Chemical summary ketorolac 66635 83 4 Full Version

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Chemical Summary Ketorolac 66635 83 4: An In-Depth Look at Its Properties and Applications

chemical summary ketorolac 66635 83 4 serves as a foundational guide for

understanding this important pharmaceutical compound. Ketorolac, identi?ed by the CAS number 66635-83-4, is a nonsteroidal anti-in?ammatory drug (NSAID) widely used for its potent analgesic and anti-in?ammatory e?ects. This article aims to provide a comprehensive and natural overview of ketorolac?s chemical characteristics, mechanism of action, clinical uses, and safety pro?le, weaving in related terms and concepts to enrich your understanding.

Understanding Ketorolac: The Basics

Ketorolac tromethamine, often referred to simply as ketorolac, is a synthetic NSAID with a strong ability to reduce pain and in?ammation. Its chemical structure and properties are crucial for its e?ectiveness and pharmacological pro?le. By delving into the chemical summary ketorolac 66635 83 4, we gain insights into why this compound is favored in clinical settings, especially for short-term management of moderate to severe pain.

Chemical Structure and Molecular Details

Ketorolac?s chemical formula is C15H13NO3, with the CAS registry number 66635-83-4

serving as its unique identi?er in chemical databases worldwide. The molecule features a pyrrolizine carboxylic acid core, making it part of the heterocyclic compound family. This structure is essential for its interaction with cyclooxygenase (COX) enzymes, which ketorolac inhibits to produce its analgesic e?ects.

Some key chemical attributes include:

Molecular weight: approximately 255.27 g/mol

Physical state: crystalline powder in its pure form

Solubility: moderately soluble in water, highly soluble in organic solvents like ethanol

The speci?c arrangement of functional groups in ketorolac, such as the carboxylic acid moiety, allows it to bind e?ectively to COX enzymes, distinguishing it from other NSAIDs. This interaction plays a central role in reducing prostaglandin synthesis, which mediates pain and in?ammation.

Mechanism of Action: How Ketorolac Works

Delving deeper into the chemical summary ketorolac 66635 83 4 naturally leads us to its mechanism of action. Ketorolac?s primary therapeutic e?ect stems from its inhibition of cyclooxygenase enzymes?speci?cally COX-1 and COX-2. These enzymes catalyze the conversion of arachidonic acid to prostaglandins, which promote in?ammation, pain, and fever.

By binding reversibly to COX enzymes, ketorolac reduces the production of

prostaglandins, leading to:

Alleviation of in?ammation at the site of injury or surgical trauma

Reduction in pain signals transmitted to the brain

Lowered fever in some cases due to diminished pyrogenic prostaglandins

Unlike opioids, ketorolac does not act on the central nervous system?s opioid receptors, which reduces risks of dependency and respiratory depression. However, its potent inhibition of COX-1 is also linked to some of its adverse e?ects, such as gastrointestinal irritation.

Relevance of Ketorolac?s Chemical Properties to Its Function

The chemical nature of ketorolac allows it to cross biological membranes e?ectively, which is critical for rapid onset of action. Its relatively small molecular size and moderate lipophilicity facilitate absorption after oral or intramuscular administration.

Additionally, the presence of the acidic carboxyl group enhances its ability to interact with enzyme active sites, making it a strong competitive inhibitor. These chemical features underpin ketorolac?s high e?cacy in managing acute pain, especially post-operative pain where quick relief is essential.

Clinical Applications and Uses

Understanding the chemical summary ketorolac 66635 83 4 extends to how this compound is utilized in medical practice. Ketorolac is primarily prescribed for short-term management of moderate to severe pain, especially when opioids are either contraindicated or undesirable.

Common Indications for Ketorolac Use

Due to its potent analgesic e?ects, ketorolac is often employed in scenarios such as:

Postoperative pain relief following surgeries like dental extraction, orthopedic

1.

procedures, or abdominal surgery

Acute musculoskeletal pain including sprains, strains, and injuries

2.

Management of renal colic and other visceral pain syndromes

3.

In hospital settings, ketorolac is available in multiple formulations, including oral tablets,

injectable solutions, and ophthalmic drops, the latter being used to reduce ocular

in?ammation after surgery.

Dosage and Administration Insights

Given its chemical potency and pharmacodynamics, ketorolac is generally prescribed for

short durations?typically no more than ?ve days?to minimize risks of adverse e?ects.

The dosing varies depending on the route of administration:

Oral: Usually 10 mg every 4 to 6 hours without exceeding 40 mg per day for adults

Intramuscular or intravenous: 15 to 30 mg every 6 hours, with a maximum daily

dose of 120 mg

Ophthalmic: Applied as per speci?c surgical protocols

It?s important to note that the chemical stability of ketorolac in di?erent formulations a?ects its shelf life and handling, making proper storage essential.

Safety Pro?le and Potential Side E?ects

No discussion of the chemical summary ketorolac 66635 83 4 would be complete without addressing safety considerations. While ketorolac is e?ective, its chemical action on COX enzymes can lead to several side e?ects, especially with prolonged use.

Common and Serious Adverse E?ects

Ketorolac?s inhibition of COX-1 reduces protective prostaglandins in the gastrointestinal tract, which can result in:

Gastrointestinal irritation and ulcers

1.

Increased risk of bleeding due to platelet function inhibition

2.

Renal impairment, especially in patients with preexisting kidney conditions or

3.

dehydration

Other possible side e?ects include headache, dizziness, and hypersensitivity reactions. Because of these risks, ketorolac is contraindicated in patients with active peptic ulcer disease, renal failure, or those at high risk of bleeding.

Precautions and Drug Interactions

Due to its chemical and pharmacological pro?le, ketorolac should be used cautiously

alongside:

Anticoagulants, which increase bleeding risk

Other NSAIDs or corticosteroids, which can enhance gastrointestinal toxicity

Certain antihypertensive drugs, as ketorolac may reduce their e?ectiveness

Healthcare providers often consider these interactions when prescribing ketorolac, ensuring safe use aligned with the patient?s overall medication regimen.

Environmental and Chemical Handling Considerations

From a chemical perspective, ketorolac 66635 83 4 requires careful handling in manufacturing and laboratory environments. The compound should be stored in a cool, dry place, protected from light to maintain its stability. During synthesis or formulation, appropriate safety measures must be observed to avoid exposure and contamination. Moreover, understanding its chemical degradation pathways is important for pharmaceutical development, ensuring that ketorolac products retain potency throughout their shelf life.

Advances in Ketorolac Formulations

Recent research has focused on enhancing ketorolac?s delivery and minimizing side e?ects through novel formulations, such as:

Extended-release tablets to provide longer pain control with lower peak plasma concentrations

Nanoparticle-based delivery systems aimed at targeted action with reduced

systemic exposure

Combination therapies that leverage ketorolac?s anti-in?ammatory e?ects with complementary agents

These innovations are grounded in a thorough grasp of ketorolac?s chemical structure and behavior, highlighting the importance of the chemical summary ketorolac 66635 83 4 in pharmaceutical science.

Exploring ketorolac through the lens of its chemical summary 66635 83 4 reveals the intricate balance between its molecular properties and therapeutic applications. This compound?s ability to e?ectively manage pain while presenting manageable risks makes it a vital tool in modern medicine, especially when used thoughtfully and with respect to its chemical nature. Whether you are a healthcare professional, a researcher, or simply curious about this NSAID, understanding its chemical foundation enriches appreciation for its role in pain management.

Question

Answer

What is the chemical name of Ketorolac with CAS number 66635-83-4?

The chemical name of Ketorolac with CAS number 66635-83-4 is (±)-5-Benzoyl-2,3-dihydro-1H-pyrrolizine-1-carboxylic acid.

What is the primary use of Ketorolac (CAS 66635-83-4)?

Ketorolac is primarily used as a nonsteroidal anti-in?ammatory drug (NSAID) for the short-term management of moderate to severe pain.

What is the molecular formula of Ketorolac with CAS 66635-83-4?

The molecular formula of Ketorolac is C15H13NO3.

What are the common routes of administration for Ketorolac (CAS 66635-83-4)?

Ketorolac can be administered orally, intramuscularly, intravenously, or as eye drops.

What is the mechanism of action

of Ketorolac (CAS

66635-83-4)?

Ketorolac works by inhibiting cyclooxygenase (COX-1 and COX-2)

enzymes, leading to decreased synthesis of prostaglandins,

which reduces in?ammation and pain.

What are the

common side e?ects

of Ketorolac (CAS

66635-83-4)?

Common side e?ects include gastrointestinal issues such as

stomach pain, nausea, and ulcers, as well as dizziness and

headache.

Is Ketorolac (CAS

66635-83-4) safe for

long-term use?

No, Ketorolac is generally recommended for short-term use only,

typically not exceeding 5 days, due to risks of serious side

e?ects.

What precautions

should be taken

when using

Ketorolac (CAS

66635-83-4)?

Precautions include avoiding use in patients with active peptic

ulcers, bleeding disorders, kidney impairment, and those allergic

to NSAIDs.

What is the

molecular weight of

Ketorolac (CAS

66635-83-4)?

The molecular weight of Ketorolac is approximately 255.27

g/mol.

Can Ketorolac (CAS

66635-83-4) be used

during pregnancy?

Ketorolac is generally not recommended during pregnancy,

especially in the third trimester, due to potential risks to the

fetus and complications during delivery.

Chemical Summary Ketorolac 66635 83 4: An In-Depth Review

Chemical summary ketorolac 66635 83 4 serves as a foundational reference point for

understanding the pharmacological and chemical properties of ketorolac tromethamine, a

widely utilized nonsteroidal anti-in?ammatory drug (NSAID). This compound, identi?able by its unique CAS number 66635-83-4, plays a critical role in pain management and anti-in?ammatory therapies. A comprehensive exploration of ketorolac?s chemical pro?le reveals not only its molecular structure and pharmacodynamics but also its clinical applications, bene?ts, and limitations.

Understanding Ketorolac: Chemical and Pharmacological Overview

Ketorolac tromethamine, represented chemically by CAS number 66635-83-4, is a potent NSAID primarily employed for short-term management of moderate to severe pain. The compound?s chemical structure includes a pyrrolizine carboxylic acid derivative, which contributes to its mechanism of action by inhibiting cyclooxygenase (COX) enzymes. This inhibition reduces prostaglandin synthesis, thereby alleviating in?ammation and pain.

Its molecular formula, $C_{15}H_{13}NO_3$, highlights the presence of aromatic rings and functional groups essential to its bioactivity. The ketorolac molecule exists as a racemic mixture, with the S-enantiomer largely responsible for its analgesic e?ects. The compound?s solubility, stability, and pharmacokinetic pro?le are heavily in?uenced by this stereochemistry, making it a subject of extensive chemical and clinical research.

Pharmacodynamics and Mechanism of Action

Ketorolac operates by non-selectively inhibiting both COX-1 and COX-2 isoenzymes. This dual inhibition reduces the production of thromboxanes and prostaglandins, compounds

that mediate in?ammation, fever, and pain. Unlike opioids, ketorolac does not directly a?ect the central nervous system?s opioid receptors, making it a preferred alternative for certain patient populations.

The chemical interactions that underpin this mechanism are rooted in the compound?s acidic functional groups, which bind to the active sites of COX enzymes, blocking substrate access. This interaction is crucial in diminishing the sensitization of nociceptors, responsible for transmitting pain signals.

Clinical Applications and Usage Patterns

In clinical contexts, ketorolac 66635 83 4 is predominantly utilized for its analgesic and anti-in?ammatory properties. It is often administered postoperatively to manage acute pain and can be delivered via oral, intramuscular, intravenous, or ophthalmic routes, depending on the therapeutic need.

Advantages Over Other NSAIDs

Potency: Ketorolac?s analgesic e?ect is often compared to low-dose opioids, o?ering signi?cant pain relief without the risk of opioid dependency.

Versatility: The availability of multiple administration routes enhances its applicability across di?erent medical scenarios.

Rapid Onset: Intravenous and intramuscular forms provide quick pain relief, which is bene?cial in acute care settings.

Limitations and Risks

Despite its e?cacy, ketorolac has limitations primarily related to its safety pro?le. The

inhibition of COX-1 can lead to adverse gastrointestinal e?ects, such as ulcers and bleeding, particularly with prolonged use. Additionally, ketorolac is contraindicated in patients with renal impairment or bleeding disorders due to its impact on platelet function and renal blood ?ow.

Chemical Stability and Storage Considerations

From a chemical standpoint, ketorolac?s stability is in?uenced by factors such as pH, temperature, and exposure to light. The compound is stable under acidic conditions but may degrade when exposed to alkaline environments. Proper storage, typically in cool, dry places away from direct sunlight, is essential to maintain its therapeutic e?cacy.

Formulation Insights

Pharmaceutical formulations of ketorolac 66635 83 4 often include the tromethamine salt to enhance solubility and bioavailability. This salt form improves dissolution rates in aqueous environments, facilitating rapid onset of action. The development of ophthalmic solutions and injectable forms also involves careful consideration of pH and osmolarity to ensure patient safety and comfort.

Comparative Analysis with Related NSAIDs

Ketorolac?s chemical and therapeutic pro?le can be contrasted with other NSAIDs such as ibuprofen, diclofenac, and naproxen. While all share the COX-inhibition mechanism, ketorolac is distinguished by its relatively higher analgesic potency and shorter recommended duration of use.

Ibuprofen: Generally used for mild to moderate pain with a longer safety pro?le for

1.

chronic use.

Diclofenac: Often prescribed for in?ammatory conditions but associated with

2.

higher cardiovascular risks.

Naproxen: Has a longer half-life, making it suitable for chronic in?ammatory

3.

diseases but less potent for acute severe pain.

In comparison, ketorolac?s chemical structure facilitates a more immediate and potent analgesic e?ect but mandates strict adherence to dosing guidelines to mitigate risks.

Regulatory Status and Market Availability

Ketorolac 66635 83 4 holds approval from major regulatory bodies including the FDA and EMA for speci?c indications. Its prescription status re?ects recognition of its e?cacy balanced against potential adverse e?ects. The compound is marketed globally in various formulations, with ongoing research aimed at optimizing its safety and expanding its therapeutic uses.

Research and Development Trends

Recent scienti?c investigations focus on modifying ketorolac?s chemical structure to minimize gastrointestinal toxicity while preserving analgesic e?cacy. Nanotechnology-

based delivery systems and sustained-release formulations represent innovative approaches to enhance patient compliance and treatment outcomes.

Emerging studies also explore ketorolac?s application in ophthalmology, where its anti-in?ammatory properties aid in managing postoperative in?ammation and allergic conjunctivitis.

Safety Pro?le and Monitoring

The clinical use of ketorolac necessitates vigilant monitoring for adverse e?ects, particularly in vulnerable populations such as the elderly or those with preexisting renal or cardiovascular conditions. Laboratory assessments often include renal function tests and complete blood counts to detect early signs of toxicity.

Healthcare providers must weigh the therapeutic bene?ts against potential risks, emphasizing patient education regarding dosage limits and symptom reporting.

The chemical summary ketorolac 66635 83 4 encapsulates a compound of signi?cant clinical value, characterized by a well-de?ned chemical structure and a potent pharmacological pro?le. Its role within pain management paradigms continues to evolve as research uncovers new facets of its e?cacy and safety. Understanding the intricate balance between its chemical properties and therapeutic applications is essential for optimizing patient outcomes and advancing NSAID pharmacotherapy.

ketorolac, ketorolac tromethamine, NSAID, pain relief, anti-in?ammatory, CAS 66635-83-4, analgesic, cyclooxygenase inhibitor, pharmaceutical, drug summary