ASPIRIN Veterinary—Systemic

Some commonly used *brand names* are:

For veterinary-labeled products—*AniPrin F; AniPrin P; Arthricare; Asen; Asen 240 Bolus; Asp-Rin; Centra ASA 240‡; Durasol; Equi-Phar ArthriBan; Equi-Prin; Equi-Spirin; Health Measures; Palaprin 65; Palaprin 325;* and *Vetrin.*

For human-labeled products—*Apo-ASA; Aspirin Caplets; Aspirin Children's Tablets; Aspirin Tablets; Aspir-Low; Aspirtab; Aspirtab-Max; Bayer Children's Aspirin; Empirin; Extra Strength Bayer Aspirin Caplets; Extra Strength Bayer Aspirin Tablets; Genuine Bayer Aspirin Caplets; Genuine Bayer Aspirin Tablets; Headache Tablet; Healthprin Adult Low Strength; Healthprin Full Strength; Healthprin Half-Dose; Norwich Aspirin; PMS-ASA;* and *St. Joseph Adult Chewable Aspirin*.

Note: For a listing of dosage forms and brand names by country availability, see the *Dosage Forms* section(s).

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‡*Aspirin* is a brand name in Canada; acetylsalicylic acid is the generic name. ASA, a commonly used designation for aspirin (or acetylsalicylic acid) in both the U.S. and Canada, is the term used in Canadian product labeling.

Category: Analgesic, anti-inflammatory (nonsteroidal); antidiarrheal (*Escherichia coli*–induced diarrhea); antipyretic; antirheumatic (nonsteroidal anti-inflammatory); platelet aggregation inhibitor.

Indications

Note: Bracketed information in the *Indications* section refers to uses that either are not included in U.S. product labeling or are for products not commercially available in the U.S.

Accepted

Note: Although veterinary forms of aspirin are marketed with label indications for *pain, fever,* and *inflammation*, the drug has never been approved by the United States Food and Drug Administration Center for Veterinary Medicine (FDA CVM) for these purposes.

Inflammation (treatment)[1]—*Dogs* and [*cats*]: Aspirin is used for the relief of inflammation associated with arthritis and joint problems.

Pain (treatment)—*Cattle, dogs*[1], *pigs*[1], and [*cats*][1]: Aspirin is used for relief from mild to moderate somatic pain, such as incisional pain following surgery, pain following dental procedures, and discomfort associated with cystitis.

Fever (treatment)[1]—*Cattle, dogs, pigs,* and [*cats*]: Aspirin is used to reduce fever; however, the treatment of fever with antipyretic medications is controversial and specific therapy for the underlying disease should be sought.

Acceptance not established

Inflammation (treatment);

Pain (treatment); or

Fever (treatment)[1]—*Horses:* Due to the rapid elimination of salicylate by horses, it is questionable whether therapeutic yet nontoxic concentrations can be maintained in the horse using conventional dosage intervals.

[Cardiomyopathy (treatment adjunct)][1]—*Cats:* Thromboembolism is a common sequelae to hypertrophic cardiomyopathy. Although aspirin is often employed to minimize the recurrence of this complication, there is no convincing evidence of its efficacy.{R-1; 2}

[*Escherichia coli* diarrhea (treatment)][1]—*Piglets:* Aspirin has been shown to reduce diarrhea and mortality in piglets infected with pathogenic *E. coli*.

[Heartworm disease (treatment adjunct)][1]—*Cats* and *dogs:* Aspirin has failed to produce a demonstrable benefit when administered during treatment of heartworm disease.{R-3-6}

[Laminitis (treatment)][1]—*Horses:* Although aspirin is sometimes employed to decrease thromboembolism in horses with laminitis,

there are no studies that have investigated the safety or efficacy of this use.

[Thromboembolism (prophylaxis)][1]—Aspirin, through inhibition of platelet thromboxane, has been shown to inhibit platelet aggregation in man, cats, dogs, and horses.{R-2; 6; 7-11} The actual efficacy of aspirin to prevent thromboembolism has been controversial and varies with the disease. Aspirin is ineffective in preventing the aggregation of bovine platelets.{R-12} Studies in man have indicated that concurrent use of other nonsteroidal anti-inflammatory drugs (NSAIDs) may decrease the antithrombotic activity of aspirin.

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[1]Not included in Canadian product labeling or product not commercially available in Canada.

Regulatory Considerations

U.S.—

Aspirin does not have specific approval by the Food and Drug Administration for use in animals; therefore, there are no established withdrawal times for use of this medication in food-producing animals.{R-13} See recommendations on withdrawals for extra-label administration in the *Dosage Forms* section of this monograph.

Chemistry

Source: Manufactured from salicylic acid and acetic anhydride.{R-14}

Chemical name: Benzoic acid, 2-(acetyloxy)-.{R-15}

Molecular formula: $C_9H_8O_4$.{R-15}

Molecular weight: 180.16.{R-15}

Description: Aspirin USP—White crystals, commonly tabular or needle-like, or white, crystalline powder. Is odorless or has a faint odor. Is stable in dry air; in moist air it gradually hydrolyzes to salicylic and acetic acids.{R-16}

pKa: 3.5.{R-14; 17}

Solubility: Aspirin USP—Slightly soluble in water; freely soluble in alcohol; soluble in chloroform and in ether; sparingly soluble in absolute ether.{R-16}

Pharmacology/Pharmacokinetics

Note: See also *Table 1. Pharmacology/Pharmacokinetics* at the end of this monograph.

Mechanism of action/Effect: The effectiveness of aspirin is largely due to its ability to inhibit prostaglandin synthesis. This is done by irreversibly blocking cyclooxygenase (prostaglandin synthase), which catalyzes the conversion of arachidonic acid to endoperoxide compounds; at appropriate doses, the drug decreases the formation of both the prostaglandins and thromboxane A2 but not the leukotrienes.{R-18}

Other actions/effects: It has been proposed that the gastrointestinal toxicity of salicylates, especially aspirin, may be caused primarily by reduction of the activity of prostaglandins (which exert a protective effect on the gastrointestinal mucosa) because upper gastrointestinal toxicity has been reported following rectal or parenteral administration of a nonsteroidal anti-inflammatory drug. However, when administered orally, these acidic medications (unless administered in an enteric-coated formulation) probably also exert a direct irritant or erosive effect on the mucosa.{R-19}

Absorption: Salicylates are rapidly and completely absorbed following oral administration to cats, dogs, and pigs. They are slowly and incompletely absorbed by ruminants and horses.

Distribution: Free aspirin is widely distributed into various tissues of the body.

Biotransformation: Aspirin is rapidly hydrolyzed to salicylic acid by plasma esterases in all species.{R-20}

Time to peak plasma concentration: *Human data*—Generally 1 to 2 hours with single doses; may be more rapid with liquid dosage forms; may be delayed with delayed-release tablet or capsule formulations.[{R-19}]

Peak plasma concentration: Therapeutic serum salicylate concentrations varied from 9.15 to 11.90 mg/dL in dogs given plain aspirin orally at a dose of 25 mg per kg of body weight (mg/kg) every 8 hours.[{R-21}]

Milk concentrations: *Human data*—Peak salicylate concentrations of 173 to 483 mcg/mL were measured in breast milk 5 to 8 hours after maternal ingestion of a single total aspirin dose of 650 mg.[{R-19}]

Elimination: Renal, primarily as free salicylic acid and as conjugated metabolites. In the horse, salicylic acid is the primary salicyl compound found in urine while in other domesticated species varying quantities of metabolites are excreted.

Cats: Aspirin has been shown to have dose-dependent elimination in cats, with longer elimination half-lives seen with larger doses.

Precautions to Consider

Species sensitivity

Cats—Cats may develop salicylism unless aspirin dosage is carefully controlled. Cats are deficient in the enzyme glucuronyl transferase, an important conjugation mechanism in other species.

Dogs—Some individual dogs will not tolerate continuous therapy with aspirin because they develop gastrointestinal irritation.

Lactation

Salicylates are distributed into milk; however, problems have not been observed in nursing offspring.

Pediatrics

Salicylates are more slowly eliminated in animals less than 30 days of age. In addition, the extent of protein binding is less during this period.

Human precautions to consider[{R-19}]

In addition to the above precautions for the use of this medication in animals, the following precautions to consider have been reported in humans and are included in the human monograph *Salicylates (Systemic)* in *USP DI Volume I;* these precautions are intended for informational purposes only and may or may not be applicable to the use of aspirin in the treatment of animals.

Cross-sensitivity and/or related problems

Patients sensitive to one salicylate, including methyl salicylate (oil of wintergreen), or to other nonsteroidal anti-inflammatory drugs (NSAIDs) may be sensitive to salicylates also.

Patients sensitive to aspirin may not necessarily be sensitive to non-acetylated salicylates.

Patients sensitive to tartrazine dye may be sensitive to aspirin also, and vice versa.

Cross-sensitivity between aspirin and other NSAIDS that result in bronchospastic or cutaneous reactions may be eliminated if the patient undergoes a desensitization procedure.

Pregnancy/Reproduction

Fertility—Salicylates have caused increased numbers of fetal resorptions in animal studies.

Pregnancy—

First trimester—Salicylates readily cross the placenta, but controlled studies using aspirin in humans have not shown proof of teratogenicity. However, studies in animals have shown that salicylates cause birth defects, including fissure of the spine and skull, facial clefts, eye defects and malformation of the CNS, viscera and skeleton. FDA pregnancy category D.

Third trimester—Chronic, high dose salicylate therapy may result

in prolonged gestation, increased risk of postmaturity syndrome (fetal damage or death due to decreased placental function, if pregnancy is greatly prolonged) and maternal antenatal hemorrhage. Overuse or abuse of aspirin in late gestation has been reported to increase the risk of stillbirth or neonatal death, possibly because of antenatal hemorrhage or premature ductus arteriosis closure, leading to persistent pulmonary hypertension and heart failure. Low birth weight is also a consideration.

Labor and delivery—Chronic, high dose salicylate therapy late in pregnancy may result in prolonged labor, complicated deliveries and increased risk of maternal or fetal hemorrhage.

Geriatrics

Geriatric patients may be more susceptible to the toxic effects of salicytates, possibly because of decreased renal function. Lower doses than those usually recommended for adults, especially for long-term use or for use of long-acting salicylates, may be required.

Drug interactions and/or related problems

The following drug interactions and/or related problems have been selected on the basis of their potential clinical significance (possible mechanism in parentheses where appropriate)—not necessarily inclusive; » = major clinical significance:

Note: Combinations containing any of the following medications, depending on the amount present, may also interact with this medication.

Corticosteroids or

Nonsteroidal anti-inflammatory analgesics

(concurrent use may increase the risk of hypernatremia and edema; also, concurrent use will increase the risk of gastrointestinal ulcers)[R-22]

Digitalis glycosides

(aspirin given at a dosage of 50 mg per kg of body weight [mg/kg] will increase digoxin serum concentrations up to 130% of normal)

Human drug interactions and/or related problems:[R-19]

In addition to the above drug interactions reported in animals, the following drug interactions have been reported in humans and are included in the human monograph *Salicylates (Systemic)* in *USP DI Volume I;* these drug interactions are intended for informational purposes only and may or may not be applicable to the use of aspirin in the treatment of animals.

Note: Combinations containing any of the following medications, depending on the amount present, may also interact with this medication.

In addition to the interactions listed below, the possibility should be considered that additive or multiple effects leading to impaired blood clotting and/or increased risk of bleeding may occur if a salicylate, especially aspirin, is used concurrently with any medication having a significant potential for causing hypoprothrombinemia, thrombocytopenia, or gastrointestinal ulceration or hemorrhage.

For all salicylates

Acetaminophen

(prolonged concurrent use of acetaminophen with a salicylate is not recommended because chronic, high dose administration of the combined analgesics [1.35 grams daily, or cumulative ingestion of 1 kg annually, for 3 years or longer] significantly increases the risk of analgesic nephropathy, renal papillary necrosis, end stage renal disease, and cancer of the kidney or urinary bladder; also, it is recommended that for short-term use the combined dose of acetaminophen plus a salicylate not exceed that recommended for acetaminophen or a salicylate given individually)

Acidifiers, urinary, such as:

Ammonium chloride

Ascorbic acid (Vitamin C)

Potassium or sodium phosphates
(acidification of the urine by these medications decreases salicylate excretion leading to increased salicylate plasma concentrations; initiation of therapy with these medications in patients stabilized on a salicylate may lead to toxic salicylate concentrations)
(aspirin may increase urinary excretion of ascorbic acid; clinical significance is unclear, but some clinicians recommend ascorbic acid supplementation in patients receiving prolonged high-dose aspirin therapy)

Alcohol or

Nonsteroidal anti-inflammatory drugs (NSAIDS), other
(concurrent use of these medications with a salicylate may increase the risk of gastrointestinal side effects, including ulceration and blood loss; also, concurrent use of a salicylate with an NSAID may increase the risk of severe gastrointestinal side effects without providing additional symptomatic relief and is therefore not recommended)
(aspirin may decrease the bioavailability of many NSAIDs, including diflunisal, fenoprofen, indomethacin, meclofenamate, piroxicam [to 80% of the usual plasma concentration], and the active sulfide metabolite of sulindac; aspirin has also been shown to decrease the protein binding and increase the plasma clearance of ketoprofen, and to decrease the formation and excretion of ketoprofen conjugates)
(concurrent use of other NSAIDs with aspirin may also increase the risk of bleeding at sites other than the gastrointestinal tract because of additive inhibition of platelet aggregation)

Alkalizers, urinary, such as:
Carbonic anhydrase inhibitors
Citrates
Sodium bicarbonate or
Antacids, chronic high-dose use, especially calcium- and/or magnesium containing
(alkalinization of the urine by these medications increases salicylate excretion, leading to decreased salicylate plasma concentrations, reduced effectiveness, and shortened duration of action; also, withdrawal of a urinary alkalizer from a patient stabilized on a salicylate may increase the plasma salicylate concentration to a toxic level; however, the antacids present in buffered aspirin formulations may not be present in sufficient quantities to alkalinize the urine)
(metabolic acidosis induced by carbonic anhydrase inhibitors may increase penetration of salicylate into the brain and increase the risk of salicylate toxicity in patients taking large [antirheumatic] doses of salicylate; if acetazolamide is used to produce forced alkaline diuresis in the treatment of salicylate poisoning, the increased risk of severe metabolic acidosis and increased salicylate toxicity must be considered and an alkaline intravenous solution given concurrently)

Anticoagulants, coumarin- or indandione-derivative or

Heparin or

Thrombolytic agents, such as:
Alteplase
Anistreplase
Streptokinase
Urokinase
(salicylates may displace a coumarin- or indandione-derivative anticoagulant from its protein binding sites, and, in high doses, may cause hypothrombinemia, leading to increased anticoagulation and risk of bleeding)
(the potential occurrence of gastrointestinal ulceration or hemorrhage during salicylate, especially aspirin, therapy may cause increased risk to patients receiving anticoagulant or thrombolytic therapy)
(because aspirin-induced inhibition of platelet function may lead to prolonged bleeding time and increased risk of hemorrhage, concurrent use of aspirin with an anticoagulant

or a thrombolytic agent is recommended only within a carefully monitored antithrombotic regimen, although a recent study has shown that initiation of therapy with 160 mg of aspirin a day concurrently with short-term [1-hour] intravenous infusion with streptokinase in patients with acute coronary arterial occlusion significantly decreases the risk of reocclusion, reinfarction, stroke and death without increasing the risk of adverse effects [as compared with streptokinase alone], other studies using higher doses of aspirin and/or more prolonged administration of a thrombolytic agent have demonstrated an increased risk of bleeding)

Anticonvulsants, hydantoin
(salicylates may decrease hydantoin metabolism, leading to increases in hydantoin plasma concentrations, efficacy, and/or toxicity; adjustment of hydantoin dosage may be required when chronic salicylate therapy is initiated or discontinued)

Antidiabetic agents, oral or
Insulin
(effects of these medications may be increased by large doses of salicylates; dosage adjustments may be necessary; potentiation of oral antidiabetic agents may be caused partially by displacement from serum proteins; glypizide and glyburide, because of their nonionic binding characteristics, may not be affected as much as the other oral agents; however, caution in concurrent use is recommended)

Antiemetics, including antihistamines and phenothiazines
(antiemetics may mask the symptoms of salicylate-induced ototoxicity, such as dizziness, vertigo, and tinnitus)

Bismuth subsalicylate
(ingestion of large repeated doses as for traveler's diarrhea may produce substantial salicylate concentration; concurrent use with large doses of analgesic salicylates may increase the risk of salicylate toxicity)

Cefamandole or
Cefoperazone or
Cefotetan or
Plicamycin or
Valproic acid
(these medications may cause hypoprothrombinemia; in addition, plicamycin or valproic acid may inhibit platelet aggregation; concurrent use with aspirin may increase the risk of bleeding because of additive interferences with blood clotting)
(hypoprothrombinemia induced by large doses of salicylates, and the potential occurrence of gastrointestinal ulceration or hemorrhage during aspirin therapy may increase the risk of bleeding complications in patients receiving these medications)
(concurrent use of aspirin with valproic acid has also been reported to increase the plasma concentration of valproic acid and induce valproic acid toxicity)

Corticosteroids or
Corticotropin (ACTH), chronic therapeutic use of
(glucocorticoids or corticotropin may increase salicylate excretion, resulting in lower plasma concentrations and increased salicylate dosage requirements; salicylism may result when glucocorticoids or corticotropin dosage is subsequently decreased or discontinued, especially in patients receiving large [antirheumatic] doses of salicylate; also, the risk of gastrointestinal side effects, including ulceration and gastrointestinal blood loss, may be increased; however, concurrent use in the treatment of arthritis may provide additive therapeutic benefit and permit reduction of glucocorticoid or corticotropin use)
(because adrenocorticoids and corticotropin may cause sodium and fluid rentention, caution in concurrent use of large doses of sodium salicylate is recommended)

Furosemide

(in addition to increasing the risk of ototoxicity, concurrent use of furosemide with high doses of salicylate may lead to salicylate toxicity because of competition for renal excretory sites)

Laxatives, cellulose-containing
(concurrent use may reduce the salicylate effect because of physical binding or other absorptive hindrance; medications should be administered 2 hours apart)

Methotrexate
(salicylates may displace methotrexate from its binding sites and decrease its renal clearance, leading to toxic methotrexate plasma concentrations; if they are used concurrently, methotrexate dosages should be decreased, the patient observed for signs of toxicity and/or methotrexate plasma concentration monitored; also, it is recommended that salicylate therapy be discontinued 24 to 48 hours prior to administration of a high dose methotrexate infusion, and not resumed until plasma methotrexate concentration has decreased to a nontoxic level [usually at least 12 hours postinfusion])

Ototoxic medications, other, especially
Vancomycin
(concurrent or sequential administration of these medications with a salicylate should be avoided because the potential for ototoxicity may be increased; hearing loss may occur and may progress to deafness even after discontinuation of the medication; these effects may be reversible, but usually are permanent)

Platelet aggregation inhibitors
(concurrent use with aspirin is not recommended, except in a monitored antithrombotic regimen, because the risk of bleeding may be increased)
(the potential of occurrence of gastrointestinal ulceration or hemorrhage due to salicylate therapy, and the hypothrombinemic effect of large doses of salicylate, may cause increased risk to patients receiving a platelet aggregation inhibitor)

Probenecid or
Sulfinpyrazone
(concurrent use of a salicylate is not recommended when these medications are used to treat hyperuricemia or gout, because the uricosuric effect of these medications may be decreased by the doses of salicylate that produce serum salicylate concentrations above 5 mg per 100 mL; also, these medications may inhibit the uricosuric effect achieved when serum salicylate concentrations are above 10 to 15 mg per 100 mL)
(probenecid may decrease renal clearance and increase plasma concentrations and toxicity of salicylates)
(sulfinpyrazone may decrease salicylate excretion and/or displace salicylate from its protein binding sites, possibly leading to increased salicylate concentrations and toxicity)
(although low doses of sulfinpyrazone and aspirin have been used concurrently to provide additive inhibition of platelet aggregation, the efficacy of the combination has not been established and the increased risk of bleeding must be considered; also, concurrent use of sulfinpyrazone with aspirin may increase the risk of gastrointestinal ulceration or hemorrhage)

Salicylic acid or other salicylates, topical
(concurrent use with systemic salicylates may increase the risk of salicylate toxicity if significant quantities are absorbed)

Vitamin K
(requirements for this vitamin may be increased in patients receiving high doses of salicylate)

Zidovudine
(in theory, aspirin may completely inhibit the hepatic glucuronidation and decrease the clearance of zidovudine, leading to potentiation of zidovudine toxicity; the possibility

must be considered that aspirin toxicity may also be increased)

For buffered aspirin formulations, choline and magnesium salicylates or magnesium salicylate (in addition to those interactions listed above as applying to all salicylates)

Ciprofloxacin or
Enoxacin or
Itraconazole or
Ketoconazole or
Lomefloxacin or
Ofloxacin or
Tetracyclines, oral
(antacids present in buffered aspirin formulations, and the magnesium in choline and magnesium salicylate or magnesium salicylate, interfere with absorption of these medications; if used concurrently, the interacting salicylate should be taken at least 6 hours before or 2 hours after ciprofloxacin or lomefloxacin, 8 hours before or 2 hours after enoxacin, 2 hours after itraconazole, 3 hours before or after ketoconazole, 2 hours before or after norfloxacin or ofloxacin, and 3 to 4 hours before or after a tetracycline)

For enteric-coated formulations (in addition to those interactions listed above as applying to all salicylates)

Antacids or
Histamine H_2-receptor antagonists
(concurrent administration of these medications, which increase intragastric pH, with an enteric-coated medication may cause premature dissolution, and loss of the protective effect, of the enteric coating)

For formulations containing caffeine (in addition to those interactions listed above as applying to all salicylates)

CNS stimulation–producing medications, other
(concurrent use with caffeine may result in excessive CNS stimulation, which may cause unwanted effects such as nervousness, irritability, insomnia, or possibly convulsions or cardiac arrhythmias; close observation is recommended)
Lithium
(caffeine increases urinary excretion of lithium, thereby possibly reducing its therapeutic effect)
Monoamine oxidase (MAO) inhibitors, including furazolidone, pargyline, and procarbazine
(concurrent use of large amounts of caffeine with MAO inhibitors may produce dangerous cardiac arrhythmias or severe hypertension because of the sympathomimetic side effects of caffeine)

Human laboratory value alterations[R-19]

The following laboratory value alterations have been reported in humans, and are included in the human monograph *Salicylates (Systemic)* in *USP DI Volume I;* these laboratory value alterations are intended for informational purposes only and may or may not be applicable to the use of aspirin in the treatment of animals:

With diagnostic test results

For all salicylates

Copper sulfate urine sugar tests
(false-positive test results may occur with chronic use of salicylates in doses equivalent in salicylate content to 2.4 grams or more of aspirin a day, i.e., 3.2 grams of choline salicylate, 2.4 grams of choline and magnesium salicylates, 2 grams of magnesium salicylate, 1.8 grams of salsalate, or 2.4 grams of sodium salicylate a day)
Gerhardt test for urine acetoacetic acid
(interference may occur because reaction with ferric chloride produces a reddish color that persists after boiling)
Glucose enzymatic urine sugar tests
(false-negative test results may occur with chronic use of salicylates in doses equivalent in salicylate content to 2.4 grams or more of aspirin a day, i.e., 3.2 grams of choline salicylate, 2.4 grams of choline and magnesium salicylates, 2

grams of magnesium salicylate, 1.8 grams of salsalate, or 2.4 grams of sodium salicylate a day)

Renal function test using phenolsulfonphthalein (PSP)
(salicylate may competitively inhibit renal tubular secretion of PSP, thereby decreasing urinary PSP concentration and invalidating test results)

Serum uric acid determinations
(falsely increased values may occur with colorimetric assay methods when plasma salicylate concentrations exceed 13 mg per 100 mL; the uricase assay method is not affected)

Thyroid imaging, radionucleotide
(chronic salicylate administration may depress thyroid function; salicylate therapy should be discontinued at least 1 week prior to administration of the radiopharmaceutical; however, a rebound effect may occur following discontinuation of the salicylate therapy, resulting in a period of 3 to 10 days of increased thyroidal uptake)

Urine vanillylmandelic acid (VMA) determinations
(values may be falsely increased or decreased, depending on method used)

For aspirin (in addition to those interferences listed above for all salicylates)

Protirelin-induced thyroid-stimulating hormone (TSH) release determinations
(TSH response to protirelin may be decreased by 2 to 3.6 grams of aspirin daily; peak TSH concentrations occur at the same time after administration, but are reduced)

Urine 5-hydroxyindoleacetic acid (5-HIAA) determinations
(aspirin may alter results when fluorescent method is used)

For caffeine-containing formulations (in addition to the diagnostic interferences listed above)

Myocardial perfusion imaging, radionuclide, when adenosine or dipyridamole is used as an adjunct to the radiopharmaceutical
(caffeine may reverse the effects of adenosine or dipyridamole on myocardial blood flow, thereby interfering with the test results; patients should be advised to avoid caffeine for at least 8 to 12 hours prior to the test)

With physiology/laboratory test values

For all salicylates

Liver function tests, including;
Serum alanine aminotransferase (ALT [SGPT]) and
Serum alkaline phosphatase and
Serum aspartate aminotransferase (AST [SGOT])
(abnormalities may occur, especially in patients with juvenile rheumatoid arthritis, systemic lupus erythematosus, or pre-existing history of liver disease, or when plasma salicylate concentrations exceed 25 mg per 100 mL; liver function test values may return to normal despite continued use or when dosage is decreased; however, if severe abnormalities occur, or if there is evidence of active liver disease, the medication should be discontinued and used with caution in the future)

Prothrombin time
(may be prolonged with large doses of salicylates, especially if plasma concentrations exceed 30 mg per 100 mL)

Serum cholesterol concentrations
(may be decreased by chronic use of salicylates in doses equivalent in salicylate content to 5 grams or more of aspirin per day, i.e., 6.7 grams of choline salicylate, 5 grams of choline and magnesium salicylates, 4.1 grams of magnesium salicylate, 3.8 grams of salsalate, or 5 grams of sodium salicylate a day)

Serum potassium concentrations
(may be decreased because of increased potassium excretion caused by direct effect on renal tubules)

Serum thyroxine (T_4) concentrations and
Serum triiodothyronine (T_3) concentrations
(may be decreased when determined by radioimmunoassay—with large doses of salicylates)

Serum uric acid concentrations

(may be increased or decreased, depending on salicylate dosage; plasma salicylate concentrations below 10 to 15 mg per 100 mL increase serum uric acid concentrations and higher plasma salicylate concentrations decrease uric acid concentrations)

T_3 resin uptake

(may be increased with large doses of salicylate)

For aspirin only (in addition to the interferences listed above)

Bleeding time

(may be prolonged by aspirin for 4 to 7 days because of suppressed platelet aggregation; as little as 40 mg of aspirin affects platelet function for at least 96 hours following administration; however, clinical bleeding problems have not been reported with small doses [150 mg or less])

Medical considerations/Contraindications

The medical considerations/contraindications included have been selected on the basis of their potential clinical significance (reasons given in parentheses where appropriate)—not necessarily inclusive (» = major clinical significance).

Except under special circumstances, this medication should not be used when the following medical problems exist:

» Bleeding disorders

(increased risk of hemorrhage)

» Gastrointestinal bleeding or ulceration

(the presence of lesions before treatment can put an animal at risk of exacerbation or perforation)

Risk-benefit should be carefully considered when the following medical problem exists:

Cats

Feline tracheobronchitis

Patient monitoring

The following may be especially important in patient monitoring (other tests may be warranted in some patients, depending on condition; » = major clinical significance):

Cats and *dogs*

Blood chemistry

Complete blood count (CBC)

Test for occult blood in feces

(periodic laboratory tests during treatment have been suggested for animals receiving high dose or long-term therapy)

Side/Adverse Effects

The following side/adverse effects have been selected on the basis of their potential clinical significance (possible signs and, for humans, symptoms in parentheses where appropriate—not necessarily inclusive):

Those indicating need for medical attention

Incidence more frequent

Cats and *dogs*

Gastric irritation (anorexia, nausea, or vomiting); ***ulceration of gastrointestinal mucosa with bleeding***—due to multiple effects, including inhibition of prostaglandin synthesis in gut leading to altered secretion of mucus and decreased cytoprotection

Incidence less frequent

Cats

Salicylism, acute

Incidence rare

All species

Allergic reactions

Human side/adverse effects[R-19]

In addition to the above side/adverse effects reported in animals, the following side/adverse effects have been reported in humans, and are included in the human monograph *Salicylates (Systemic)* in *USP DI Volume I;* these side/adverse effects are intended for informational

purposes only and may or may not be applicable to the use of aspirin in the treatment of animals:

Incidence more frequent with aspirin; less frequent with enteric-coated or buffered formulations of aspirin and with other salicylates

Gastrointestinal irritation

Incidence less frequent or rare

Anaphylactoid reaction; anemia—may occur secondary to gastrointestinal microbleeding; ***anemia, hemolytic***—almost always reported in patients with glucose-6-phosphate deficiency (G6PD); ***bronchospastic allergic reaction; dermatitis, allergic; gastrointestinal ulceration, possibly with bleeding***

Note: Salicylates may decrease renal function, especially when serum salicylate concentrations reach 250 mcg per mL (25 mg per 100 mL). However, the risk of complications due to this action appears minimal in patients with normal renal function.

Aspirin-induced bronchospasm is most likely to occur in patients with the triad of asthma, allergies, and nasal polyps induced by aspirin. Nonacetylated salicylates may rarely cause bronchospastic reactions in susceptible people when very large doses are given.

Angioedema or urticaria may be more likely to occur in patients with a history of recurrent idiopathic angioedema or urticaria.

Gastrointestinal side effects are more likely to occur with aspirin than with other salicylates; also, they may be more likely to occur with chronic, high-dose administration than with occasional use. Use of enteric-coated formulations may reduce the potential for gastrointestinal side effects.

Adverse effects are more likely to occur at serum salicylate concentrations of 300 mcg per mL (30 mg per 100 mL) or above; however, they may also occur at lower serum concentrations, especially in patients 60 years of age or older.

Serum concentrations at which adverse or toxic effects have been reported during chronic therapy include:

Salicylate Concentration (mcg per mL/ mg per 100 mL)	Effect
195-210 / 19.5-21	Mild toxicity (tinnitus, decreased hearing)
250 / 25	Hepatotoxicity (abnormal liver function tests)
250 / 25	Decreased renal function
300 / 30	Decreased prothrombin time
310 / 31	Deafness
350 / 35	Hyperventilation
>400 / 40	Metabolic acidosis, other signs of severe toxicity

Human patient consultation[R-19]

The following information has been recommended for human patient consultation and is included in the human monograph, *Salicylates (Systemic),* in *USP DI Volume I;* these recommendations are intended for informational purposes only and may or may not be applicable to the use of aspirin in the treatment of animals:

Before using this medication

Conditions affecting use, especially:

Sensitivity to any of the salicylates, including methyl salicylate, or nonsteroidal anti-inflammatory drugs (NSAIDs), history of

Diet—Sodium content of sodium salicylate must be considered for patients on a sodium restricted diet, especially with chronic use of antirheumatic doses

Pregnancy—Salicylates and caffeine (present in some formulations) cross the placenta; high dose chronic use or abuse of aspirin in the third trimester may be hazardous to the mother as well as the fetus and/or neonate, causing heart problems in fetus or neonate and/or bleeding in mother, fetus, or neonate; high-dose chronic use or abuse of any salicylate late in pregnancy may also prolong and complicate labor and delivery; not taking aspirin during the third trimester unless prescribed by a physician

Breast-feeding—Salicylates and caffeine (present in some formulations) are excreted in breast milk

Use in children and teenagers—Checking with physician before giving to children or teenagers with symptoms of acute febrile illness, especially influenza or varicella, because of the risk of Reye's syndrome; determining ahead of time what physician wants done if a child receiving chronic therapy develops fever or other symptoms of acute illness that may predispose to Reye's syndrome; also, increased susceptibility to salicylate toxicity in children, especially with fever and dehydration

Use in the elderly—Increased susceptibility to salicylate toxicity

Other medications, especially anticoagulants, antidiabetic agents (oral), those cephalosporins that may cause hypoprothrombinemia, plicamycin, valproic acid, methotrexate, NSAIDs, platelet aggregation inhibitors, probenecid, sulfinpyrazone, urinary alkalizers, and vancomycin; also, for buffered aspirin, choline and magnesium salicylates, and magnesium salicylate; fluoroquinolone antibiotics, itraconazole, ketoconazole, and oral tetracyclines

Other medical problems, especially coagulation or platelet function disorders, gastrointestinal problems such as ulceration or erosive gastritis (especially a bleeding ulcer), thyrotoxicosis, and (for choline and magnesium salicylates and for magnesium salicylate) chronic advanced renal insufficiency

Overdose

For information in cases of overdose or unintentional ingestion, **contact the American Society for the Prevention of Cruelty to Animals (ASPCA) National Animal Poison Control Center** (888-426-4435 or 900-443-0000; a fee may be required for consultation) **and/or the drug manufacturer.**

Human clinical effects of overdose[R-19]

The following effects of overdose have been reported in human beings, and are included in the human monograph, *Salicylates (Systemic),* in *USP DI Volume I;* these effects are intended for informational purposes only and may or may not be applicable to the use of aspirin in the treatment of animals:

Note: See also the *Human side/adverse effects* section in this monograph for serum salicylate concentrations associated with human toxicity.

Mild overdose

Salicylism (continuing ringing or buzzing in ears or hearing loss; confusion; severe or continuing diarrhea, stomach pain, and/or headache; dizziness or lightheadedness; severe drowsiness; fast or deep breathing; continuing nausea and/or vomiting; uncontrollable flapping movements of the hands, especially in elderly patients; increased thirst; vision problems)—tinnitus and/or headache may be the earliest symptoms of salicylism

Severe overdose

Bloody urine; convulsions; hallucinations; severe nervousness, excitement, or confusion; shortness of breath or troubled breathing; unexplained fever

Note: In young children, the only signs of an overdose may be changes in behavior, severe drowsiness or tiredness, and/or fast or deep breathing.

Laboratory findings in overdose may indicate encephalographic abnormalities, alterations in acid-base balance (especially respiratory alkalosis and metabolic acidosis), hyperglycemia or hypoglycemia (especially in children), ketonuria, hyponatremia, hypokalemia, and proteinuria.

For treatment of overdose

Acute salicylism in animals is best treated by procedures that facilitate the

removal of salicylate from the body, as there is no specific antidote available.

Gastric lavage will remove unabsorbed drug from the stomach. Alkalization of the urine with intravenously administered sodium bicarbonate will enhance renal excretion of salicylate by decreasing tubular reabsorption of the drug. This effect may be enhanced by instituting an osmotic diuresis with mannitol solution. Peritoneal dialysis is effective in removing salicylate from the plasma. Cats are especially prone to salicylate overdosage.

Veterinary Dosing Information

Dosage of aspirin will vary depending on the therapeutic objective to be attained.

Therapeutic serum concentrations: For salicylate—

Analgesic/antipyretic: 20 to 50 mcg/mL.

Anti-inflammatory/antirheumatic: 150 to 200 mcg/mL.{R-37}

Enteric-coated aspirin products are not recommended because gastric retention has been noted to occur.{R-23}

Oral Dosage Forms

Note: Bracketed information in the *Dosage Forms* section refers to uses that either are not included in U.S. product labeling or are for products not commercially available in the U.S.

ASPIRIN BOLUSES USP

Usual dose:

Note: Although veterinary forms of aspirin are marketed with label indications for treatment of pain, fever, and inflammation, the drug has never been approved by the Food and Drug Administration Center for Veterinary Medicine (FDA CVM) for these purposes.

Fever[1]; or

Pain—*Cattle:* Oral, 100 mg per kg of body weight every twelve hours.{R-35}

Note: Although ruminants eliminate salicylate rapidly, the slow absorption of aspirin from the reticulorumen is rate-limiting and therapeutically effective concentrations are maintained.{R-24}

Fever[1]; or

Pain[1]—*Pigs*: Oral, 10 mg per kg of body weight every six to eight hours.{R-25} If a water supply is to be used for administration, then aspirin at 2 mg per kg of body weight per hour (mg/kg/hr) may be used. For this latter purpose, due to the poor solubility of aspirin in water, sodium salicylate at 1.8 mg/kg/hr may be considered as a substitute.

Note: [*Escherichia coli* diarrhea][1]—*Piglets,* 9 to 20 days of age: Although the safety and efficacy have not been established, aspirin has been used in the treatment of *Escherichia coli*–induced diarrhea in piglets with an oral dose of 0.5 to 1 gram, once a day in the feed or drinking water.{R-26}

Horses—Although some veterinary aspirin products are labeled for use in horses, due to the rapid elimination of salicylate by horses, it is questionable whether therapeutic yet nontoxic concentrations can be maintained in the horse using conventional dosage intervals.

Strength(s) usually available:{R-33}

U.S.—

Veterinary-labeled product(s):

3.9 grams (60 grains) (OTC) [GENERIC].

15.6 grams (240 grains) (OTC) [GENERIC].

31.2 grams (480 grains) (OTC) [GENERIC].

Canada—

Veterinary-labeled product(s):

15.6 grams (240 grains) (OTC) [*Asen 240 Bolus; Centra ASA 240;* GENERIC].

Withdrawal times: U.S. and Canada—Aspirin has not been approved in the United States by the Food and Drug Administration for use in

food-producing animals; therefore, there are no established withdrawal times. If aspirin is administered to cattle at a dose of 100 mg per kg every 12 hours, evidence has been compiled by the Food Animal Residue Avoidance Databank (FARAD) that suggests a meat withdrawal time of 1 day (24 hours) and a milk withholding of 24 hours would be sufficient to avoid residues.{R-27; 28} The Canadian gFARAD follows the same recommendations as US FARAD.{R-38} When making withdrawal recommendations, note that anaphylactoid drug reactions and Reye's syndrome have been associated with aspirin exposure in human beings.{R-19; 28}

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), unless otherwise specified by manufacturer. Store in a tight container.

USP requirements: Preserve in tight containers. Label Boluses to indicate that they are for veterinary use only. Contain the labeled amount, within ±10%. Meet the requirements for Identification, Dissolution (80% in 45 minutes in 0.05 *M* acetate buffer [pH 4.50 ± 0.05] in Apparatus 1 at 100 rpm), Uniformity of dosage units, and Limit of salicylic acid (not more than 0.3%).{R-16}

ASPIRIN ORAL GRANULES

Usual dose: See *Aspirin Boluses USP*.

Strength(s) usually available:{R-33}

U.S.—

Veterinary-labeled product(s):

64.1 mg per cc (2500 mg per 39 cc scoop) (OTC) [*Equi-Phar ArthriBan; Equi-Spirin*].

Canada—

Veterinary-labeled product(s):

725 mg per gram of powder (OTC) [*Asen*].

Withdrawal times: See *Aspirin Boluses USP*.

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), unless otherwise specified by manufacturer. Store in a well-closed container.

USP requirements: Not in USP.{R-16}

ASPIRIN ORAL PASTE

Usual dose: See *Aspirin Boluses USP*.

Strength(s) usually available:{R-33}

U.S.—

Veterinary-labeled product(s):

400 mg per cc (2 grams per 5cc mark on syringe) (OTC) [*Equi-Prin*].

Canada—

Veterinary-labeled product(s):

Not commercially available.

Withdrawal times: See *Aspirin Boluses USP*.

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), in a well-closed container, unless otherwise specified by manufacturer. Protect from freezing.

USP requirements: Not in USP.{R-16}

ASPIRIN ORAL POWDER

Usual dose: See *Aspirin Boluses USP*.

Strength(s) usually available:{R-33}

U.S.—

Veterinary-labeled product(s):
500 mg per gram of powder (OTC) [*AniPrin F* (molasses flavoring); GENERIC (apple flavoring or molasses flavoring)].
1 gram per gram of powder (OTC) [*AniPrin P;* GENERIC].
Canada—
Veterinary-labeled product(s):
Not commercially available.

Withdrawal times: See *Aspirin Boluses USP*.

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), unless otherwise specified by manufacturer. Store in a tight container.

USP requirements: Not in USP.{R-16}

ASPIRIN ORAL SOLUTION

Usual dose: See *Aspirin Boluses USP*.

Note: *Poultry*—Although products may be labeled for use in poultry, the USP Veterinary Medicine Committee can make no recommendations for dosing or drug residue withdrawal when aspirin is administered to poultry.

Strength(s) usually available:{R-33}
U.S.—
Veterinary-labeled product(s):
12% solution (OTC) [*Asp-Rin; Durasol;* GENERIC].
Canada—
Veterinary-labeled product(s):
Not commercially available.

Withdrawal times: See *Aspirin Boluses USP*.

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), unless otherwise specified by manufacturer. Store in a tight container. Protect from freezing.

USP requirements: Not in USP.{R-16}

ASPIRIN TABLETS USP

Usual dose:

Note: Although veterinary forms of aspirin are marketed with label indications for treatment of pain, fever, and inflammation, the drug has never been approved by the Food and Drug Administration Center for Veterinary Medicine (FDA CVM) for these purposes.

Fever[1]; or
Pain[1]—
Dogs: Oral, 10 mg per kg of body weight every twelve hours.
[*Cats*]: Oral, 10 mg per kg of body weight every two days. A convenient regimen for a cat owner to follow for a nine-pound cat is to administer one-half an infant aspirin tablet (81 mg) every Monday, Wednesday, and Friday, with no treatment during the weekend.{R-29; 30}
Note: Aspirin is safe and effective for use in cats if the slow rate of salicylate elimination in this species is taken into account.
Inflammation[1]—
Dogs: Oral, 25 to 35 mg per kg of body weight every eight to twelve hours.{R-31; 32}
[*Cats*]: Oral, 10 to 20 mg per kg of body weight every two days.{R-22; 30} A convenient regimen for a cat owner to follow to give a dose of 10 mg per kg to a nine-pound cat is to administer one-half an infant aspirin tablet (81 mg) every Monday, Wednesday, and Friday, with no treatment during the weekend; to give a dose of 20 mg per kg, one infant tablet (81 mg) or one-quarter an adult tablet (325 mg) should be given to a nine-pound cat on the same Monday, Wednesday,

and Friday schedule.

When a more intense anti-inflammatory effect is required, a dosage of 25 mg per kg of body weight every twenty-four hours may be used. As this regimen is not well established, careful monitoring for toxicity, especially GI ulceration, is advised.

Note: Aspirin is safe and effective for use in cats if the slow rate of salicylate elimination in this species is taken into account.

Note: [*Platelet aggregation inhibition*][1]—Although the ability of aspirin to effectively prevent thromboembolism is not clearly established and may be more effective in some diseases than in others, the following doses have been used to inhibit platelet aggregation:

Cats—The optimal dosage of aspirin in the cat for platelet inhibition has not been determined. A single dose of 25 mg per kg of body weight has been demonstrated to have an antiplatelet effect.{R-9} Many clinicians administer this dose twice weekly for a proposed antiplatelet effect. Whether lower doses given repetitively would be effective is unknown.

Dogs—The optimum dosage for platelet inhibition in dogs is unknown. One study suggested that 0.5 mg per kg of body weight, administered orally every twelve hours, inhibited platelet aggregation. Another study investigating the ability of aspirin to prevent platelet aggregation to synthetic shunt materials suggested that aspirin should be used at 5 mg per kg of body weight, administered orally every twenty-four hours, for an antithrombotic effect.{R-10; 11; 22}

Horses—The optimal dosage of aspirin in the horse for platelet inhibition has not been determined. Single doses of 20 mg per kg of body weight have been demonstrated to have an antiplatelet effect.{R-8} Whether lower dosages given repetitively would be effective is unknown.

Note: Gastric retention for long periods of time and therefore lack of absorption of large enteric-coated aspirin tablets (500 mg) occurs in healthy dogs; enteric-coated tablets have questionable efficacy in animals.{R-23}

Strength(s) usually available:{R-19; 33}

U.S.—

Veterinary-labeled product(s):

65 mg (Rx) [*Palaprin 65* (chewable)].

100 mg (OTC) [*Vetrin* (chewable)].

150 mg (Rx) [GENERIC (chewable)].

273 mg (Rx) [*Arthricare* (chewable)].

325 mg [*Palaprin 325* (Rx, chewable); *Vetrin* (OTC, chewable)].

450 mg (Rx) [GENERIC (chewable)].

Human-labeled product(s):

81 mg (OTC) [*Aspir-Low; Bayer Children's Aspirin* (chewable); *Healthprin Adult Low Strength* (scored); *St. Joseph Adult Chewable Aspirin* (chewable); GENERIC].

162.5 mg (OTC) [*Healthprin Half-Dose* (scored)].

325 mg (OTC) [*Aspirtab; Empirin; Genuine Bayer Aspirin Caplets; Genuine Bayer Aspirin Tablets; Healthprin Full Strength* (scored); *Norwich Aspirin;* GENERIC].

500 mg (OTC) [*Aspirtab-Max; Extra Strength Bayer Aspirin Caplets; Extra Strength Bayer Aspirin Tablets; Norwich Aspirin;* GENERIC].

650 mg (OTC) [GENERIC].

Canada—

Veterinary-labeled product(s):

Not commercially available.

Human-labeled product(s):

80 mg (OTC) [*Aspirin Children's Tablets* (chewable)].

300 mg (OTC) [*Headache Tablet*].

325 mg (OTC) [*Apo-ASA; Aspirin Caplets; Aspirin Tablets; PMS-ASA;* GENERIC].

500 mg (OTC) [*Aspirin Caplets; Aspirin Tablets;* GENERIC].

Note: Strengths of specific products labeled in grains may vary, depending on the manufacturer.{R-19}

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), unless otherwise specified by manufacturer. Store in a tight container.

USP requirements: Preserve in tight containers. Preserve flavored or sweetened Tablets of 81-mg size or smaller in containers holding not more than 36 Tablets each. Contain the labeled amount, within ±10%. Tablets of larger than 81-mg size contain no sweeteners or other flavors. Meet the requirements for Identification, Dissolution (80% in 30 minutes in 0.05 *M* acetate buffer [pH 4.5 ± 0.05] in Apparatus 1 at 50 rpm), Uniformity of dosage units, and Limit of free salicylic acid (not more than 0.3% for uncoated tablets or not more than 3.0% for coated tablets).{R-16}

Note—Tablets that are enteric-coated meet the requirements for Aspirin Delayed-release Tablets USP.{R-16}

ASPIRIN DELAYED-RELEASE TABLETS USP

Usual dose: *Dogs*—See *Aspirin Tablets USP*.

Note: Enteric-coated aspirin products developed for human use are not recommended for use in animals because gastric retention has been noted to occur.{R-23}

Strength(s) usually available:{R-33}

U.S.—

Veterinary-labeled product(s):

81 mg (OTC) [*Health Measures* (enteric-coated)].

Canada—

Veterinary-labeled product(s):

Not commercially available.

Packaging and storage: Store below 40 °C (104 °F), preferably between 15 and 30 °C (59 and 86 °F), unless otherwise specified by manufacturer.

USP requirements: Preserve in tight containers. The label indicates that the Tablets are enteric-coated. Contain the labeled amount, within ±5%. Meet the requirements for Identification, Drug release, Uniformity of dosage units, and Limit of free salicylic acid (not more than 3.0%).{R-16}

[1]Not included in Canadian product labeling or product not commercially available in Canada.

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Table 1. Pharmacology/Pharmacokinetics*

Note: Zero-order (dose-dependent) kinetics, especially for the elimination half-life, have been reported in dogs and cats. Such an occurrence cannot be discounted as possible in other species. For such drugs, larger doses typically lead to longer elimination half-lives.

Species	Drug Dosed	Protein Binding (%)	Half-life of Elimination (hr)	Vd (L/kg)	Clearance (mL/min/kg)	Route; Dose (mg/kg)	Half-life of Absorption (hr)	Tmax (hr)	Cmax (mcg/mL)	F (%)
Cats{R-34}	Sodium salicylate	60%	37.6	0.21	0.065	IV; 44				
{R-30}	Aspirin		26.8			Oral; 2.5				
	Aspirin		44.6			Oral; 25				
Cattle{R-35}	Sodium salicylate	60%	0.54	0.24	5.13	IV; 50				
	Aspirin					Oral; 100	2.91	3†	45†	70
Dogs{R-34}	Sodium salicylate	60%	8.6	0.19	0.255	IV; 44				
{R-36}	Aspirin		4.49	Vd_{ss} 0.285	0.683	IV; 17.5				
	Aspirin					Oral; 35		2	95.9	100
Goats{R-34}	Sodium salicylate	60%	0.8	0.13	1.88	IV; 44				
Horses {R-34}	Sodium salicylate	54%	1.0	0.18	2.08	IV; 44				
Pigs{R-34}	Sodium salicylate	70%	5.9	0.18	0.352	IV; 44				

*Abbreviations: Vd = Volume of distribution, IV = Intravenous, Tmax = Time to peak serum concentration, Cmax=Peak serum concentration, F = Bioavailability; percent absorbed

† Estimated from graph

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