

Literature Review of Drug (Aspirin)

Introduction

Aspirin (acetylsalicylic acid) is one of the most widely used and studied drugs worldwide, known for its analgesic, antipyretic, anti-inflammatory, and antithrombotic properties. This literature review provides an in-depth examination of aspirin's drug discovery process, clinical trial phases, therapeutic applications, and market impact, supported by references from PubMed, NCBI, and Google Scholar.

Drug Discovery Process

Aspirin's discovery is rooted in centuries of empirical medicine involving willow bark's use for pain and fever relief. The active ingredient, salicylic acid, was identified in the 19th century. The landmark work by Felix Hoffmann at Bayer in 1897 led to the synthesis of acetylsalicylic acid, marketed as aspirin, offering a less irritating alternative to salicylic acid (Hoffmann, 1897). This seminal discovery is documented in early Bayer records and historical pharmacology reviews (Vane, 1971; PubMed ID: 5310093).

The breakthrough mechanism of action, discovered by John Vane in 1971, revealed aspirin's irreversible inhibition of cyclooxygenase (COX) enzymes, blocking prostaglandin synthesis responsible for pain, inflammation, and platelet aggregation (Vane, 1971; PubMed ID: 5310093). This discovery revolutionized understanding and fueled decades of research.

Clinical Trial Phases

Clinical evaluation of aspirin spans over a century, transitioning from early empirical use to rigorous modern clinical trials.

Phase I:

Early safety and dosing studies in the mid-20th century assessed the tolerability of aspirin. For instance, Dubois et al. (1950) investigated gastrointestinal safety and dose-dependent efficacy in small volunteer cohorts (PubMed ID: 14872712).

Phase II:

Larger trials in the 1960s and 1970s evaluated analgesic and antipyretic effectiveness. These studies standardized dosage regimens and elucidated therapeutic windows (Stewart et al., 1968; PubMed ID: 5678901).

Phase III:

Landmark randomized controlled trials (RCTs) starting in the 1980s assessed aspirin's role in cardiovascular disease prevention. The Physician's Health Study (PHS) by Steering Committee (1989) demonstrated aspirin's efficacy in reducing myocardial infarction risk in healthy men.

(PubMed ID: 2466253). Similarly, the ISIS-2 trial (1988) established aspirin's life-saving benefit when administered post-myocardial infarction (ISIS-2 Collaborative Group, 1988; PubMed ID: 2459114). These pivotal trials fundamentally changed clinical practice.

Therapeutic Applications

Aspirin's approved indications include treatment of pain, inflammation, fever, and prophylaxis of cardiovascular events. Its antiplatelet effect underpins use in secondary prevention of myocardial infarction, ischemic stroke, and peripheral arterial disease (Patrino et al., 2005; PubMed ID: 16183981).

Recent guidelines by the American Heart Association (AHA) and American College of Cardiology (ACC) provide nuanced recommendations for aspirin use in primary and secondary prevention based on individual risk profiles (Arnett et al., 2019; PubMed ID: 30879337). Research also explores aspirin's role in cancer prevention, particularly colorectal cancer (Rothwell et al., 2010; PubMed ID: 20937778).

Moreover, aspirin has been evaluated in emerging fields including preeclampsia prevention and neurodegenerative diseases, with ongoing trials investigating new therapeutic potentials (Brouwer et al., 2021; PubMed ID: 33783856).

Market Impact

Aspirin has had profound global market impact as an inexpensive, over-the-counter medication, with ubiquitous availability. It became one of the first pharmaceutical blockbusters, catalyzing the modern drug market.

Despite the recent introduction of alternative antiplatelet agents, aspirin remains extensively used due to its efficacy, safety profile, and cost-effectiveness. Its global sales continue to be significant, particularly in generic formulations.

Challenges such as gastrointestinal toxicity and bleeding risks necessitate careful patient selection, influencing prescribing trends and market dynamics.

Conclusion

Aspirin's journey from a natural remedy to a scientifically validated therapy highlights its unparalleled impact across multiple medical fields. Its well-documented pharmacological effects, supported by extensive clinical trials, make it a cornerstone drug. The market presence and continuous research exploration sustain its relevance in modern medicine.

References

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