A RELIABLE HPLC-PDA METHOD FOR THE DETERMINATION OF MELOXICAM IN RAT PLASMA: DEVELOPMENT, VALIDATION, AND BIODISTRIBUTION APPLICATION

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ABSTRACT

INTRODUCTION: Non-steroidal anti-inflammatory drugs (NSAIDs) have been investigated for potential roles in modulating neurotoxic pathways, such as β-amyloid peptide aggregation implicated in Alzheimer's disease. Meloxicam (MLX), a member of the enolic acid subclass of NSAIDs, is commonly prescribed for conditions like rheumatoid arthritis and osteoarthritis but its use is limited by gastric adverse efects. OBJECTIVE: To support toxicological assessments and characterize potential sex-based differences in drug metabolism and systemic exposure, a high-performance liquid chromatography with photodiode array detection (HPLC-PDA) method was developed and validated to quantify MLX in rat plasma. MATERIALS AND METHODS: For the MLX plasma extraction, liquid-liquid partitioning was employed. A Waters C18 column (150 mm × 4.6 mm × 5 μm) with a mobile phase of acetonitrile and water containing 0.05% triethylamine, pH adjusted to 3.0 with phosphoric acid, was used. The injection volume was 5 μL, with a 1.0 mL/min flow rate. Detection was performed at a wavelength of 365 nm, with a total running time of 9 minutes. The bioanalytical method was validated according to established international and national guidelines. RESULTS: The bioanalytical method showed linearity over a concentration range of 1–50 μg/mL (R^2 > 0.9992), with inter-day accuracy between 89.86% and 102.15%, and precision (RSD) from 0.30% to 5.92%. Sample stability was confirmed under various storage conditions,

making the method suitable for repeat analysis in long-term evaluations. CONCLUSION: The validated HPLC-PDA method is well-suited for pharmacokinetic and biodistribution studies of MLX, facilitating the assessment of sex-specific differences in toxicological conditions that may influence safety outcomes.

Keywords: Bioanalytical method; HPLC; Validation

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