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Using this page · Individualise medicines monitoring This medicines monitoring page has been written using publications and expert opinion. It is designed to save clinician time, but not replace professional responsibility. When using this page you should: ensure an individualised monitoring plan is developed in partnership with the patient and take account of any locally agreed advice and guidance. Baseline Liver function tests Urea and electrolytes · potassium particularly important Smoking status · advise patients to seek advice if likely to change 5 days after starting treatment; 3 days after any dose adjustment Plasma theophylline concentration · for MR preparations, take levels 4-6 hours after dose In most individuals a plasma theophylline of between 10-20mg/litre is required for satisfactory bronchodilation; however, a lower plasma theophylline concentration of 5-15mg/litre (or less) may sometimes be effective. Dosing Lower than normal doses may be required in older people, those with heart failure, or those with hepatic impairment. Adverse effects Adverse effects can occur within the range 10-20mg/litre and both the frequency and severity increase at concentrations above 20mg/litre. Ongoing once stable Required Every 6 - 12 months Plasma theophylline concentration · increase frequency or monitor one-off for some patients; for MR preparations, take levels 4-6 hours after dose Increasing monitoring frequency Consider increasing frequency of monitoring in patients who are: older have heart failure have hepatic impairment pregnant Monitoring one-off for some patients Consider checking plasma theophylline where the patient: experiences side effects that may suggest toxicity (nausea, vomiting, tremor or palpitations) starts an enzyme-inhibiting drug (e.g. erythromycin, clarithromycin, allopurinol, or cimetidine) starts an enzyme-inducing drug (e.g. carbamazepine, rifampicin, or St John's Wort) changes smoking status (tobacco can lower plasma levels of theophylline) Alcohol at risk patients High alcohol intake can reduce plasma theophylline Periodically Full blood count Serum potassium Potassium at risk patients Potassium at risk patients includes those: taking concomitant beta-2 agonists, corticosteroids, or diuretics with severe asthma Notes Effects of enzyme inhibiting or enzyme inducing drugs Enzyme inhibiting or inducing drugs can affect plasma theophylline levels significantly. Check levels where necessary. Effects of pregnancy During pregnancy protein binding decreases; the free level of drug will increase; and so a lower therapeutic range may be appropriate. Consider checking levels frequently, in particular in pregnant women with acute severe asthma or who are critically dependent on therapeutic theophylline. Brand prescribing and dispensing The rate of absorption from modified-release preparations can vary between brands. Patients should therefore be maintained on the same brand. Bibliography Update history 15 May 2023 Links to SmPCs for Uniphyllin Continus and Phyllocontin Continus updated Print this page Theophylline is an oral bronchodilator with a narrow therapeutic window, used in the treatment of conditions such as asthma and chronic obstructive pulmonary disease (COPD).Theophylline also has CNS stimulant properties, increasing the respiratory drive in hypoxia and this effect is sometimes used in the treatment of apnoea in premature neonates. Theophylline is partly metabolised to caffeine in neonates and caffeine citrate is more often used directly now as this causes less side effects compared to administering the parent drug.Theophylline is rapidly absorbed from the gastrointestinal tract when administered in liquid form or as uncoated tablets, with peak concentrations occuring within 1 - 2 hours of a single dose on an empty stomach.Peak concentrations are delayed up to 6 - 10 hours after food or if sustained release products are used.A small fraction is excreted unchanged in the urine but most of the drug is first metabolised in the liver with urinary excretion of the metabolites 1,3 dimethyluric, 1-methyluric acid and 3-methlyxanthine.Many factors affect the rate of theophylline metabolism. Concentrations are increased in heart failure, cirrhosis, viral infections and in the elderly, and decreased in smokers, chronic alcoholics and by drugs that induce hepatic metabolism, resulting in a wide range of elimination half-lives in different patient groups. In normal adults the half-life averages 6-9 hours.Some formulations contain theophylline salts, for example with ethylenediamine which is then known as aminophylline. The increased soluability of aminophyline compared to theophylline is an advantage for intravenous use.Theophylline levels are useful for optimising dosing. Monitoring is also valuable in confirming a diagnosis of theophylline toxicity and in managing the overdosed patient.Sample requirementsFor oral dosing, samples should be taken at least five half-lives after any change in dose. For adults this is 3 days; for children 2 days and for neonates 7 days.The recommended sampling time for monitoring of modified release preparations that are given every 12 hours is 4 - 6 hours post dose.For intravenous infusion take samples 4 - 6 hours after start of i.v. infusion, then monitor daily.For adults, blood taken into a 5mL gold top gel tube (or rust top for the Acute Unit)For children, blood taken into a 2mL lithium heparin tube (or a 3.5mL rust top gel tube)For neonates, blood taken into a 1mL minicollect plain tube or a 0.8mL minicollect lithium heparin tubeStorage/transportSend at ambient temperature to the laboratory. If unavoidable, samples can be stored refrigerated overnight.Required informationRelevant clinical details including time relative to dose, prescribed product and route of administration and other medicaton.Turnaround timesThe assays are run throughout the day and night.The in-lab turnaround time is normally less than 24 hours.The test can be ordered as an urgent request.Therapeutic guidelinesSide effects are common with theophylline.Mild effects such as nausea, headache and jitteriness occur at concentrations below 10mg/L.More serious side effects (tremor, agitation, insomnia, diarrhoea, palpitations, cardiac arrhythmias and seizures) occur with increasing frequency at concentrations greater than 20 mg/L (greater than 14mg/L in neonate).Serious toxicity is more common with parenteral than with oral administration.Rhabdomyolosis and acute renal failure have been described following self-poisoning with theophylline.If any symptoms of toxicity despite concentrations within the therapeutic range consider dose reduction.To learn more about theophylline visit Lab Tests OnlinePage last updated 27/04/2023 Drug used to treat respiratory diseases Pharmaceutical compound TheophyllineClinical dataTrade namesTheolair, Slo-BidOther names1,3-dimethylxanthineAHFS/Drugs.comMonographMedlinePlusa681006Pregnancycategory AU: A[citation needed] Routes ofadministrationBy mouth, intravenous, rectalATC codeR03DA04 (WHO) R03DB04Legal statusLegal status AU: S4 (Prescription only) CA: ℞-only UK: P (Pharmacy medicines) US: ℞-only Pharmacokinetic dataBioavailability100% (oral)Protein binding40% (primarily to albumin)MetabolismHepatic: CYP1A2, CYP2E1, CYP3A4Metabolites• 1,3-Dimethyluric acid • 1-Methyixanthine • 3-MethylxanthineElimination half-life5–8 hoursIdentifiers IUPAC name 1,3-dimethyl-7H-purine-2,6-dione CAS Number58-55-9 YPubChem CID2153IUPHAR/BPS413DrugBankDB00277 YChemSpider2068 YUNII0I55128JYKKEGGD00371 YChEBICHEBI:28177 YChEMBLChEMBL190 YCompTox Dashboard (EPA)DTXSID5021336 ECHA InfoCard100.000.350 Chemical and physical dataFormulaC7H8N4O2Molar mass180.167 g·mol−13D model (JSmol)Interactive image SMILES Cn1c2c(c(=O)n(c1=O)C)[nH]cn2 InChI InChI=1S/C7H8N4O2/c1-10-5-4(8-3-9-5)6(12)11(2)7(10)13/h3H,1-2H3,(H,8,9) YKey:ZFXYFBGIUFBOJW-UHFFFAOYSA-N Y (verify) Theophylline extended-release tablets in Japan Theophylline, also known as 1,3-dimethylxanthine, is a drug that inhibits phosphodiesterase and blocks adenosine receptors.[1] It is used to treat chronic obstructive pulmonary disease (COPD) and asthma.[2] Its pharmacology is similar to other methylxanthine drugs (e.g., theobromine and caffeine).[1] Trace amounts of theophylline are naturally present in tea, coffee, chocolate, yerba mate, guarana, and kola nut.[1][3] The main actions of theophylline involve:[2] relaxing bronchial smooth muscle increasing heart muscle contractility and efficiency (positive inotrope) increasing heart rate (positive chronotropic) increasing blood pressure increasing renal blood flow anti-inflammatory effects central nervous system stimulatory effect, mainly on the medullary respiratory center[4][5] The main therapeutic uses of theophylline are for treating:[2] Chronic obstructive pulmonary disease (COPD)[6] Asthma Infant apnea[7] Blocks the action of adenosine; an inhibitory neurotransmitter that induces sleep, contracts the smooth muscles and relaxes the cardiac muscle. Treatment of post-dural puncture headache.[8][9] Theophylline and other methylxanthines are often used for their performance-enhancing effects in sports, as these drugs increase alertness, bronchodilation, and increase the rate and force of heart contraction.[10] There is conflicting information about the value of theophylline and other methylxanthines as prophylaxis against exercise-induced asthma.[11] The use of theophylline is complicated by its interaction with various drugs and by the fact that it has a narrow therapeutic window (