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Evaluating the Effect of Panax ginseng (Red Ginseng) Extract on Some Immune Factors in Mice Infected with Visceral Leishmaniasis

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Abstract:
Visceral leishmaniasis (VL), caused by *Leishmania donovani*, poses a major public health threat particularly with growing resistance to conventional drugs. This study evaluated the immunomodulatory potential of red ginseng (*Panax ginseng*) alcoholic extract in vivo in BALB/c mice. HPLC analysis identified three ginsenosides (Re, Rb1, Rb2). Acute toxicities of two doses (0.2 ml/day) at concentrations of 120 mg/kg and 480 mg/kg were carried out in 10 mice aged 8-24 weeks and weighing 25-28gm, administered by oral gavage; five mice for each dose were monitored over ten days for feeding, movement, and other activities. In vivo, ginseng treatment at two doses (120 and 480 mg/kg) significantly modulated immune biomarkers including TNF-α IL-27, IL-10, and IFN-γ compared to positive control and Pentostam groups. These findings suggest that ginseng possesses promising immunomodulatory properties, warranting further investigation as adjunctive host-directed therapy.
Keywords: Visceral leishmaniasis, *Red* ginseng, Ginsenosides, Immunomodulation, Cytokines.
The research is based on an M.A thesis.

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Introduction:

Visceral leishmaniasis (VL) is one of the most critical parasitic infections worldwide, caused by protozoa of the genus *Leishmania* - particularly *Leishmania donovani* transmitted through bites of infected female phlebotomine sandflies. The disease is endemic in tropical and subtropical regions, affecting millions and placing close to one billion at risk (World Health Organization, 2024).

Inside the mammalian host, promastigotes of Leishmania enter macrophages, and are converted to amastigotes. Then, they start their reproduction inside the phagolysosome. These organisms adore hiding in the spleens or livers of hosts as a manner of visceral leishmaniasis, whereas both of these organs are filled with mononuclear phagocytes which in turn provide a favorable environment for parasites. Indeed, the host body becomes more capable of combating infection. However, patients with such disease suffered from liver granulomas, a messed-up structure of spleens, and their spleen and liver end up enlarged (Poulaki and Piperaki, 2021; Maeda *et al.*, 2021; Goto *et al.*, 2023).

Medicinal plants, including ginseng, could help with leishmaniasis. Scientists think the ginsenosides in ginseng give the immune system a boost to fight off the illness. These compounds increase immune cells' cytokine production. Still, there's no solid proof that ginsenosides specifically enhance Th1 responses against Leishmania. Defeating the parasite needs those responses along with key molecules like IFN-γ, IL-12, and TNF-α, which help macrophages eliminate the parasite. So, ginsenosides might be useful for future treatments, though further evidence is required to confirm this hypothesis (Dayakar *et al.*, 2019; Taraghian *et al.*, 2021; You *et al.*, 2022).

This study aims to evaluate the effect of extract of red ginseng root (*Panax ginseng*) on immune biomarkers in BALB/c mice infected with *L. donovani*.

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Materials and methods

Animal Grouping

Sixty-five albino BALB/c mice (8-24 weeks, 25-28 g) were obtained from the National Centre for Drug Control and Research, Baghdad. Fifty-three mice were infected intraperitoneally with 1×10^7 *L. donovani* promastigotes/mL. After 14 days, infection was confirmed in five infected mice using Giemsa-stained liver and spleen impression smears. The remaining 48 infected mice were then divided into four groups., and 12 mice were left without infection considered as negative control as shown in table (1).

Table (1): Experimental animal grouping design

No. Group	n	Treatment	Description
G1	12	Negative control	Healthy uninfected mice, normal saline (0.1 mL/day, oral) for 14 and 28 days
G2	12	Positive control	Infected, no treatment, normal saline (0.1 mL/day, oral) for 14 and 28 days
G3	12	Pentostam	Infected, intramuscular Pentostam (0.041 mg,0.1 mL/day) for 14 and 28 days
G4	12	Ginseng 120mg/kg	Infected, ginseng extract via oral gavage (0.2 mL) for 14 and 28 days
G5	12	Ginseng 480mg/kg	Infected, ginseng extract via oral gavage (0.2 mL) for 14 and 28 days

Source and Preparation of Panax ginseng Extract

Red ginseng (*Panax ginseng*) dried roots were commercially obtained from a local herbal supplier (Baghdad, Iraq). Approximately 80 g of ground roots were extracted with 70% ethanol in a Soxhlet apparatus for 72 hours. After solvent evaporation, the final yield was approximately 15% (w/w). The extract was stored in amber vials at -20°C. Working solutions were dissolved in normal saline (0.9% NaCl) (Ryu *et al.*, 2017).

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HPLC Analysis

Dried ginseng extract (10 mg/mL in HPLC-grade methanol) was filtered (0.22 µm) and analyzed on a C18 reversed-phase column (250 × 4.6 mm, 5 µm) at 30°C with ultrapure water/acetonitrile mobile phase, flow rate 1.0 mL/min, UV detection at 203 nm. Ginsenosides were identified by comparing retention times with authentic standards (Hsu *et al.*, 2022).

Parasite Strain and Culture

Leishmania donovani was obtained from the biology department, college of science, Baghdad university, cultivated on RPMI-1640 medium and maintained by serial passage through NNN biphasic medium every eight days at 27°C.

Detection of VL using, Impression Smears

Infection was confirmed using liver and spleen impression smears stained with Giemsa and examined for amastigotes under light microscopy (Pudasaini *et al.*, 2023).

Blood Collection

Ethical approval was obtained from Mustansiriyah University / College of Science Ethics Committee. Blood samples (1-2 mL) were collected after partial anaesthesia with ether at 14 and 28 days via the facial vein. Serum was separated by centrifugation (3000 rpm, 15 min) and stored at -20°C (Teilmann *et al.*, 2014).

Immunological Analyses (ELISA)

Serum TNF-α, IL-27, IL-10, IFN-γ, were measured using commercial ELISA kits (YLbiont, Shanghai YL Biotech, China) via the sandwich immunoassay principle. Optical density was measured at 450 nm, and concentrations were determined from standard curves.

Statistical Analysis

The Statistical Packages of Social Sciences-SPSS (IBM Corp, 2019) program was used to determine differences among groupsin study parameters. Least significant difference-LSD test (ANOVA) was used to compare group means in this study.

Results and discussion

HPLC Analysis of Red Ginseng

HPLC analysis found three ginsenosides in the alcohol extract—Re at 19.413 minutes, Rb1 at 35.521 minutes, and Rb2 at 41.337 minutes. These make up 45.1%, 41.8%, and 13.1% of the ginsenoside fraction,

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respectively, according to Table 2. They're key bioactive components of *P. ginseng* known for antioxidant, anti-inflammatory, and immunomodulatory effects (He *et al*., 2022; Zhao *et al*., 2024). These findings are consistent with Li *et al.* (2022), who demonstrated that extraction conditions substantially affect ginsenoside recovery, content determination, and structural transformation in *Panax ginseng*. Their study further showed that optimized extraction procedures are suitable for both qualitative and quantitative ginsenoside analysis using UPLC-Q-Exactive-MS and HPLC-UV.

Table (2): Retention times and peak areas of ginsenosides detected by HPLC

Compound	Retention Time (min)	Percentage (%)	Identification
Re	19.413	45.1%	Ginsenoside Re
Rb1	35.521	41.8%	Ginsenoside Rb1
Rb2	41.337	13.1%	Ginsenoside Rb2

Detection of VL in Mice (Impression Smears)

Giemsa-stained liver and spleen impression smears confirmed successful *L. donovani* infection by demonstrating intracellular amastigotes within macrophages at day 14 post-infection (Figures 1A and B).

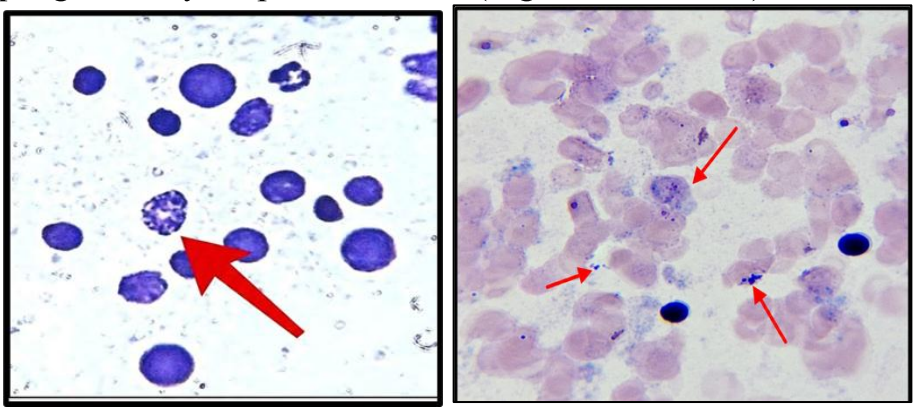

Figure (1): A) Liver impression smear showing intracellular amastigotes (arrow) within Kupffer cells (100X). stain with Giemsa stain. B) Spleen impression smear showing intracellular amastigotes (arrow) (100X). Stain with Giemsa stain

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Serum level TNF-α

Serum TNF-α showed statistically significant variations among all groups ($P \leq 0.01$). The positive control group recorded the highest concentrations (145.25 ± 13.79 pg/ml at 14 days; 135.89 ± 10.67 at 28 days) compared to the negative control (33.78 ± 2.74 pg/ml). Pentostam and Ginseng at both doses significantly reduced TNF-α relative to the positive control (Table 3).

Table (3): Serum levels of TNF-α (pg/ml) across experimental groups

Group	TNF-α 14 days (pg/ml)	TNF-α 28 days (pg/ml)
G1	33.78 ±2.74 d	33.78 ±2.74 c
G2	145.25 ±13.79 a	135.89 ±10.67 a
G3	52.78 ±0.96 bc	55.31 ±6.64 b
G4	63.42 ±3.93 b	61.51 ±6.54 b
G5	39.95 ±0.52 cd	55.04 ±7.21 b
L.S.D.	14.832 **	19.399 **
P-value	0.0001	0.0001

Means with different letters in the same column differ significantly. ** ($P \leq 0.01$)

The elevated TNF-α in the untreated group reflects classical macrophage activation during VL; however, excessive TNF-α production contributes to tissue immunopathology (Tadesse *et al.*, 2021; Almeida *et al.*, 2023). Treatment with Pentostam reduced TNF-α by reducing parasitic antigenic load (Araújo-Santos *et al.*, 2017; Kocyigit *et al.*, 2002). Ginseng helps fight some conditions because of ginsenoside Rb1. This compound fights inflammations via regulating TLR4 and handling pathways of MAPK and NF-κB. It essentially calms overactive macrophages, so they don't cause too much inflammation (Gao *et al.*, 2020; Li *et al.*, 2025).

Serum level IL-27

Among groups, IL-27 levels differed significantly ($P \leq 0.01$). The positive control group recorded the highest concentrations (88.42 ± 7.33 at 14 days; 81.67 ± 5.93 at 28 days) vs. negative control (21.92 ± 1.87

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pg/ml). Both Pentostam and Ginseng significantly reduced IL-27 in a dose-dependent manner (Table 4).

Table (4): Serum levels of IL-27 (pg/ml) across experimental groups

Group	IL-27 14 Days (pg/ml)	IL-27 28 Days (pg/ml)
G1	21.92 ±1.87 c	21.92 ±1.87 c
G2	88.42 ±7.33 a	81.67 ±5.93 a
G3	39.79 ±1.33 b	38.68 ±4.17 b
G4	45.84 ±3.09 b	37.52 ±2.17 b
G5	29.12 ±3.25 c	32.08 ±4.33 bc
L.S.D.	9.840 **	10.589 **
P-value	0.0001	0.0001

Means with different letters in the same column differ significantly. ** ($P \leq 0.01$)

Elevated IL-27 during visceral leishmaniasis seems to activate an immune pathway that suppresses protective immune responses. It stifles the protective Th1 responses but boosts IL-10 producing T-cells. This then results in more immune suppression and persistent parasites, essentially aiding the infection to hang around (Costa-Madeira *et al*., 2022; Jafarzadeh *et al*., 2020). Pentostam treatment may lower IL-27 levels, reducing infection-triggered immune activity. Antileishmanial therapy success correlates with a decrease in IL-27, which normally spikes during active visceral leishmaniasis. Plus, research shows that dendritic cells generate IL-27 during Leishmania infantum infections (Pérez-Cabezas *et al*., 2016; Tadesse *et al*., 2021). Ginseng might vary in effectiveness based on dosage because of how it affects the immune system, not just by suppressing it. It seems ginsenosides tweak immune-cell actions, including dendritic-cell maturity and cytokine production. Yet, additional evidence is required to confirm that dendritic cells are directly involved, particularly from studies using cell-specific markers (Ratan *et al*., 2020; You *et al*., 2022).

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Serum level IL-10

At day 14, no significant intergroup differences were observed. At day 28, the positive control recorded significantly elevated IL-10 (364.00 ± 94.95 pg/ml) vs. all other groups ($P \leq 0.05$) (Table 5).

Table (5): Serum levels of IL-10 (pg/ml) across experimental groups

Group	IL-10 14 Days (pg/ml)	IL-10 28 Days (pg/ml)
G1	194.00 ±58.73 a	194.00 ±58.73 a
G2	244.00 ±81.95 a	364.00 ±94.95 b
G3	206.50 ±7.36 a	190.00 ±66.16 a
G4	208.00 ±71.45 a	210.20 ±79.76 a
G5	216.00 ±82.42 a	178.00 ±82.01 a
L.S.D.	178.80 NS	181.077 *
P-value	0.9927	0.0498

Means with different letters in the same column differ significantly. * ($P \leq 0.05$), NS: Non-significant.

The progressive IL-10 elevation in the untreated group reflects increasing immunosuppression characteristic of visceral leishmaniasis (Samant *et al.*, 2021; da Silva *et al.*, 2022). Pentostam and ginseng stop this rise as well. It could be because they reduce infection-driven immune responses after treatment. With ginseng, though, it might tweak inflammatory signals instead of directly suppressing IL-10 through a single pathway (Tadesse *et al.*, 2021; Qu *et al.*, 2025).

Serum level IFN-γ

IFN-γ levels differed significantly among groups ($P \leq 0.01$). The positive control recorded the highest concentrations (145.04 ± 15.11 at 14 days; 131.35 ± 11.49 at 28 days) vs. negative control (22.06 ± 3.34 pg/ml). Pentostam and both doses of Ginseng significantly reduced IFN-γ levels (Table 6).

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Table (6): Serum levels of IFN-γ (pg/ml) across experimental groups

Group	IFN-γ 14 Days (pg/ml)	IFN-γ 28 Days (pg/ml)
G1	22.06 ±3.34 c	22.06 ±3.34 c
G2	145.04 ±15.11 a	131.35 ±11.49 a
G3	61.85 ±1.10 b	59.14 ±3.99 b
G4	64.62 ±3.32 b	54.12 ±2.46 b
G5	49.92 ±5.02 b	49.59 ±8.64 b
L.S.D.	17.396 **	18.192 **
P-value	0.0001	0.0001

Means with different letters in the same column differ significantly. ** ($P \leq 0.01$)

The IFN-γ, a key Th1 cytokine, ramps up macrophages to fight off intracellular Leishmania. It activates these cells to whip up reactive oxygen and nitrogen species to take down the leishmania. However, if it keeps going too strong, it boosts inflammation and damages tissues once the immune response loses control (Elmahallawy *et al.*, 2021; Goto *et al.*, 2023; Sacks and Scott, 2025). Pentostam lowers IFN-γ levels, reducing infection-driven immune activation after antileishmanial therapy. This ties to fewer parasites and antigens kicking around, but we can't rely on serum IFN-γ alone to prove everything (Adem *et al.*, 2016; Tadesse *et al.*, 2021). Ginseng decreases IFN-γ levels in a dose-dependent manner, showing reduced Th1-linked inflammation. This is probably because of its ginsenosides, particularly Rb1, which tamp down NF-κB-related inflammatory signals. Still, we need more evidence to show that Rb1 directly links to STAT1 inhibition (Liu *et al.*, 2021; Gao *et al.*, 2020; Jang *et al.*, 2024).

Conclusion:

A big immune-modulating effects were observed for Panax ginseng-derived red ginseng extract toward *L. donovani*-affected BALB/c mice. Using such extract at 480 mg/kg, cytokine reductions were comparable to those observed with Pentostam, ~~proposing their potentials~~ suggesting its potential to fight leishmaniasis.

Further Work

More research into red ginseng extract's safety would be wise. Also, figuring out how it affects parasites in the liver and spleen would give us cool insights. Future studies should investigate the functions of Re, Rb1, and Rb2, and whether joining ginseng with boosts of Pentostam its impacts.

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References

1. Adem, E., Tajebe, F., Getahun, M., Kiflie, A., Diro, E., Hailu, A., Schallig, H. D. F. H., Kämpe, O., Svensson, M., Andersson, J., & Nylén, S. (2016). Successful treatment of human visceral leishmaniasis restores antigen-specific IFN-γ, but not IL-10 production. *PLOS Neglected Tropical Diseases, 10*(3), e0004468. https://doi.org/10.1371/journal.pntd.0004468

2. Almeida, F. S., Oliveira, A. E. R., Silva, J. S., & Tavares, N. M. (2023). Leishmaniasis: Immune cells crosstalk in macrophage polarization. *Tropical Medicine and Infectious Disease, 8*(5), 276. https://doi.org/10.3390/tropicalmed8050276

3. Araújo-Santos, T., Prates, D. B., Andrade, B. B., Nascimento, D. O., Clarêncio, J., Entringer, P. F., Carneiro, A. B., Silva-Neto, M. A., Miranda, J. C., Brodskyn, C. I., Barral, A., Bozza, P. T., & Borges, V. M. (2017). Anti-parasite therapy drives changes in human visceral leishmaniasis-associated inflammatory balance. *Scientific Reports, 7*, 4334. https://doi.org/10.1038/s41598-017-04595-8

4. Costa-Madeira, J. C., Trindade, D., Nascimento, M. S. L., Santos, R. S., Silva, J. S., & Borges, V. M. (2022). T lymphocyte exhaustion during human and experimental visceral leishmaniasis. *Frontiers in Immunology, 13*, 835711. https://doi.org/10.3389/fimmu.2022.835711

5. da Silva, R. R., Vasconcelos, J. M., Gomes, C. M., Laurenti, M. D., & Corbett, C. E. P. (2022). Association between interleukin 10 (IL-10) polymorphisms and leishmaniasis progression: A systematic review and

meta-analysis. *Scientific Reports, 12*, 11713. https://doi.org/10.1038/s41598-022-15377-2
6. Dayakar, A., Chandrasekaran, S., Veronica, J., & Maurya, R. (2019). Cytokines: Key determinants of resistance or disease progression in visceral leishmaniasis. *Frontiers in Immunology, 10*, 670. https://doi.org/10.3389/fimmu.2019.00670
7. Elmahallawy, E. K., Alkhaldi, A. A. M., Saleh, A. A., et al. (2021). Host immune response against leishmaniasis and parasite persistence strategies: A review and assessment of recent research. *Biomedicine & Pharmacotherapy, 139*, 111671. https://doi.org/10.1016/j.biopha.2021.111671
8. Gao, H., Kang, N., Hu, C., Zhang, Z., Xu, Q., Liu, Y., & Yang, S. (2020). Ginsenoside Rb1 exerts anti-inflammatory effects in vitro and in vivo by modulating toll-like receptor 4 dimerization and NF-κB/MAPKs signaling pathways. *Phytomedicine, 69*, 153197. https://doi.org/10.1016/j.phymed.2020.153197
9. Goto, Y. (2023). Pathological roles of macrophages in *Leishmania* infections. *Parasitology International, 93*, 102706. https://doi.org/10.1016/j.parint.2023.102706
10. Hsu, B.-Y., Jen, C.-T., Inbaraj, B. S., & Chen, B.-H. (2022). A comparative study on analysis of ginsenosides in American ginseng root residue by HPLC-DAD-ESI-MS and UPLC-HRMS-MS/MS. *Molecules, 27*(10), 3071. https://doi.org/10.3390/molecules27103071
11. He, B., Chen, P., Yang, J., Yun, Y., Zhang, X., Yang, R., & Shen, Z. (2022). Oxidative stress and ginsenosides: An update on the molecular mechanisms. Oxidative Medicine and Cellular Longevity, 2022, 9299574. https://doi.org/10.1155/2022/9299574
12. IBM Corp. (2019). IBM SPSS Statistics for Windows (Version 26.0) [Computer software]. IBM Corp.
13. Jafarzadeh, A., Nemati, M., Chauhan, P., Patidar, A., Sarkar, A., Sharifi, I., Nair, A., & Saha, B. (2020). Interleukin-27 functional duality balances *Leishmania* infectivity and pathogenesis. *Frontiers in Immunology, 11*, 1573. https://doi.org/10.3389/fimmu.2020.01573
14. Jang, J., et al. (2024). Upregulation of NK cell activity, cytokine expression, and NF-κB pathway by ginsenoside concentrates from *Panax ginseng* berries in healthy mice and macrophage cell lines. *Journal of*

Ethnopharmacology, *335*, 118681. https://doi.org/10.1016/j.jep.2024.118681

15. Kocyigit, A., Gur, S., Gurel, M. S., Bulut, V., & Ulukanligil, M. (2002). Antimonial therapy induces circulating proinflammatory cytokines in patients with cutaneous leishmaniasis. *Infection and Immunity*, *70*(12), 6589–6591. https://doi.org/10.1128/IAI.70.12.6589-6591.2002

16. Li, H., Chen, B., Zhang, Q., Wang, Y., Wang, Q., Jin, Y., & Wang, X. (2022). Effects of different extraction methods in pharmacopoeia on the content and structure transformation of ginsenosides. *Molecules*, *27*(14), 4347. https://doi.org/10.3390/molecules27144347

17. Li, Y., Zhang, M., Zhang, K., Niu, H., Li, H., & Wu, W. (2025). Ginsenosides modulate immunity via TLR4/MyD88/NF-κB pathway and gut microbiota. *Phytomedicine*, *142*, 156763. https://doi.org/10.1016/j.phymed.2025.156763

18. Lin, Z., Jiang, S., Shang, Z., Liu, H., Ren, J., Zhao, Z., Yang, B., Luo, S., Ren, G., & Yuan, C.-S. (2022). Recent progress (2015–2020) in the investigation of the pharmacological effects and mechanisms of ginsenoside Rb1. *Journal of Ginseng Research*, *46*(1), 39–53. https://doi.org/10.1016/j.jgr.2021.03.004

19. Maeda, K., Iwasaki, M., Itaya, C., Kimura, Y., Matsushita, M., Oki, T., Ueno, N., & Wilson, M. E. (2021). Hepatomegaly associated with non-obstructive sinusoidal dilation in experimental visceral leishmaniasis. *PLOS Neglected Tropical Diseases*, *15*(11), e0009984. https://doi.org/10.1371/journal.pntd.0009984

20. Poulaki, A., & Piperaki, E.-T. (2021). Effects of visceralising *Leishmania* on the spleen, liver, and bone marrow: A pathophysiological perspective. *Microorganisms*, *9*(4), 759. https://doi.org/10.3390/microorganisms9040759

21. Pudasaini, P., GC, S., & Paudel, S. (2023). Intracellular amastigotes in fine-needle aspiration cytology of cutaneous leishmaniasis. *Clinical Case Reports*, *11*(5), e7377. https://doi.org/10.1002/ccr3.7377

22. Pérez-Cabezas, B., Cecílio, P., Robalo, A. L., Silvestre, R., Carrillo, E., Moreno, J., San Martín, J. V., Vasconcellos, R., & Cordeiro-da-Silva, A. (2016). Interleukin-27 early impacts *Leishmania infantum* infection in

mice and correlates with active visceral disease in humans. *Frontiers in Immunology, 7*, 478. https://doi.org/10.3389/fimmu.2016.00478
23. Qu, Q., et al. (2025). Evaluation of anti-inflammatory effects of six ginsenosides and Rg1 regulation of macrophage polarization and metabolites to alleviate colitis. *Antioxidants, 14*(3), 283. https://doi.org/10.3390/antiox14030283
24. Ratan, Z. A., Haidere, M. F., Hong, Y. H., Park, S. H., Lee, J.-O., Lee, J., & Cho, J. Y. (2020). Adaptogenic effects of *Panax ginseng* on modulation of immune functions. *Journal of Ginseng Research, 45*(1), 32–40. https://doi.org/10.1016/j.jgr.2020.09.004
25. Ryu, J., Kwon, S.-J., Ahn, J.-W., Jo, Y. D., Kim, S. H., Jeong, S. W., Lee, M. K., Kim, J.-B., Kang, S.-Y., & Ha, B.-K. (2017). Effect of hydrothermal processing on ginseng extract. *Journal of Ginseng Research, 41*(4), 572–577. https://doi.org/10.1016/j.jgr.2016.08.005
26. Sacks, D., & Scott, P. (2025). Oxygen and immunity to *Leishmania* infection. *Infection and Immunity*. https://doi.org/10.1128/iai.00504-24
27. Samant, M., Sahu, U., Pandey, S. C., & Khare, P. (2021). Role of cytokines in experimental and human visceral leishmaniasis. *Frontiers in Cellular and Infection Microbiology, 11*, 624009. https://doi.org/10.3389/fcimb.2021.624009
28. Tadesse, D., Abdissa, A., Mekonnen, M., Belay, T., & Hailu, A. (2021). Antibody and cytokine levels in visceral leishmaniasis patients with varied parasitemia before, during, and after treatment in patients admitted to Arba Minch General Hospital, southern Ethiopia. *PLOS Neglected Tropical Diseases*, *15*(8), e0009632. https://doi.org/10.1371/journal.pntd.0009632
29. Teilmann, A. C., Nygaard Madsen, A., Holst, B., Hau, J., Rozell, B., & Abelson, K. S. P. (2014). Physiological and pathological impact of blood sampling by retro-bulbar sinus puncture and facial vein phlebotomy in laboratory mice. *PLOS ONE, 9*(11), e113225. https://doi.org/10.1371/journal.pone.0113225
30. Taraghian, M., Haniloo, A., Abbasi, F., Taghipour, A. and Sarkari, B. (2021) 'The comparison of the IFN-γ, TNF-α and IL-10 cytokines in cutaneous leishmaniasis', Journal of Parasitic Diseases, 45, pp. 1029–1035. doi: https://10.1007/s12639-021-01401-9.

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31. World Health Organization. (2024). *Leishmaniasis fact sheet*. https://www.who.int/news-room/fact-sheets/detail/leishmaniasis
32. You, L., Cha, S., Kim, M. Y., & Cho, J. Y. (2022). Ginsenosides are active ingredients in *Panax ginseng* with immunomodulatory properties from cellular to organismal levels. *Journal of Ginseng Research, 46*(6), 711–721. https://doi.org/10.1016/j.jgr.2021.12.007
33. Zhao, L., et al. (2024). Neuroinflammation inhibition and neuroprotective effects of purpurin, a potential anti-AD compound, screened via network proximity and gene enrichment analyses. *Phytotherapy Research*, *38*(1), 45–58. https://doi.org/10.1002/ptr.8064

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تقييم تأثير مستخلص نبات الجنسنج الأحمر (ginseng Panax) على بعض العوامل المناعية في الفئران المصابة بداء الليشمانيا الحشوية

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مستخلص البحث:

يُعدّ داء الليشمانيا الحشوية (VL) من أبرز الأمراض الطفيلية التي تهدد الصحة العامة على مستوى العالم، إذ يسببه طفيلي *donovani Leishmania* الذي ينتقل عبر لدغة أنثى ذبابة الرمل، وتزداد خطورته مع تنامي مقاومة الأدوية التقليدية. تهدف هذه الدراسة إلى تقييم الفاعلية المعدِّلة للمناعة لمستخلص الجنسنج الأحمر (*Panax ginseng*) الكحولي في الجسم الحي على فئران BALB/c المُصابة تجريبياً. كشف تحليل HPLC عن ثلاثة جينسينوسيدات رئيسية هي Re وRb1 وRb2. تم اختبار السميات الحادة لجرعتين (0.2 مل/يوم) عند تركيزات 120 ملغ/كغ و480 ملغ/كغ على 10 فئران تتراوح أعمارها بين 8-24 أسبوعًا وتزن 25-28 جم، وأُعطيت عن طريق الفم ؛ وتمت متابعة خمسة فئران لكل جرعة لمدة عشرة أيام من حيث التغذية والحركة والأنشطة الأخرى. في الجسم الحي اذ تم معالجة الفئران المُصابة بجرعتين من المستخلص (120 و480 مغ/كغم)، فأسفرت عن تعديل معنوي في مستويات السيتوكينات (IL-10, IL-27, TNF-α و IFN-γ) مقارنةً بالمجموعة الإيجابية ومجموعة Pentostam. تُشير النتائج إلى أن الجنسنج يمتلك خصائص واعدة في تعديل المناعة، مما يستدعي مزيداً من الدراسة كعلاج مساعد موجَّه للمضيف.

الكلمات المفتاحية : داء الليشمانيا الحشوي، الجنسنج الأحمر، جينسينوسيدات , تعديل مناعي , السيتوكينات.

ملاحظة : هل البحث مستل من رسالة ماجستير او اطروحة دكتوراه ؟ نعم