphocyte function-associated antigen (LFA)-1, thereby stimulating HIV-infected dendritic cells and T cells and promoting viral spread.[39] Inhibition of ICAM-1/LFA-1 reduces HIV replication and transmission in vitro, suggesting the potential of ICAM-1 as a therapeutic target in HIV infection. Yue et al[40] observed an elevation in $CD4^+$ T cells in YAK+ART group, with significantly decreased expression of ICAM-1/LFA-1 in $CD4^+$ T cells following 6 months of YAK administration compared with ART controls. These results suggest that YAK directly affects the immune response in PLWH by decreasing the expression of ICAM-1 and LFA-1.

Improvement of Immune Response

$CD4^+$ T-cell depletion is key to disease progression in PLWH. HIV-1 infection occurs when the virus binds to chemokine receptors and CD4 molecules on the surface of T cells. As the first recognition sites for HIV on the host cell surface, chemokine receptors CCR5 and CXCR4 are crucial in HIV infection.[41,42] Targeting these receptors is an attractive strategy for blocking HIV entry into host cells.[43]

The active ingredients and other components of YAK regulate T cells through multiple targets and pathways, increasing the number of $CD4^+$ T cells (Figure 1A). Liu et al[44] found that anticoagulant whole blood collected from PLWH at 6 months of YAK treatment exhibited restoration of CCR5 and CXCR4 expression, an increased number of $CD4^+$ T cells, and a decreased HIV-1 load compared with that from healthy controls. Such findings suggest that YAK may restore coreceptor and T-cell activation levels to reverse the virus-induced immune damage in PLWH.

Regulation of Cytokine and Chemokine Responses

HIV infection of the human body activates T cells, which rapidly proliferate and secrete high levels of two inflammatory markers: interleukin (IL)-6 and sCD14.[45] IL-6 and sCD14 predict disease progression and are associated with increased risks of HIV/AIDS and death.[46] Th1 cells produce IL-2, triggering IFN-γ expression to activate NK cells and leading to apoptosis of HIV-1-infected T cells, which may be critical for controlling HIV-1.[47,48] Cytokine IL-13 has received considerable attention as the regulator of $CD4^+$ Th2 immunity,[49] with inhibition of IL-13 expression increasing the activity of $CD8^+$ T cells and protecting against viral infection.[50]

Li et al[51] collected the venous blood of PLWH to screen for HIV-1 load and cytokines at 6 months and 12 months of YAK treatment. They found improvements in the levels of IL-2, IL-13, and IFN-γ, number of $CD4^+$ T cells, and anti-HIV activity at 12 months, suggesting that YAK may improving the immune status of PLWH by increasing cytokines and inhibiting HIV-1 (Figure 1A).

Increased Proliferation of NK Cells

HIV infection changes the distribution and functions of the NK cell subpopulation, even after ART.[52] NK cells are important in HIV-1 infection, inhibiting viral entry into $CD4^+$ T cells and preventing HIV-1 transmission.[53] IFN-γ (also known as immune IFN) is produced by T cells and is involved in immune regulation, activating NK cells and increasing their cytotoxic capabilities.[54] Targeting NK cells to restore their residual functionality can bolster their antiviral effects.

YAK was shown to significantly increase the proliferation and cytotoxic function of the human NK cell line NK-92MI[55] (Figure 1B). Qian et al[55] cultured NK-92MI cells in blank control and YAK-containing serum (4%, 8%, 15%, 25%) in vitro. Compared with the control, NKG2A expression was downregulated and IFN-γ secretion was upregulated at 6 hours of culture ($P < 0.05$). Thus, YAK significantly increased the proliferation and cytotoxicity of NK-92MI by inhibiting NKG2A receptors and increasing secretion of IFN-γ.

Regulation of Th17/Treg Balance

An altered Th17/Treg ratio, indicative of rapid depletion of Th17 cells and increased frequency of Tregs, is a hallmark of HIV infection and a marker of disease progression. This imbalance contributes to immune dysfunction and microbial translocation, which leads to chronic immune activation/inflammation and disease progression.[56] Th17 cells and Tregs are important gatekeepers of mucosal interfaces, with transcriptional profiles that are controlled by the lineage

transcription factors RORγt/RORC2 and FOXP3, respectively.[57] HIV-1 infection can modify the mRNA expression of these transcription factors, which may decrease the immune response of Tregs and Th17 cells.[58]

YAK regulates Th17/Treg imbalance by increasing the level of Th17 cells and decreasing the level of Tregs (Figure 1C). Huang[59] found that, compared with healthy control, 6 months of YAK treatment led to increases in the proportion of Th17 cells and the expression of RORγt mRNA, alongside reduced levels of Tregs and mRNA expression of *Foxp3*, in peripheral blood mononuclear cells. Therefore, YAK appears to increase $CD4^+$ T cell counts by regulating the Th17/Treg ratio.

Maintenance of the Intestinal Mucosal Barrier

HIV-1 infection disrupts gut-associated lymphatic tissue, leading to loss of intestinal integrity, translocation of pathological microorganisms across the compromised gastrointestinal barrier, and systemic immune activation, even after ART.[60] $CD4^+$ memory T cells in the gut carry higher levels of HIV DNA compared with blood.[61] Virus-induced changes in microbial translocation and damage to the intestinal barrier contribute to inflammation and immune activation, induces apoptosis of CD4+T cells, and aggravates immune failure.[62] The homing of lymphocytes from the bloodstream to the intestine is a prerequisite for establishing the immune barrier of the intestinal mucosa. This occurs through binding of the homing receptors on the surface of lymphocytes to specific ligands in the intestinal mucosal tissue.[63] Maintaining the integrity of intestinal mucosa and the balance of intestinal flora is crucial in the pathogenesis of HIV infection.

YAK reduces the permeability of the intestinal mucosal barrier, maintaining its integrity, through inhibition of the expression of tight junction (TJ) proteins (Figure 1D). Li et al[64] found that two ingredients of astragalus polysaccharide and ginseng stem saponin in YAK, significantly upregulated expression of the chemokines CCL25 and CCL28, chemokine receptors CCR9 and CCR10, CD80, CD86, major histocompatibility complex II (MHC-II), Toll-like receptor 4 (TLR4), and nuclear factor (NF)-κB p65 in intestinal mucosal tissue. These changes promoted the homing of intestinal lymphocytes and stimulated the activation of other immune cells (T and B cells), thereby enhancing intestinal mucosal immunity.

To simulate the intestinal mucosal injury induced by HIV-1, Sang et al[65] stimulated monolayers of Caco-2 human epithelial cells with IFN-γ. They then examined changes in membrane electrical impedance, fluorescein sodium transmittance, and mRNA expression of genes encoding TJ proteins at different time points following treatment with YAK or blank control group. YAK reduced the permeability of the simulated intestinal mucosal barrier and maintained its integrity, which was found to be related to inhibition of the expression of proteins ZO-1, Claudin-1, and Claudin-5.

Traditional Chinese medicine has unique advantages in regulating the abundance of flora and restoring immune reconstitution. YAK can regulates the intestinal flora, improves intestinal homeostasis, promotes immune reconstitution, and enhances immune function. YAK combined with ART has a certain clinical effect on PLWH, which can improve the proportion of protective factors of intestinal mucosa bacteria (*such as Streptococcus, Macromonas, Wesneria, Streptococcus lactis*).[66] YAK decreased the abundance of *Lachnoclostridium, Muribaculaceae, Lactobacillaceae, Alphaproteobacteria, Aeromonadales and Prevotella* and increase the abundance of *Fusobacteriota and Lachnospiraceae* and enhance body immunity in HIV/AIDS patients with poor immune reconstitution.[67]

Regulation of Abnormal Lipid Metabolism of HIV

HIV-1 infection, chronic inflammation, and ART therapy are all related to changes in lipid metabolism, posing risk factors for cardiovascular and cerebrovascular diseases among PLWH.[68,69]

Shen et al[70] used the 3-(4,5-Dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide assay and fluorogenic quantitative PCR to examine the effects of a range of concentrations of YAK-containing serum and ritonavir at different time points on the proliferation of human hepatoma Hep G2 cells and the expression of genes related to lipid metabolism, respectively. Compared with the blank control, the ritonavir + YAK treatment group inhibited cell viability at 24 and 48 hours, while the YAK group upregulated the expression of CYP7A1 and downregulated that of HMG-CoA reductase and peroxisome proliferator-activated receptor (PPAR)α at 48 hours. The role of YAK in lipid lowering may involve inhibition of endogenous cholesterol, promotion of fatty acid transport, and removal of lipids from. Baicalin, a compound present in YAK, has metabolic effects exerted through increasing the activation of brown and white adipose tissue via the AMPK/PGC1α pathway.[71,72]

Clinical Applications of YAK in AIDS

Impacts on Clinical Manifestations, Quality of Life (QoL), Survival Rate, Anemia, and Lung Infections

YAK can be used to improve the clinical symptoms of HIV/AIDS. Clinical trials showed that patients receiving YAK had significantly improved clinical manifestations of AIDS compared with combination therapy of YAK and ART has been shown to benefit AIDS patients. China National Knowledge Infrastructure, Wanfang, Chinese Biomedicine Literature Database, PubMed, Embase and Medline were searched for studies on the effect of YAK on HIV/AIDS published up to February 2025. Data was presented in the Table 2.

The prevalence of anemia and lung infections among PLWH is high,[82,83] but can be prevented using YAK. In a cross-sectional analysis of 8632 PLWH, patients receiving YAK therapy had a lower prevalence of anemia than those who did

Table 2 Studies Showing the Benefits of Yiaikang (YAK) Capsules in Combination with Antiretroviral Therapy for the Treatment of Acquired Immunodeficiency Syndrome (AIDS)

Disease	Treatment Groups	Design	No. of cases	Treatment Duration	Symptoms	*P*-value	Ref
AIDS	YAK+ART	Observational study/ retrospective	150	8 years	CD4+ T cells ↑, QoL ↑, clinical symptoms↓	P<0.01	[73]
	YAK+ART	Observational study/pre- and post-treatment	59	3 months	CD4+ T cells ↑, QoL ↑, clinical symptoms↓	NR	[74]
	YAK+ART	Observational study/pre-and post-treatment	125	3 years	$CD4^+$ T cells ↑,QoL ↑; fever, fatigue, poor appetite, diarrhea ↓	NR	[75]
	YAK+ART	Observational study/ retrospective	885	48 months	Weakness, shortness of breath, spontaneous sweating↓, CD4+ T cells ↑,QoL ↑	P<0.01	[76]
Immunological non-response	ART+YAK	Randomized, double-blind, placebo trial	109	12 months	Immune reconstruction ↑	P=0.16	[77]
Asymptomatic stage of AIDS	ART+YAK, ART	Randomized, controlled trial	60	6 months	T-cell subsets ↑ ($CD4^+$, $CD4^+CD45RA+$, $CD4^+CD45RO^+$, $CD4^+CD28^+$, $CD4^+CD95^+$); T-cell subsets ↓ ($CD8^+$, $CD8^+CD38^+$)	*P*<0.05	[78]
	ART+YAK	Observational study/pre- and post-treatment	379	30 months	$CD4^+$ T cells↑, QoL↑, fever, cough, anorexia, fatigue, diarrhea, rash ↓	*P*<0.01	[79]
AIDS with skin lesions	YAK+ART	Observational study/ retrospective study	116	2 years and 6 months	Herpes, mucosal ulcers, skin rash, pruritus↓	*P*<0.01	[80]
AIDS with GI symptoms	YAK+ART	Observational study/ retrospective study	1792	2 years	Anorexia, diarrhea, abdominal distension ↓, QoL ↑	*P*<0.01	[81]

Abbreviations: ILART, Antiretroviral therapy; GI, gastrointestinal; QoL, quality of life; ↑, Increase; ↓, Decrease.

not.[82] In addition, a randomized placebo-controlled trial performed in Henan Province, China, found that 4.9% of PLWH in the treatment group experienced a lung infection, compared with 6.0% of PLWH in the control group.[84]

Survival rate is an indicator of the effectiveness of AIDS management. Jin et al reported a retrospective cohort study that compared the survival rate of HIV infection in patients with and without YAK treatment. A total of 3229 HIV-infected patients were followed for 21,876 person-years, showing 8-year cumulative survival rates of 78.5% in the YAK group (n = 1442) and 74.0% in the non-YAK group (n = 1787). The follow-up studies also showed that YAK increased the survival rate and increased lifetime in HIV-infected patients.[85,86]

QoL refers to awareness and satisfaction with social status and living conditions. PLWH often face both physical and psychological stress, and thus require greater attention to their QoL. In a cross-sectional study of 275 PLWH, mean QoL scores (excluding spirituality/personal beliefs) were significantly higher in the YAK + ART group than in the ART group ($P < 0.05$).[87]

Adjuvant Drugs for Common AIDS-Related Conditions

As an adjuvant medicine, YAK can improve the efficacy of the primary treatment for many of the symptoms and illnesses common in PLWH. It has been widely used to treat abnormal lipid metabolism, diarrhea, anxiety/depression, ulcers, cough, and HIV/hepatitis C with hepatic fibrosis (Table 3).

Table 3 Illnesses and Symptoms Treated with Yiaikang (YAK) Capsule Therapy in Patients with Human Immunodeficiency Virus (HIV) Infection

Illness	Therapy	Design	Sample sizes	Treatment duration	Symptoms	Clinical Change [ref]
Rash	Siwuxiaofeng decoction +YAK	Observational study/pre- and post-treatment	45	6 months	Lesions, pruritus	Symptoms alleviated measured by TCM symptom score scale[88]
ART-associated GI adverse events	Lianpu decoction +YAK	Randomized, controlled trial	63	2 weeks	Nausea, vomiting, abdominal bloating, anorexia	Symptoms alleviated measured by TCM symptom score sacle[89]
Diarrhea	Sishen decoction +YAK	Randomized, controlled trial	55	14 days	Diarrhea	Symptoms alleviated as measured by TCM Symptom Score sacle[90]
Anxiety/ depression	Xiaoyao San +YAK	Randomized, controlled trial	70	6 weeks	Anxiety, depression, chest distress, insomnia, sweating	Symptoms alleviated as measured by TCM symptom score and HAMA/HAMD sacle[91]
Ulcerated	Gancao Xiexin decoction +YAK	Randomized, controlled trial	100	7 days	Dental ulcer, oral leukoplakia	Symptoms alleviated measured by TCM Symptom Score sacle[92]
Cough	Zhisou powder+YAK	Observational study/pre- and post-treatment	48	14 days	Cough, sputum, asthma	Symptoms alleviated measured by TCM Symptom Score sacle[93]
HIV/HCV with hepatic fibrosis	Biejiajian pills +YAK	Observational study/pre- and post-treatment	30	12 months	Fatigue, irritability, dry mouth, and bitter mouth	Symptoms alleviated measured by TCM Symptom Score sacle[94]

Abbreviations: ILART, antiretroviral therapy; HCV, hepatitis C virus, TCM, traditional Chinese medicine, HAMA, Hamilton Anxiety Rating Scale, HAMD, Hamilton Depression Rating Scale.

Improvement in Clinical Symptoms of Abnormal Lipid Metabolism

Yu et al[95] performed a clinical trial with 40 PLWH who took YAK + ART. After 6 months of YAK treatment, patients experience alleviation of clinical symptoms (asthma, spontaneous sweating, chest tightness, fatigue, and palpitation), achieved through regulation of phosphatidylcholine, phosphatidylethanolamine, cholesterol ester, and sphingomyelin, along with improvements in lipid metabolism and decreased vascular endothelial injury.

Conclusions

The therapeutic effects and mechanisms of action of YAK in the treatment of patients with AIDS have become a focus of TCM research.[96] By outlining these mechanisms and progress in clinical research on YAK in HIV/AIDS, this review has highlighted novel therapeutic targets and effective complementary approaches to ART. The key actions of YAK include the following: blocking virus–receptor binding, elevating $CD4^+$ T-cell counts, regulating cytokine/chemokine responses, regulating Th17/Treg balance, enhancing NK cytotoxicity, and maintaining the integrity of the intestinal mucosal barrier. These effects are mediated through a number of pathological pathways involving NF-κB, PPAR, PD-1, transforming growth factor (TGF)-β/Smad, T-cell receptors (TCRs), and TLRs. Clinical studies have demonstrated the therapeutic efficacy of YAK in terms of improvements in clinical symptoms and QoL, longer survival times, and reduced mortality in patients with AIDS. As an herbal medicine, YAK is complementary to ART. However, there is limited clinical trial data on the effects of YAK in AIDS. Firstly, its pharmacology and therapeutic mechanism have not been extensively explored, necessitating further research to optimize its clinical application. Secondly, due to limited number and quality of clinical studies included in the analysis, further research is needed. Lately, we support large-scale clinical trials to evaluate the protective efficacy of YAK in AIDS, as well as single-cell and spatial multi-omics studies of its mechanisms of action. YAK shows great promise as a complementary treatment to ART and warrants further exploration.

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Disclosure

The authors report no conflicts of interest in this work.

References

1. Gallo RC, Sarin PS, Gelmann EP, et al. Isolation of human T-cell leukemia virus in acquired immune deficiency syndrome (AIDS). *Science*. 1983;220(4599):865–867. doi:10.1126/science.6601823
2. UNAIDS. Fact sheet – latest global and regional statistics on the status of the AIDS epidemic. Available from: https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf. Accessed June 27, 2025.
3. Om E, Marshall L, Teljeur C, et al. Oral pre-exposure prophylaxis (PrEP) to prevent HIV: a systematic review and meta-analysis of clinical effectiveness, safety, adherence and risk compensation in all populations. *BMJ Open* 2022;12(5):e048478. doi:10.1136/bmjopen-2020-048478.
4. Nachega JB, Scarsi KK, Gandhi M, et al. Long-acting antiretrovirals and HIV treatment adherence. *Lancet HIV*. 2023;10;(5):e332–e342. doi:10.1016/s2352-3018(23)00051-6
5. Li J, Qin W, Ma X, et al. Analysis of basic researches on TCM preventing and treating AIDS funded by national natural science foundation of China from 2001 to 2019. *Chin J Med Guide*. 2022;24(03):272–279.
6. Qian Z, Zhang Y, Xie X, Wang J. Efficacy and safety of traditional Chinese herbal medicine combined with HAART in the treatment of HIV/AIDS: a protocol for systematic review and meta-analysis. *Medicine*. 2021;100(52):e28287. doi:10.1097/md.0000000000028287
7. Deng B, Zhang Q, Liu Z, et al. Analysis of the status quo of the treatment of AIDS by Yiaikang. *Forum Traditional Chin Med*. 2021;36(04):73–75. doi:10.13913/j.cnki.41-1110/r.2021.04.032
8. Jiang Q, Zhang M, Wang J, et al. Mechanism of Yiaikang Capsules for the treatment of AIDS based on network pharmacology, molecular docking and transcriptomics methods: an exploration study. *Guangxi Med J*. 2024;46(10):1555–1563.
9. Ding H, J-x LI, Tang B, et al. Interaction of astragaloside IV, combined with ginsenoside Rg1 against autophagy injury of PC12 cells induced by oxygen glucose deprivation / reoxygenation. *Chinese Pharmacological Bulletin*. 2017;33(02):235–243.

10. Jeong JJ, Kim B, Kim DH. Ginsenoside Rh1 eliminates the cytoprotective phenotype of human immunodeficiency virus type 1-transduced human macrophages by inhibiting the phosphorylation of pyruvate dehydrogenase lipoamide kinase isozyme 1. *Biol Pharm Bull*. 2013;36(7):1088–1094. doi:10.1248/bpb.b13-00013
11. Jiangju W, j l, Jiang L, Ting L. Research progress of ginseng adjuvant in treatment of AIDS and its opportunistic infections. *Med Pharm Yunnan*. 2024;45(06):75–79.
12. Cho YK, Kim JE. The frequency of defective genes in vif and vpr genes in 20 hemophiliacs is associated with Korean Red Ginseng and highly active antiretroviral therapy: the impact of lethal mutations in vif and vpr genes on HIV-1 evolution. *J Ginseng Res*. 2021;45(1):149–155. doi:10.1016/j.jgr.2020.03.003
13. Li Z, Zhao Y, Lin W, Ye M, Ling X. Rapid screening and identification of active ingredients in licorice extract interacting with V3 loop region of HIV-1 gp120 using ACE and CE-MS. *J Pharm Biomed Anal*. 2015;111:28–35. doi:10.1016/j.jpba.2015.02.021
14. Aluckal E, Ismail A, Paulose A, et al. Assessment of total antioxidant capacity and antimicrobial activity of Glycyrrhiza glabra in saliva of HIV-infected patients. *J Pharm Bioallied Sci*. 2017;9(Suppl 1):S237–s240. doi:10.4103/jpbs.JPBS_141_17
15. Haizhen Y, Lei Z, Xuhui L, Bo Z, Yuanyuan C, Qingxia Z. Research on mechanism of radix scutellariae in treating aids based on network pharmacology. *New Chin Med*. 2020;52(18):1–5. doi:10.13457/j.cnki.jncm.2020.18.001
16. Li BQ, Fu T, Dongyan Y, Mikovits JA, Ruscetti FW, Wang JM. Flavonoid baicalin inhibits HIV-1 infection at the level of viral entry. *Biochem Biophys Res Commun*. 2000;276(2):534–538. doi:10.1006/bbrc.2000.3485
17. Ono K, Nakane H, Fukushima M, Chermann JC, Barré-Sinoussi F. Inhibition of reverse transcriptase activity by a flavonoid compound, 5,6,7-trihydroxyflavone. *Biochem Biophys Res Commun*. 1989;160(3):982–987. doi:10.1016/s0006-291x(89)80097-x
18. Huagui Q, Zhanqiu Y. Study on the anti-HIV effect of carboxymethyl pachymaram in vitro. *Herald of Medicine*. 2008;(10):1156–1158.
19. Jia M, Yang TH, Yao XJ, Meng J, Meng JR, Mei QB. Anti-oxidative effect of Angelica polysaccharide sulphate. *Zhong Yao Cai*. 2007;30 (2):185–188.
20. Wu C. Studies on the Inhibitory effects of Astragalus extracts on HIV-1 and the Possible Mechanism. *Master*. 2020. Available from: https://link.cnki.net/doi/10.27356/d.cnki.gtjdu.2020.001031. Accessed June 27, 2025.
21. Xu Z. Clinical efficacy of Yiaikang capsule in treating HIV/AIDS syndrome of lung-qi deficiency and observation on NF-κB signaling pathway. *master*. 2018.
22. Gong M. Explore the mechanism of Yiaikang capsule in treating lung Qi deficiency syndrome of HIV/AIDS based on PPAR signaling pathway. *master*. 2023. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2023.000495. Accessed June 27, 2025.
23. Zhai M. Explore the immunomodulatory mechanism of Jianpi Yiqi prescription on HIV/AIDS patients with lung Qi deficiency based on TGF-β/Smad signaling pathway. *Master*. 2023. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2023.000627. Accessed June 27, 2025.
24. Zhang Z. Explore the mechanism of Yiaikang capsule in the treatment of AIDS based on ID2/E2A signal axis and PD-1 receptor. *Master*. 2022. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2022.000400. Accessed June 27, 2025.
25. Ren Y. Study on the regulatory effect of Jianpi Yiqi Prescription on TCR immune pool in HIV/AIDS patients with lung Qi deficiency syndrome. *Master*. 2023. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2023.000074. Accessed June 27, 2025.
26. Li L. Effect of Yiaikang capsule on the expression of Th22 cells and its key transcription factor aromatic hydrocarbon receptor in peripheral blood of HIV-infected patients. *Master*. 2015.
27. Hu X. Explore the mechanism of Yiaikang in the treatment of HIV/AIDS based on TLRs signaling pathway regulating abnormal activation of T lymphocyte immunity. *Master*. 2022. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2022.000334. Accessed June 27, 2025.
28. Li F, Xu L. Review of the 15-year clinical treatment of AIDS with yiaikang capsules. 2018;4.
29. Zhao M, Wang Q, Benbo L, et al. Experimental study on treatment of SIV infected rhesus monkeys AIDS model by yiaikang combined with ART. *Liaoning J Trad Chin Med*. 2023;50(03):193–199. doi:10.13192/j.issn.1000-1719.2023.03.054
30. Zhou M. *Experimental Study on Improving Immune Function of SIVmac239 Infected Rhesus Monkeys in Chronic Phase by Traditional Chinese Medicine "Yi Aikang"*. Master. KUNMING UNIVERSITY OF SCIENCE AND TECHNOLOGY; 2022.
31. Shaik MM, Peng H, Lu J, et al. Structural basis of coreceptor recognition by HIV-1 envelope spike. *Nature*. 2019;565(7739):318–323. doi:10.1038/s41586-018-0804-9
32. Vidya Vijayan KK, Karthigeyan KP, Tripathi SP, Hanna LE. Pathophysiology of CD4+ T-Cell Depletion in HIV-1 and HIV-2 Infections. *Front Immunol*. 2017;8:580. doi:10.3389/fimmu.2017.00580
33. Sereti I, Krebs SJ, Phanuphak N, et al. Persistent, albeit reduced, chronic inflammation in persons starting antiretroviral therapy in acute HIV infection. *Clini Infectious Diseases*. 2017;64(2):124–131. doi:10.1093/cid/ciw683
34. Lata S, Ali A, Sood V, Raja R, Banerjea AC. HIV-1 Rev downregulates Tat expression and viral replication via modulation of NAD(P)H:quinine oxidoreductase 1 (NQO1). *Nat Commun*. 2015;6:7244. doi:10.1038/ncomms8244
35. Kilareski EM, Shah S, Nonnemacher MR, Wigdahl B. Regulation of HIV-1 transcription in cells of the monocyte-macrophage lineage. *Retrovirology*. 2009;6:118. doi:10.1186/1742-4690-6-118
36. Li Q, Li J, Liu Z, Sang F, Deng B, Guo H. Effect of yiaikang capsule on the expression of tat and rev genes in HIV-1 infected patients. 2015;6.
37. Ishida W, Harada Y, Fukuda K, Fukushima A. Inhibition by the antimicrobial peptide LL37 of lipopolysaccharide-induced innate immune responses in human corneal fibroblasts. *Invest Ophthalmol Vis Sci*. 2016;57(1):30–39.
38. Yu X, Shang H, Jiang Y. ICAM-1 in HIV infection and underlying mechanisms. *Cytokine*. 2020;125:154830. doi:10.1016/j.cyto.2019.154830
39. Rodriguez-Plata MT, Puigdomènech I, Izquierdo-Useros N, et al. The infectious synapse formed between mature dendritic cells and CD4(+) T cells is independent of the presence of the HIV-1 envelope glycoprotein. *Retrovirology*. 2013;10:42. doi:10.1186/1742-4690-10-42
40. J YUE, Li J, Liu Z, et al. Effects of Yiai Kang on ICAM-1 and LFA-1 expression levels of CD4+T lymphocytes in HIV-1 infected patients. *China J Tradition Chin Med Pharm*. 2023;38(08):3986–3989.
41. Brelot A, Chakrabarti LA. CCR5 revisited: how mechanisms of HIV entry govern AIDS pathogenesis. *J Mol Biol*. 2018;430(17):2557–2589. doi:10.1016/j.jmb.2018.06.027
42. Haqqani AA, Tilton JC. Entry inhibitors and their use in the treatment of HIV-1 infection. *Antiviral Res*. 2013;98(2):158–170. doi:10.1016/j.antiviral.2013.03.017
43. Lieberman-Blum SS, Fung HB, Bandres JC. Maraviroc: a CCR5-receptor antagonist for the treatment of HIV-1 infection. *Clin Ther*. 2008;30 (7):1228–1250. doi:10.1016/s0149-2918(08)80048-3

44. Z LIU, Li Q, B-w DENG, et al. Effects of yiaikang treatment on CCR5, CXCR4 Expression and T cell ACTIVATion in HIV-1 Infected Patients. *J Basic Chin Med*. 2018;24(10):1424–1427+1457. doi:10.19945/j.cnki.issn.1006-3250.2018.10.026
45. Lederman MM, Calabrese L, Funderburg NT, et al. Immunologic failure despite suppressive antiretroviral therapy is related to activation and turnover of memory CD4 cells. *J Infect Dis*. 2011;204(8):1217–1226. doi:10.1093/infdis/jir507
46. Kuller LH, Tracy R, Belloso W, et al. Inflammatory and coagulation biomarkers and mortality in patients with HIV infection. *PLoS Med*. 2008;5(10):e203. doi:10.1371/journal.pmed.0050203
47. Hsu DC, Breglio KF, Pei L, et al. Emergence of polyfunctional cytotoxic CD4+ T cells in mycobacterium avium immune reconstitution inflammatory syndrome in human immunodeficiency virus-infected patients. *Clin Infect Dis*. 2018;67(3):437–446. doi:10.1093/cid/ciy016
48. Temu TM, Polyak SJ, Wanjalla CN, et al. Latent tuberculosis is associated with heightened levels of pro-and anti-inflammatory cytokines among Kenyan men and women living with HIV on long-term antiretroviral therapy. *Aids*. 2023;37(7):1065–1075. doi:10.1097/qad.0000000000003523
49. Paul WE, Zhu J. How are TH2-type immune responses initiated and amplified? *Nat Rev Immunol*. 2010;10(4):225–235. doi:10.1038/nri2735
50. Ranasinghe C, Trivedi S, Wijesundara DK, Jackson RJ. IL-4 and IL-13 receptors: roles in immunity and powerful vaccine adjuvants. *Cytokine Growth Factor Rev*. 2014;25(4):437–442. doi:10.1016/j.cytogfr.2014.07.010
51. Li J, Li Q, Sang F, Liu Z, Wang D, Xu L. Effect and correlation analysis of Jianpi Yiqi prescription on viral load, IL-2, IL-13 and IFN-γ in HIV/AIDS patients. *J Basic Chin Med*. 2018;24(10):1421–1423. doi:10.19945/j.cnki.issn.1006-3250.2018.10.025
52. Mikulak J, Oriolo F, Zaghi E, Di Vito C, Mavilio D. Natural killer cells in HIV-1 infection and therapy. *Aids*. 2017;31(17):2317–2330. doi:10.1097/qad.0000000000001645
53. Oliva A, Kinter AL, Vaccarezza M, et al. Natural killer cells from human immunodeficiency virus (HIV)-infected individuals are an important source of CC-chemokines and suppress HIV-1 entry and replication in vitro. *J Clin Invest*. 1998;102(1):223–231. doi:10.1172/jci2323
54. Capuano C, Pighi C, Molfetta R, et al. Obinutuzumab-mediated high-affinity ligation of FcγRIIIA/CD16 primes NK cells for IFNγ production. *Oncoimmunology*. 2017;6(3):e1290037. doi:10.1080/2162402x.2017.1290037
55. Qian J, Sang F, Liu Z, et al. EFfects of Yi Ai Kang serum on the apoptosis ofNK-92Ml cells and the expression of NKG2A, NKG2D and IFN-Y. *China J Tradition Chin Med Pharm*. 2021;36(11):6756–6759.
56. Wacleche VS, Landay A, Routy JP, Ancuta P. The Th17 lineage: from barrier surfaces homeostasis to autoimmunity, cancer, and HIV-1 pathogenesis. *Viruses*. 2017;9(10). doi:10.3390/v9100303
57. Yero A, Bouassa RM, Ancuta P, Estaquier J, Jenabian MA. Immuno-metabolic control of the balance between Th17-polarized and regulatory T-cells during HIV infection. *Cytokine Growth Factor Rev*. 2023;69:1–13. doi:10.1016/j.cytogfr.2023.01.001
58. Colineau L, Rouers A, Yamamoto T, et al. HIV-Infected Spleens Present Altered Follicular Helper T Cell (Tfh) Subsets and Skewed B Cell Maturation. *PLoS One*. 2015;10(10):e0140978. doi:10.1371/journal.pone.0140978
59. Huang Z. Effects of Yiaikang capsule on Th17/Treg cells and their key transcription factors in HIV/AIDS patients. *Master*. 2015.
60. Mak G, Zaunders JJ, Bailey M, et al. Preservation of gastrointestinal mucosal barrier function and microbiome in patients with controlled HIV infection. *Front Immunol*. 2021;12:688886. doi:10.3389/fimmu.2021.688886
61. Mattapallil JJ, Douek DC, Hill B, Nishimura Y, Martin M, Roederer M. Massive infection and loss of memory CD4+ T cells in multiple tissues during acute SIV infection. *Nature*. 1093-7;434(7037). doi:10.1038/nature03501
62. Farcomeni S, Moretti S, Fimiani C, et al. Short- and Long-Term Immunological Responses in Chronic HCV/HIV Co-Infected Compared to HCV Mono-Infected Patients after DAA Therapy. *Pathogens*. 10(11). doi:10.3390/pathogens10111488
63. Lorvik KB, Meyer-Myklestad MH, Kushekar K, et al. Enhanced Gut-Homing Dynamics and Pronounced Exhaustion of Mucosal and Blood CD4(+) T Cells in HIV-Infected Immunological Non-Responders. *Front Immunol*. 2021;12:744155. doi:10.3389/fimmu.2021.744155
64. Renjun LI. Study on oral administration of Astragalus polysaccharide and ginseng stem saponin to enhance foot-and-mouth disease vaccine and intestinal mucosal immunity. *Doctor*. 2017.
65. Sang F, Li Q, Qian J, et al. Discussion on the Protective Effect of Yiaikang Capsule onIntestinal Mucosal Barrier Injury of HIV/AIDS Based onPermeability and Tight Junction. *J Emergency Traditional Chin Med*. 2018;27(05):769–772.
66. Yang Q. *To explore the clinical efficacy of Yiaikang capsule in the intervention of HIV/AIDS spleen-centered deficiency syndrome and its influence on intestinal flora based on the theory of* "spleen-centered protection". *Master*. 2024.
67. Y-n LIU, Z-b LIU, Sang F, Liu Z, P-y LI, H-j GUO. Effects of yiaikang capsules on intestinal microflora and immune function in HIV/AIDS patients with poor immune reconstitution of lung and spleen qi deficiency syndrome. *China J Tradition Chin Med Pharm*. 2022;37(05):2729–2733.
68. Ji S, Xu Y, Han D, et al. Changes in Lipid Indices in HIV+ Cases on HAART. *Biomed Res Int*. 2019;2019:2870647. doi:10.1155/2019/2870647
69. Funderburg NT, Mehta NN. Lipid abnormalities and inflammation in HIV infection. *Curr HIV/AIDS Rep*. 2016;13(4):218–225. doi:10.1007/s11904-016-0321-0
70. Shen J, Ren Z, Li Q, et al. Effect of YAK-containing serum on genes related to lipid metabolism induced by Ritonavir in Hep G2 cells. *Lishizhen Med Materia Med Res*. 2019;30(01):77–80.
71. Liu L, Liao P, Wang B, Fang X, Li W, Guan S. Oral administration of baicalin and geniposide induces regression of atherosclerosis via inhibiting dendritic cells in ApoE-knockout mice. *Int Immunopharmacol*. 2014;20(1):197–204. doi:10.1016/j.intimp.2014.02.037
72. Zhang Y, Zhang Z, Zhang Y, et al. Baicalin promotes the activation of brown and white adipose tissue through AMPK/PGC1α pathway. *Eur J Pharmacol*. 2022;922:174913. doi:10.1016/j.ejphar.2022.174913
73. Wei S, Kang B, Liu K. Clinical observation of Yiaikang capsule treating AIDS for 8 years. *Modern Dis Control Prevention*. 2014;25(01):108–110. doi:10.13515/j.cnki.hnjpm.2014.01.039
74. Qiu T, Li X. Clinical observation of yiaikang capsule in treating AIDS Patients. *Acta Chin Med*. 2011;26(01):9–10. doi:10.16368/j.issn.1674-8999.2011.01.005
75. Wang B, Liu X, Baitao G, Yang X, Liu Z, Jiang Z. The Effect of Yiaikang Capsules on Immune Function of HIV/AIDS Patients. *Acta Chin Med*. 2008;6–7. doi:10.16368/j.issn.1674-8999.2008.06.026
76. Li F, Xu L, Zhang M, Guo J. Clinical observation of 885 cases of AIDS patients treated by Yiaikang capsule combined with syndrome differentiation. *Acta Chin Med*. 2010;51(09):808–810. doi:10.13288/j.11-2166/r.2010.09.012
77. Chen Z, Y SUN, Zhang X, et al. The effect of antiretroviral treatment combined traditional Chinese medicine on the reconstruction of immune function in AIDS patients. *Chin J AIDS & STD*. 2022;28(10):1132–1135. doi:10.13419/j.cnki.aids.2022.10.04

78. Liu P, Li Q, Xuan X, Dong Z, Wang Z, Du Y. The effect of Yiaikang capsules on T lymphocyte subsets of asymptomatic HIV infected patients. *Chongqing Med J*. 2014;43(22):2853–2854+2858.
79. Clinical Expert Group of Traditional Chinese Medicine for AIDS Treatment in Henan Province. Intervention of Yiaikang capsule on 379 asymptomatic HIV infected patients. *Traditional Chin Med Res*. 2008;(03):31–33.
80. He Y, Xu L, Guo J, Cui L, Wang D. Yiaikang capsule treating 116 cases of HIV/AIDS accompanied with skin damage. *Chin Med Modern Distance Educ China*. 2008;(07):685–686.
81. Liu P, Zhang Y, Song J. Summary of clinical efficacy of Yiaikang in treating 1792 cases of spleen and stomach symptom of AIDS. *Acta Chin Med*. 2009;24(05):9–10. doi:10.16368/j.issn.1674-8999.2009.05.009
82. Jin Y, Li Q, Meng X, et al. Prevalence of anaemia among HIV patients in rural China during the HAART era. *Int J STD AIDS*. 2017;28(1):63–68. doi:10.1177/0956462415622866
83. Ma C, Z TAO, Y LIU, et al. The clinical efficacy of integrated traditional Chinese and western medicine on HIV/AIDS patients with pulmonary infection:A Meta-analysis. *Chin J AIDS & STD*. 2021;27(10):1080–1086. doi:10.13419/j.cnki.aids.2021.10.07
84. Yang C. Clinical study on reducing incidence of AIDS pulmonary infection with traditional Chinese medicine. *Master*. 2022. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2022.000335. Accessed June 27, 2025.
85. Jin Y, Guo H, Wang X, et al. Traditional Chinese medicine could increase the survival of people living with HIV in rural central China: a retrospective cohort study, 2004-2012. *Am J Chin Med*. 2014;42(6):1333–1344. doi:10.1142/s0192415x14500839
86. Jin Y, Zhang M, Ma Y, et al. Effects of Chinese Medicine on the Survival of AIDS patients administered second-line ART in rural areas of china: a retrospective cohort study based on real-world data. *Evid Based Complement Alternat Med*. 2022;2022:5103768. doi:10.1155/2022/5103768
87. Xu QL, Guo HJ, Jin YT, et al. Advantages of Chinese Medicine for Patients with acquired immunodeficiency syndrome in rural central China. *Chin J Integr Med*. 2018;24(12):891–896. doi:10.1007/s11655-017-2418-8
88. Fu L. Siwu Xiaofeng decoction mainly treated 30 cases of chronic AIDS rash. *Traditional Chin Med Res*. 2013;26(09):16–18.
89. Yang L, Wang Z. Clinical study of Yiaikang capsule combined with Lianpu Yin in the treatment of digestive tract reaction caused by AIDS HAART therapy. *Acta Chin Med*. 2014;29(09):1241–1242. doi:10.16368/j.issn.1674-8999.2014.09.005
90. Liu C. Yiaikang capsule combined with Sishen decoction to treat 55 cases of AIDS diarrhea. *China J Pharm Econ*. 2012;(01):62–63.
91. Yan B. Clinical observation of Yiaikang capsule combined with Xiaoyao Powder in the treatment of AIDS accompanied by anxiety and depression. *Chin J Integrated Traditional Western Med*. 2010;30(05):553–555.
92. Jin H, Li C, Zhang M. Clinical observation of Yiaikang capsule combined with licorice Xiexin Decoction in treatment of AIDS oral ulcer. *Acta Chin Med*. 2010;25(03):383–384. doi:10.16368/j.issn.1674-8999.2010.03.042
93. Zhang H, Xu Z, Hua C. Yiaikang capsule combined with Zhisou powder treated 48 cases of AIDS patients with cough. *Clin J Traditional Chin Med*. 2017;29(11):1890–1892. doi:10.16448/j.cjtcm.2017.0627
94. Shao C. Clinical study of Yiaikang capsule combined with Biejia Decoction Pill on HIV/HCV co-infection. *master*. 2018.
95. Yu Z. Study on the mechanism of Yiqi Jianpi Decoction in the treatment of lipid metabolism and vascular endothelial injury in lung Qi deficiency syndrome of HIV/AIDS. *master*. 2022. Available from: https://link.cnki.net/doi/10.27119/d.cnki.ghezc.2022.000055. Accessed June 27, 2025.
96. Liu Y. Current status and Prospects of AIDS treatment with new drugs in traditional Chinese Medicine. *J Traditional Chin Med*. 2022;63 (22):2187–2191. doi:10.13288/j.11-2166/r.2022.22.017