

Opioid Pharmacokinetics and Expected Metabolites (Updated 05-2009)

Reviewed & Reformatted from previous versions by Jeffrey Fudin, R.Ph., BS, Pharm.D., DAAPM

DRUG	Half-Life (Hrs ^A)	Time to Steady State (Hrs ^A)	Metabolites	Time to Peak Conc. (Hrs ^A)	Serum Predictability	Sample Time After Dose (Hrs ^A)	24 Hour Dose vs. Expected Serum Conc. (ng/mL)
OXYCODONE ^{1,2,3,24}	IR=3.2 CR=4.5-8	IR = 17.5 CR = 24-36	Noroxycodone, Oxymorphone, Oxycodyl, Oxymorphanol, Noroxycodyl	IR = 1.6 CR = 2.1-3.2	Y	IR = 1.4 +/-0.7 CR = 3.2 +/-2.2	IR 20mg = 15.6 +/-4.4 CR 20mg = 15.1 +/-4.7
MORPHINE ^{4,5,6,24,25}	2-4	24	Morphine-3-glucuronide, Morphine-6-glucuronide, Normorphine, Codeine, 7,8-dihydromorphinone	IR = 1 CR = 2-3	Y	IR = 1.0 CR = 4.4	IR 40mg = 11.1 +/-8.4 CR 100mg = 36.9 +/-15.5
TRANSDERMAL FENTANYL ^{7,8,9,24}	16-25	72	Norfentanyl, 4-N-(N-propionylanilino) piperidine, 4-N-(N-hydroxypropionylanilino) piperidine, 1-(2-phenethyl)-4-N-(N-hydroxypropionylanilino) piperidine	24-72	Y	25mcg/hr=38.1hrs 50mcg/hr=34.8hrs 75mcg/hr= 33.5hrs 100mcg/hr=36.8hrs	(600mcg = 0.6 +/-0.3) (1200mcg = 1.4 +/- 0.5) (1800mcg = 1.7 +/- 0.7) (2400mcg = 2.5 +/- 1.2) [XXXXmcg ^D]
HYDROCODONE ^{15,16,17,24,39,40,41}	3.8	19-22.5	Hydromorphone, Norcodeine, 6-beta-hydrocodol, 6-alpha-hydrocodol, 6-beta-hydromorphol, 6-alpha-hydromorphol, norhydrocodone	1.3	Y	IR = 1.3	IR 10mg = 23.6ng +/-5.2
HYDROMORPHONE ^{10,11,12,24}	2.5	12.5	Hydromorphone-3-glucuronide, Hydromorphone-3-glucoside, Dihydroisomorphine-6-glucuronide, Dihydroisomorphine-6-glucoside, Dihydroisomorphine, Dihydromorphine ^E	48-60 min.	Y	IR = 1.47	IR 48 mg = 19.7 +/- 4.04
CODEINE ^{13,14,24}	2.5-3.5	12.5-17.5	Morphine, Norcodeine, Normorphine, Hydrocodone, Codeine 6-glucuronide	1-2	Y	IR = 1.1	IR 180mg = 222.9 +/- 48.9
METHADONE ^{18,19,20,24}	24	~5 days	EDDP (2-ethyl-1,5-dimethyl-3,3-diphenylpyrrolinium), EMDP (2-ethyl-5-methyl-3,3-diphenylpyraline)	2-4	Y	SS blood draw @ 24 hr post-dose, before subsequent dose, & after initial dose.	Linear drug levels increase 260ng/mL for every 1mg/kg consumed
HEROIN ^{21,22,23,24}	~3 min. 1.7-5.3 min	~15 min.	6-acetylmorphine, Morphine, Morphine-3-glucuronide, Normorphine, 6-acetylmorphine 3-glucuronide, Normorphine glucuronide	10 minutes for I.M. dose ^B	Y	112mcg/min continuous infusion = 5min ^C	Heroin level = 57 ng/mL ^C 6-acetylmorphine level=15ng/mL ^C
LEVORPHANOL	One dose 11-16hr Chronic dosing up to 30 hrs	72hrs	3-glucuronide	approximately 1	?		
PROPOXYPHENE	3-12hs		Dextropropoxyphene, nordextropropoxyphene	2-3			
Meperidine	~3.6hr	3-6 days	Normeperidine, meperidinic acid, normeperidinic acid	1-1.5	?		
Oxymorphone-IR, ER ⁴²	IR = 7.2 - 9.4hr ER 9.4 – 11.3	IR = 3-4 days ER = 3 days	Oxyorphone-3-glucuronide, 6-OH-oxymorphone,	IR = 30mins ER = 3 hrs	Y	IR = 4.39 +/-1.72 ER = 7.33 +/-2.93	IR 20mg = 4.39 +/-1.72 CR 20mg = 2.54 +/-1.35

IR = Immediate Release Products, CR = Continuous Release products, SS = Steady State
A-Hours, unless otherwise indicated
B-Can detect heroin and 6-acetyl morphine within 10-15 minutes of parenteral administration
C-Administered IV in a single patient over 180 minutes

D-Cummulative amount of fentanyl release from patch dose in 24 hours.
E-hydromorphone is 7,8-dihydromorphinone: Please note that morphine metabolism to hydro-morphine has been confirmed in 8 mammals other than humans.
There is only data that correlates the conversion of morphine to hydromorphone in humans.²⁹

Courtesy of Jeffrey Fudin, RPh, BS, PharmD, DAAPM and Antonio Rivera, Pharm.D.

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