INPLASY

Efficacy of salvianolic acid B for myocardial ischemia-reperfusion injury in rat models: a systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 August 2025 and was last updated on 28 August 2025.

INTRODUCTION

Review question / Objective The objective of this systematic evaluation is to investigate the efficacy of Salvianolic acid B(Sal B) in a rat model of myocardial ischemia-reperfusion(MI/RI), so as to better inform clinical treatment. To this end, the key issue addressed by this systematic evaluation is to clarify the role of Sal B in myocardial ischemia-reperfusion in rats.

Rationale Current research on MIRI predominantly remains at the preclinical stage, with the majority of studies utilizing rat models.Existing systematic reviews and meta-analyses evaluating the cardioprotective effects of Sal B on MI/RI have incorporated data from diverse animal species without clearly distinguishing between acute myocardial infarction models and MI/RI models. To address this gap, the present study specifically focuses on rat models and strictly limits the experimental paradigm to MI/RI. Through an extensive literature review, we systematically evaluate the protective effects of Sal B intervention in rat MI/RI models. This focused approach provides robust preclinical evidence to support the therapeutic potential of Sal B in MI/RI management, while establishing a solid foundation for future mechanistic investigations and clinical translation.

Condition being studied MI/RI remains a major challenge in the treatment of acute myocardial infarction, and no effective pharmacological intervention is currently available. Sal B, a key bioactive compound derived from Salvia miltiorrhiza, has demonstrated promising cardioprotective effects in preclinical studies. This

study investigates the efficacy and underlying mechanisms of Sal B in mitigating MI/RI in a rat model, thereby providing preclinical evidence to support its therapeutic application.

METHODS

Search strategy We systematically search the following six databases: PubMed, Web of Science, EMBASE, China National Knowledge Infrastructure (CNKI), Wanfang Database, and VIP Database. The search strategy consist of two thematic components: intervention and disease. Both Medical Subject Headings (MeSH) terms and free-text keywords were utilized in all searches. Two independent investigators perform the literature retrieval using the following terms to identify all relevant articles:"Salvianolic acid", "Salvianic acid", "Salvianolic acid B", "Salvianic acid B", "Myocardial Infarction", "Myocardial Ischemia", "Myocardial Reperfusion Injury", "Myocardial Ischemia/Reperfusion Injury", "Myocardial I/R", "Myocardial Reperfusion".

Participant or population Rats with established myocardial ischemia-reperfusion models are included in the study, while those that only underwent myocardial infarction modeling without subsequent reperfusion are excluded.

Intervention In this systematic review, Sal B is utilized as the intervention in the experimental groups, regardless of dosage and administration route, while the control groups received interventions such as normal saline, purified water, or no treatment.

Comparator A comparison will be made between the experimental groups treated with Sal B and the control groups receiving other treatments.

Study designs to be included Controlled experiments will be included.

Eligibility criteria Studies that meet the following criteria will be included: those using rats as subjects, employing a MI/RI animal model, administering Sal B as the intervention, and utilizing control groups treated with normal saline, purified water, or no treatment. The search will be limited to studies published in English or Chinese.

Information sources The literature search will cover PubMed, Web of Science, EMBASE, China National Knowledge Infrastructure (CNKI), Wanfang Database, and VIP Database. Dissertation theses will be included, while case reports, clinical trials, reviews, and conference abstracts will be excluded.

Main outcome(s) Primary endpoints are myocardial infarction area, cardiac biomarkers: creatine kinase-MB (CK-MB), lactate dehydrogenase (LDH), and echocardiographic parameters : maximum rate of left ventricular pressure rise(+dp/dt max), maximum rate of left ventricular pressure decline(-dp/dt max), Left Ventricular End-Diastolic Pressure (LVEDP).

Additional outcome(s) Secondary endpoints encompass myocardial injury-related markers and inflammatory indicators such as malondialdehyde (MDA), superoxide dismutase (SOD), Myocardial apoptosis index, endothelin(ET), catalase(CAT), tumor necrosis factor-α(TNF-α).

Data management Based on the pre-established inclusion criteria, two investigators independently extract relevant data. The extracted information included: first author, year of publication, species of experimental animals, sex, body weight, duration of ischemia, duration of reperfusion, experimental groups, dosage of Sal B, and route of administration. If multiple intervention groups with different doses of Sal B were reported in the same study, only the data from the highest dose group were included for analysis. For outcome measures where specific numerical values were not explicitly reported in the literature, we attempted to contact the original authors to obtain the data; studies were excluded if no response was received. Following independent data extraction by the two investigators, the results were cross-checked. Any discrepancies were resolved through discussion or by consulting a third reviewer to ensure the accuracy and reliability of the data extraction process.

Quality assessment / Risk of bias analysis The SYRCLE' s risk of bias tool was used to evaluate the risk of bias in the included studies. The CAMARADES checklist, a widely adopted tool for quality assessment in animal experimental research, is also employed in this study to evaluate the therapeutic interventions in the included studies. Two independent investigators perform the risk of bias and quality assessments. Any disagreements are resolved through discussion or by consulting a third reviewer.

Strategy of data synthesis This meta-analysis is performed using Review Manager (RevMan version 5.4) and Stata 18.0 software. Data are analyzed using standardized mean difference (SMD) or mean difference (MD) with 95% confidence intervals (CI).

A fixed-effects model is applied when heterogeneity was low ($p > 0.1$, $I^2 < 50\%$), while a random-effects model is used in the presence of significant heterogeneity ($p \leq 0.1$, $I^2 \geq 50\%$).

Subgroup analysis If more than three studies are included for a given outcome, subgroup analysis was conducted to explore potential sources of heterogeneity.

Sensitivity analysis Sensitivity analysis is carried out to evaluate the robustness and reliability of the results. Publication bias is assessed using Egger's test and funnel plots.

Language restriction The search will be limited to studies published in English or Chinese.

Country(ies) involved China.

Keywords MI/RI; Sal B; Meta-analysis; Preclinical studies; Animal models.

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