[Template:Use dmy dates](/wiki/Template:Use_dmy_dates" \o "Template:Use dmy dates) [Template:Drugbox](/wiki/Template:Drugbox) **Ibuprofen**, from **isobutylphenylpropanoic acid**, is a [nonsteroidal anti-inflammatory drug](/wiki/Nonsteroidal_anti-inflammatory_drug) (NSAID) used for treating [pain](/wiki/Pain), [fever](/wiki/Fever), and [inflammation](/wiki/Inflammation).<ref name=AHFS2016/> This includes [painful menstrual periods](/wiki/Dysmenorrhea), [migraines](/wiki/Migraines), and [rheumatoid arthritis](/wiki/Rheumatoid_arthritis).<ref name=AHFS2016/> About 60% of people improve with any given NSAID, and it is recommended that if one does not work then another should be tried.<ref name=BNF67>[Template:Cite book](/wiki/Template:Cite_book)</ref> It may also be used to close a [patent ductus arteriosus](/wiki/Patent_ductus_arteriosus) in a [premature baby](/wiki/Premature_baby). It can be used by mouth or [intravenously](/wiki/Intravenously). It typically begins working within an hour.<ref name=AHFS2016/>

Common side effects include [heartburn](/wiki/Heartburn) and a [rash](/wiki/Rash).<ref name=AHFS2016/> Compared to other NSAIDs it may have fewer side effects such as [gastrointestinal bleeding](/wiki/Gastrointestinal_bleeding).<ref name=BNF67/> It increases the risk of [heart failure](/wiki/Heart_failure), [kidney failure](/wiki/Kidney_failure), and [liver failure](/wiki/Liver_failure).<ref name=AHFS2016/> At low doses, it does not appear to increase the risk of [myocardial infarction](/wiki/Myocardial_infarction); however, at higher doses it may. It may result in worsened [asthma](/wiki/Asthma).<ref name=BNF67/> While it is unclear if it is safe in early [pregnancy](/wiki/Pregnancy),<ref name=AHFS2016/> it appears to be harmful in later pregnancy and therefore is not recommended.[[1]](#cite_note-1) Like other NSAIDs, it works by inhibiting the making of [prostaglandins](/wiki/Prostaglandins) by decreasing the activity of the enzyme [cyclooxygenase](/wiki/Cyclooxygenase).<ref name=AHFS2016/> Ibuprofen might be a weaker anti-inflammatory than other NSAIDs.<ref name=BNF67/>

Ibuprofen was discovered in 1961 by [Stewart Adams](/wiki/Stewart_Adams_(chemist)) and marketed as **Brufen**.<ref name = plat12>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> It is available under a number of [trade names](/wiki/List_of_ibuprofen_brand_names), including **Advil**, **Motrin**, and **Nurofen**.<ref name=AHFS2016>[Template:Cite web](/wiki/Template:Cite_web)</ref>[[2]](#cite_note-2) It was first marketed in 1969 in the United Kingdom and in the United States in 1974.<ref name=AHFS2016/><ref name = plat12/> It is on the [WHO Model List of Essential Medicines](/wiki/WHO_Model_List_of_Essential_Medicines), the most important medications needed in a basic [health system](/wiki/Health_system).[[3]](#cite_note-3) It is available as a [generic medication](/wiki/Generic_medication).<ref name=AHFS2016/> The wholesale cost in the [developing world](/wiki/Developing_world) is between 0.01 and 0.04 USD per dose.[[4]](#cite_note-4) In the United States it costs about 0.05 USD per dose.<ref name=AHFS2016/>

## Contents

* 1 Medical uses[[edit](/index.php?title=(none)&action=edit&section=1)]
  + 1.1 Ibuprofen lysine[[edit](/index.php?title=(none)&action=edit&section=2)]
* 2 Adverse effects[[edit](/index.php?title=(none)&action=edit&section=3)]
  + 2.1 Cardiovascular risk[[edit](/index.php?title=(none)&action=edit&section=4)]
  + 2.2 Skin[[edit](/index.php?title=(none)&action=edit&section=5)]
  + 2.3 Interactions[[edit](/index.php?title=(none)&action=edit&section=6)]
  + 2.4 Overdose[[edit](/index.php?title=(none)&action=edit&section=7)]
  + 2.5 Miscarriage[[edit](/index.php?title=(none)&action=edit&section=8)]
* 3 Mechanism of action[[edit](/index.php?title=(none)&action=edit&section=9)]
* 4 Physical and chemical properties[[edit](/index.php?title=(none)&action=edit&section=10)]
  + 4.1 Stereochemistry[[edit](/index.php?title=(none)&action=edit&section=11)]
* 5 History[[edit](/index.php?title=(none)&action=edit&section=12)]
* 6 Marketing[[edit](/index.php?title=(none)&action=edit&section=13)]
  + 6.1 North America[[edit](/index.php?title=(none)&action=edit&section=14)]
* 7 Research[[edit](/index.php?title=(none)&action=edit&section=15)]
* 8 References[[edit](/index.php?title=(none)&action=edit&section=16)]
* 9 External links[[edit](/index.php?title=(none)&action=edit&section=17)]

## Medical uses[[edit](/index.php?title=(none)&action=edit&section=1)]

[thumb|200-mg ibuprofen tablets](/wiki/File:200mg_ibuprofen_tablets.jpg) Ibuprofen is used primarily to treat [fever](/wiki/Fever) (including postimmunisation fever), mild to moderate [pain](/wiki/Pain) (including pain relief after [surgery](/wiki/Surgery)), [painful menstruation](/wiki/Dysmenorrhoea), [osteoarthritis](/wiki/Osteoarthritis), dental pain, [headaches](/wiki/Headache), and [pain from kidney stones](/wiki/Renal_colic). About 60% of people respond to any NSAID; those who do not respond well to a particular one may respond to another.[[5]](#cite_note-5) It is used for inflammatory diseases such as [juvenile idiopathic arthritis](/wiki/Juvenile_idiopathic_arthritis) and [rheumatoid arthritis](/wiki/Rheumatoid_arthritis).[[6]](#cite_note-6)[[7]](#cite_note-7) It is also used for [pericarditis](/wiki/Pericarditis) and [patent ductus arteriosus](/wiki/Patent_ductus_arteriosus).<ref name=AHFS>[Template:Cite web](/wiki/Template:Cite_web)</ref>

### Ibuprofen lysine[[edit](/index.php?title=(none)&action=edit&section=2)]

In some countries, ibuprofen [lysine](/wiki/Lysine) (the lysine salt of ibuprofen, sometimes called "ibuprofen lysinate") is licensed for treatment of the same conditions as ibuprofen; the lysine salt is used because it is more water-soluble.[[8]](#cite_note-8) In 2006, ibuprofen lysine was approved in the US by the [Food and Drug Administration](/wiki/Food_and_Drug_Administration) (FDA) for closure of [*patent ductus arteriosus*](/wiki/Patent_ductus_arteriosus) in premature infants weighing between [Template:Convert](/wiki/Template:Convert), who are no more than 32 weeks gestational age when usual medical management (such as fluid restriction, diuretics, and respiratory support) is not effective.[[9]](#cite_note-9)

## Adverse effects[[edit](/index.php?title=(none)&action=edit&section=3)]

Adverse effects include [nausea](/wiki/Nausea), [dyspepsia](/wiki/Dyspepsia), [diarrhea](/wiki/Diarrhea), [constipation](/wiki/Constipation), gastrointestinal ulceration/bleeding, [headache](/wiki/Headache), [dizziness](/wiki/Dizziness), rash, salt and fluid retention, and [hypertension](/wiki/Hypertension).[[7]](#cite_note-7)[[10]](#cite_note-10) Infrequent adverse effects include esophageal ulceration, [heart failure](/wiki/Congestive_heart_failure), [hyperkalemia](/wiki/Hyperkalemia), [renal impairment](/wiki/Renal_failure), confusion, and [bronchospasm](/wiki/Bronchospasm).[[7]](#cite_note-7) Ibuprofen can exacerbate asthma, sometimes fatally.[[11]](#cite_note-11) Ibuprofen may be quantified in blood, plasma, or serum to demonstrate the presence of the drug in a person having experienced an anaphylactic reaction, confirm a diagnosis of poisoning in hospitalized patients, or assist in a medicolegal death investigation. A [monograph](/wiki/Monograph) relating ibuprofen plasma concentration, time since ingestion, and risk of developing renal toxicity in overdose patients has been published.<ref name=Baselt>[Template:Cite book](/wiki/Template:Cite_book)</ref>

### Cardiovascular risk[[edit](/index.php?title=(none)&action=edit&section=4)]

Along with several other NSAIDs, chronic ibuprofen use has been found correlated with risk of [hypertension](/wiki/Hypertension)[[12]](#cite_note-12) and [myocardial infarction](/wiki/Myocardial_infarction) (heart attack),[[13]](#cite_note-13) particularly among those chronically using high doses. In older hypertensive patients treated with [hydrochlorothiazide](/wiki/Hydrochlorothiazide), ibuprofen at a high daily dose was found to significantly increase systolic blood pressure.[[14]](#cite_note-14) On 9 July 2015, the US FDA toughened warnings of increased [heart attack](/wiki/Heart_attack) and [stroke](/wiki/Stroke) risk associated with ibuprofen and related NSAIDs; the NSAID [aspirin](/wiki/Aspirin) is not included in this warning.[[15]](#cite_note-15)

### Skin[[edit](/index.php?title=(none)&action=edit&section=5)]

Along with other NSAIDs, ibuprofen has been associated with the onset of [bullous pemphigoid](/wiki/Bullous_pemphigoid) or pemphigoid-like blistering.[[16]](#cite_note-16) As with other NSAIDs, ibuprofen has been reported to be a [photosensitising](/wiki/Photosensitivity) agent,[[17]](#cite_note-17) but it is considered a weak photosensitising agent compared to other members of the 2-arylpropionic acid class. Like other NSAIDs, ibuprofen is an extremely rare cause of the [autoimmune disease](/wiki/Autoimmune_disease) [Stevens-Johnson syndrome](/wiki/Stevens-Johnson_syndrome) (SJS).[[18]](#cite_note-18)[[19]](#cite_note-19)

### Interactions[[edit](/index.php?title=(none)&action=edit&section=6)]

Drinking alcohol when taking ibuprofen may increase the risk of stomach bleeding.<ref name=drugs>[Template:Cite web](/wiki/Template:Cite_web)</ref>

According to the [US Food and Drug Administration](/wiki/Food_and_Drug_Administration_(United_States)), "ibuprofen can interfere with the [antiplatelet](/wiki/Antiplatelet) effect of low-dose aspirin, potentially rendering aspirin less effective when used for cardioprotection and [stroke](/wiki/Stroke) prevention." Allowing sufficient time between doses of ibuprofen and immediate-release (IR) aspirin can avoid this problem. The recommended elapsed time between a dose of ibuprofen and a dose of aspirin depends on which is taken first. It would be 30 minutes or more for ibuprofen taken after IR aspirin, and 8 hours or more for ibuprofen taken before IR aspirin. However, this timing cannot be recommended for [enteric-coated](/wiki/Enteric_coating) aspirin. But, if ibuprofen is taken only occasionally without the recommended timing, the reduction of the cardioprotection and stroke prevention of a daily aspirin regimen is minimal.[[20]](#cite_note-20)

### Overdose[[edit](/index.php?title=(none)&action=edit&section=7)]

Ibuprofen overdose has become common since it was licensed for OTC use. Many overdose experiences are reported in the [medical literature](/wiki/Medical_journal), although the frequency of life-threatening complications from ibuprofen overdose is low.[[21]](#cite_note-21) Human response in cases of overdose ranges from absence of symptoms to fatal outcome despite intensive-care treatment. Most symptoms are an excess of the pharmacological action of ibuprofen, and include [abdominal pain](/wiki/Abdominal_pain), nausea, [vomiting](/wiki/Vomiting), drowsiness, dizziness, headache, [tinnitus](/wiki/Tinnitus), and [nystagmus](/wiki/Pathologic_nystagmus). Rarely, more severe symptoms, such as [gastrointestinal bleeding](/wiki/Gastrointestinal_bleeding), [seizures](/wiki/Seizures), [metabolic acidosis](/wiki/Metabolic_acidosis), [hyperkalaemia](/wiki/Hyperkalaemia), [hypotension](/wiki/Hypotension), [bradycardia](/wiki/Bradycardia), [tachycardia](/wiki/Tachycardia), [atrial fibrillation](/wiki/Atrial_fibrillation), [coma](/wiki/Coma), hepatic dysfunction, [acute renal failure](/wiki/Acute_renal_failure), [cyanosis](/wiki/Cyanosis), [respiratory depression](/wiki/Hypoventilation), and [cardiac arrest](/wiki/Cardiac_arrest) have been reported.[[22]](#cite_note-22) The severity of symptoms varies with the ingested dose and the time elapsed; however, individual sensitivity also plays an important role. Generally, the symptoms observed with an overdose of ibuprofen are similar to the symptoms caused by overdoses of other NSAIDs.

Correlation between severity of symptoms and measured ibuprofen plasma levels is weak. Toxic effects are unlikely at doses below 100 mg/kg, but can be severe above 400 mg/kg (around 150 tablets of 200 mg units for an average man);<ref name = Clinicalmedicine2003-Volans>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> however, large doses do not indicate the clinical course is likely to be lethal.[[23]](#cite_note-23) A precise [lethal dose](/wiki/Lethal_dose) is difficult to determine, as it may vary with age, weight, and concomitant diseases of the individual person.

Therapy is largely symptomatic. In cases presenting early, gastric decontamination is recommended. This is achieved using [activated charcoal](/wiki/Activated_charcoal); charcoal adsorbs the drug before it can enter the [systemic circulation](/wiki/Systemic_circulation). [Gastric lavage](/wiki/Gastric_lavage) is now rarely used, but can be considered if the amount ingested is potentially life-threatening, and it can be performed within 60 minutes of ingestion. [Emesis](/wiki/Vomiting) is not recommended.[[24]](#cite_note-24) The majority of ibuprofen ingestions produce only mild effects and the management of overdose is straightforward. Standard measures to maintain normal urine output should be instituted and [renal function](/wiki/Renal_function) monitored.[[25]](#cite_note-25) Since ibuprofen has acidic properties and is also excreted in the urine, [forced alkaline diuresis](/wiki/Forced_diuresis) is theoretically beneficial. However, because ibuprofen is highly protein-bound in the blood, renal excretion of unchanged drug is minimal. Forced alkaline diuresis is, therefore, of limited benefit.[[26]](#cite_note-26) Symptomatic therapy for hypotension, gastrointestinal bleeding, acidosis, and renal toxicity may be indicated. On occasion, close monitoring in an [intensive-care unit](/wiki/Intensive-care_unit) for several days is necessary. A patient who survives the acute intoxication usually experiences no late [sequelae](/wiki/Sequelae).

### Miscarriage[[edit](/index.php?title=(none)&action=edit&section=8)]

A study of pregnant woman suggests those taking any type or amount of NSAIDs (including ibuprofen, [diclofenac](/wiki/Diclofenac) and [naproxen](/wiki/Naproxen)) were 2.4 times more likely to [miscarry](/wiki/Miscarriage) than those not taking the drugs.[[27]](#cite_note-27) However, an Israeli study found no increased risk of miscarriage in the group of mothers using NSAIDs.[[28]](#cite_note-28)

## Mechanism of action[[edit](/index.php?title=(none)&action=edit&section=9)]

Nonsteroidal anti-inflammatory drugs such as ibuprofen work by [inhibiting](/wiki/Enzyme_inhibitor) the [COX](/wiki/Cyclooxygenase) [enzymes](/wiki/Enzyme), which convert [arachidonic acid](/wiki/Arachidonic_acid) to [prostaglandin H2](/wiki/Prostaglandin_H2) (PGH2). PGH2, in turn, is converted by other enzymes to several other [prostaglandins](/wiki/Prostaglandin) (which are mediators of pain, inflammation, and fever) and to [thromboxane A2](/wiki/Thromboxane_A2) (which stimulates [platelet](/wiki/Platelet) aggregation, leading to the formation of [blood clots](/wiki/Thrombus)).

The exact mechanism of action of ibuprofen is unknown. Ibuprofen is a nonselective inhibitor of cyclooxygenase, an enzyme involved in prostaglandin synthesis via the arachidonic acid pathway. Its pharmacological effects are believed to be due to inhibition of cyclooxygenase-2 (COX-2) which decreases the synthesis of prostaglandins involved in mediating inflammation, pain, fever, and swelling. Antipyretic effects may be due to action on the hypothalamus, resulting in an increased peripheral blood flow, vasodilation, and subsequent heat dissipation. Inhibition of COX-1 is thought to cause some of the side effects of ibuprofen including gastrointestinal ulceration. Ibuprofen is administered as a racemic mixture. The R-enantiomer undergoes extensive interconversion to the S-enantiomer *in vivo*. The S-enantiomer is believed to be the more pharmacologically active enantiomer.[[29]](#cite_note-29) Like aspirin and [indometacin](/wiki/Indometacin), ibuprofen is a nonselective COX inhibitor, in that it inhibits two [isoforms](/wiki/Isozyme) of cyclooxygenase, COX-1 and COX-2. The [analgesic](/wiki/Analgesic), [antipyretic](/wiki/Antipyretic), and anti-inflammatory activity of NSAIDs appears to operate mainly through inhibition of COX-2, whereas inhibition of COX-1 would be responsible for unwanted effects on the gastrointestinal tract.[[30]](#cite_note-30) However, the role of the individual COX isoforms in the analgesic, anti-inflammatory, and gastric damage effects of NSAIDs is uncertain and different compounds cause different degrees of analgesia and gastric damage.[[31]](#cite_note-31)

## Physical and chemical properties[[edit](/index.php?title=(none)&action=edit&section=10)]

It is practically insoluble in water, but very soluble in most organic solvents ([ethanol](/wiki/Ethanol), [methanol](/wiki/Methanol), [acetone](/wiki/Acetone) and [dichloromethane](/wiki/Dichloromethane)).<ref name = MD>[Template:Cite web](/wiki/Template:Cite_web)</ref>

### Stereochemistry[[edit](/index.php?title=(none)&action=edit&section=11)]

|  |  |
| --- | --- |
| [200px](/wiki/File:R-ibuprofen-A-2D-skeletal.png) | [200px](/wiki/File:S-ibuprofen-B-2D-skeletal.png) |
| [200px](/wiki/File:Ibuprofen-3D-balls.png) | [200px](/wiki/File:(S)-ibuprofen-3D-balls.png) |
| (*R*)-ibuprofen | (*S*)-ibuprofen |

It is an optically active compound with both *S* and *R*-isomers, of which the *S* (dextrorotatory) isomer is the more biologically active; this isomer has also been isolated and used medically (see [dexibuprofen](/wiki/Dexibuprofen) for details).<ref name = MD/>

Ibuprofen is produced industrially as a [racemate](/wiki/Racemate). The compound, like other 2-arylpropionate derivatives (including [ketoprofen](/wiki/Ketoprofen), [flurbiprofen](/wiki/Flurbiprofen), [naproxen](/wiki/Naproxen), etc.), does contain a chiral center in the α-position of the [propionate](/wiki/Propionate) moiety. So two [enantiomers](/wiki/Enantiomer) of ibuprofen occur, with the potential for different biological effects and metabolism for each enantiomer. Indeed, the (*S*)-(+)-ibuprofen ([dexibuprofen](/wiki/Dexibuprofen)) was found to be the active form both [*in vitro*](/wiki/In_vitro) and [*in vivo*](/wiki/In_vivo).

It was logical, then, to consider the potential for improving the selectivity and potency of ibuprofen formulations by marketing ibuprofen as a single-enantiomer product (as occurs with [naproxen](/wiki/Naproxen), another NSAID). Further *in vivo* testing, however, revealed the existence of an [isomerase](/wiki/Isomerase) ([alpha-methylacyl-CoA racemase](/wiki/Alpha-methylacyl-CoA_racemase)), which converted (*R*)-ibuprofen to the active (*S*)-[enantiomer](/wiki/Enantiomer).[[32]](#cite_note-32)[[33]](#cite_note-33)[[34]](#cite_note-34)

## History[[edit](/index.php?title=(none)&action=edit&section=12)]

Ibuprofen was derived from [propionic acid](/wiki/Propionic_acid) by the [research](/wiki/Research) arm of [Boots Group](/wiki/Boots_Group) during the 1960s.<ref name = pmid1569234>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> Its discovery was the result of research during the 1950s and 1960s to find a safer alternative to aspirin.<ref name = plat12/><ref name=IJCP03/> It was discovered by a team led by [Stewart Adams](/wiki/Stewart_Adams_(chemist)) and the patent application was filed in 1961.<ref name=plat12/> Adams initially tested the drug as treatment for his [hangover](/wiki/Hangover).[[35]](#cite_note-35) The drug was launched as a treatment for [rheumatoid arthritis](/wiki/Rheumatoid_arthritis) in the United Kingdom in 1969, and in the United States in 1974. Later, in 1983 and 1984, it became the first NSAID (other than aspirin) to be available [over the counter](/wiki/Over_the_counter) (OTC) in these two countries.<ref name = plat12/><ref name = IJCP03>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> Dr. Adams was subsequently awarded an [OBE](/wiki/Order_of_the_British_Empire) in 1987. Boots was awarded the [Queen's Award for Technical Achievement](/wiki/Queen's_Awards_for_Enterprise) for the development of the drug in 1987.<ref name=plat12/>

## Marketing[[edit](/index.php?title=(none)&action=edit&section=13)]

[Template:See also](/wiki/Template:See_also) [thumb|A bottle of generic ibuprofen](/wiki/File:Bottle_of_Ibuprofen_tablets_with_cap_removed_and_tablets_in_front.jpg) Ibuprofen was made available under prescription in the United Kingdom in 1969, and in the United States in 1974.[[36]](#cite_note-36) In the years since, the good tolerability profile, along with extensive experience in the population, as well as in so-called [phase-IV trials](/wiki/Clinical_trial) (postapproval studies), have resulted in the availability of ibuprofen OTC in pharmacies worldwide, as well as in supermarkets and other general retailers.[Template:Citation needed](/wiki/Template:Citation_needed) Ibuprofen is its [INN](/wiki/International_Nonproprietary_Name), [BAN](/wiki/British_Approved_Name), [AAN](/wiki/Australian_Approved_Name) and [USAN](/wiki/United_States_Adopted_Name) approved name. Advil is manufactured by [Pfizer](/wiki/Pfizer) and has been on the market since 1984.

### North America[[edit](/index.php?title=(none)&action=edit&section=14)]

Ibuprofen is commonly available in the United States up to the FDA's 1984 dose limit OTC, rarely used higher by prescription.<ref name=otcusa>[Template:Cite web](/wiki/Template:Cite_web)</ref> In 2009, the first injectable formulation of ibuprofen was approved in the United States, under the trade name Caldolor.[[37]](#cite_note-37)[[38]](#cite_note-38)

## Research[[edit](/index.php?title=(none)&action=edit&section=15)]

Ibuprofen is sometimes used for the treatment of acne because of its anti-inflammatory properties, and has been sold in Japan in topical form for adult acne.[[39]](#cite_note-39)<ref name=inpharma>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> As with other NSAIDs, ibuprofen may be useful in the treatment of severe [orthostatic hypotension](/wiki/Orthostatic_hypotension) (low blood pressure when standing up).[[40]](#cite_note-40) In some studies, ibuprofen showed superior results compared to a placebo in the prevention of [Alzheimer's disease](/wiki/Alzheimer's_disease), when given in low doses over a long time.[[41]](#cite_note-41)[[42]](#cite_note-42) Ibuprofen has been associated with a lower risk of [Parkinson's disease](/wiki/Parkinson's_disease), and may delay or prevent it. Aspirin, other NSAIDs, and [paracetamol](/wiki/Paracetamol) (acetaminophen) had no effect on the risk for Parkinson's.[[43]](#cite_note-43) In March 2011, researchers at [Harvard Medical School](/wiki/Harvard_Medical_School) announced in [*Neurology*](/wiki/Neurology_(journal)) that ibuprofen had a [neuroprotective](/wiki/Neuroprotection) effect against the risk of developing [Parkinson's disease](/wiki/Parkinson's_disease).[[44]](#cite_note-44)[[45]](#cite_note-45)[[46]](#cite_note-46) People regularly consuming ibuprofen were reported to have a 38% lower risk of developing Parkinson's disease, but no such effect was found for other pain relievers, such as aspirin and paracetamol. Use of ibuprofen to lower the risk of Parkinson's disease in the general population would not be problem-free, given the possibility of adverse effects on the urinary and digestive systems.<ref name=urj2011>[Template:Cite journal](/wiki/Template:Cite_journal)</ref>

## References[[edit](/index.php?title=(none)&action=edit&section=16)]

[Template:Reflist](/wiki/Template:Reflist)

## External links[[edit](/index.php?title=(none)&action=edit&section=17)]

[Template:Commons category](/wiki/Template:Commons_category)

* [U.S. National Library of Medicine: MedlinePlus Drug Information: Ibuprofen](http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682159.html)
* [University of Bristol chemistry department page on Ibuprofen](http://www.chm.bris.ac.uk/motm/ibuprofen/homepage.htm)
* [U.S. National Library of Medicine: Drug Information Portal – Ibuprofen](http://druginfo.nlm.nih.gov/drugportal/dpdirect.jsp?name=ibuprofen)

[Template:Anti-inflammatory and antirheumatic products](/wiki/Template:Anti-inflammatory_and_antirheumatic_products) [Template:Topical products for joint and muscular pain](/wiki/Template:Topical_products_for_joint_and_muscular_pain) [Template:Analgesics](/wiki/Template:Analgesics) [Template:Acne agents](/wiki/Template:Acne_agents) [Template:Prolactin inhibitors and anti-inflammatory products for vaginal administration](/wiki/Template:Prolactin_inhibitors_and_anti-inflammatory_products_for_vaginal_administration) [Template:Prostanoidergics](/wiki/Template:Prostanoidergics) [Template:Nuclear receptor ligands](/wiki/Template:Nuclear_receptor_ligands) [Template:Authority control](/wiki/Template:Authority_control)

[Category:Nonsteroidal anti-inflammatory drugs](/wiki/Category:Nonsteroidal_anti-inflammatory_drugs) [Category:Propionic acids](/wiki/Category:Propionic_acids) [Category:World Health Organization essential medicines](/wiki/Category:World_Health_Organization_essential_medicines) [Category:Pfizer products](/wiki/Category:Pfizer_products) [Category:RTT](/wiki/Category:RTT) [Category:British inventions](/wiki/Category:British_inventions)