

## LITERATURE ON RECTAL MEDICATION BIOAVAILABILITY

Event	Medications Indicated	Rectal Bioavailability	References and Pharmacy Notes
General Pain Somatic, Neuropathic	Morphine	Similar to oral	More rapid pain control vs oral - onset 10 minutes (21) Tmax fast = 30min(1)
	Oxycodone	Similar to oral	Analgesia onset fast = 30min -1h(2)
	Methadone	80% - 90% of oral	Rectal Suspension - Quicker Tmax vs Oral = 1.4h vs 2.8, onset = 30min (3) Improved absorption via suspension (80%) vs suppository (35%-58%)(15)
	Hydromorphone	50% of oral	Note: Study done only on suppositories, not suspension (4)
	Aspirin	Similar to oral	As suspension at pH of 4 (4,6)
	Indomethacin	112 - 137% of oral	Rectal Suspension - Onset fast =10 min, Tmax =20min vs 40min oral (4)
	Ibuprofen	88% of oral	Slower rectal Tmax 1.1h vs 33min oral (4)
	Ketoprofen	Similar to oral	Study tested only Fatty suppository (4)
	Naprosyn	80% of oral	Studies done on both suppository and oral solution(4)
	Acetaminophen	90% of oral	As aqueous suspension (6)
	Dexamethasone	No PK Studies published	Satisfactory results have been obtained in several studies with rectal corticosteroids(16). Large amount of anecdotal evidence for effectiveness of BRD suppositories. Case Study on BRD(17)
	Lidocaine	200% of oral	(28)
	Ketamine	150% of oral	(14)

Event	Medications Indicated	Rectal bioavailability	References and Pharmacy Notes
Antidepressants (Depression, Nerve Pain)	Imipramine	Similar to oral	(4)
	Clomipramine	Similar to oral	(4)
	Doxepin	Therapeutic Blood Levels	(4,8)
	Trazodone	Clinically effective	(4)

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Respiratory Symptoms - Shortness of Breath, secretions, inflammation	Medications Indicated	Rectal Bioavailability	References and Pharmacy Notes
	Morphine	Similar to oral	More rapid pain control vs oral - onset 10 minutes (21) Tmax fast = 30min(1)
	Lorazepam	80% -100% of oral	2x Faster than SL and Oral (30,31) Rectal T-max = 1.12hr vs 2.37hr (oral). 2.35hr (SL)
	Atropine	31% of IM	Pediatric study-Tmax 15 minutes (4, 27)
	Dexamethasone	No PK Studies Published	Satisfactory results have been obtained in several studies with rectal corticosteroids(16). Large amount of anecdotal evidence for effectiveness of BRD suppositories. Case Study on BRD(17)

Event	Medications Indicated	Rectal bioavailability	References and Pharmacy Notes
(CNS) Delerium, Agitation or Anxiety	Phenobarbital	Similar to oral	Faster absorption and less variability via micro enema suspension vs. suppository (10,11,25)
	Ketamine	150% of oral	(14)
	Chlorpromazine	Similar to oral	(4)
	Haloperidol	No PK studies published	Anecdotal reports support clinical effectiveness administered rectally
	Diazepam	Similar to oral	Rapid Tmax =17 min(rectal suspension) vs 82 min(suppose) vs 52 min(oral tablet)(12)
	Lorazepam	80% -100% of oral	Very quick seizure control reported - mean time to cessation of seizures 37 sec.(13)
	Quetiapine	189% of oral	24
	Midazolam	Similar to oral	Sedative effects comparable to oral (9) Tmax 16minutes (1)

Event	Medications Indicated	Rectal bioavailability	References and Pharmacy Notes
Fever	Aspirin	Similar to oral	As suspension at pH of 4 (4,6)
	Indomethacin	112 - 137% of oral	Rectal Suspension - Onset fast =10 min, Tmax =20min vs 40min oral(5)
	Ibuprofen	88% of oral	Slower rectal Tmax 1.1h vs 33min oral(4)
	Acetaminophen	90% of oral	As aqueous suspension- (6)

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Event	Medications Indicated	Rectal bioavailability	References and Pharmacy Notes
Seizures	Phenobarbital	Similar to oral	Slower Tmax vs oral , faster absorption and less variability via micro enema suspension vs. suppository(10,11,25)
	Lorazepam	80% -100% of oral	Very quick seizure control reported - mean time to cessation of seizures 37 sec.(13) 2x Faster than SL and Oral (30,31) Rectal T-max = 1.12hr vs 2.37hr (oral). 2.35hr (SL)
	Diazepam	Similar to oral	Rapid Tmax =17 min(rectal suspension) vs 82 min(suppose) vs 52 min(oral tablet)(12)
	Levetiracetam (Keppra)	Similar to oral	(18) Note - not crushable (order liquid)
	Lamotrigine (Lamictal)	63% of oral	May need to titrate dose up from oral to rectal (4)
	Valproic Acid	89% to 100%	(4)
	Carbamazepine	67% of oral	Study tested fatty suppository (4)
	Midazolam	Similar to oral	Sedative effects comparable to oral(9) Tmax 16minutes(1)

Event	Medications Indicated	Rectal bioavailability	References and Pharmacy Notes
Nausea and Vomiting	Metoclopramide (Reglan)	53% of oral	(4) Effective for Gastroparesis (19)
	Haloperidol	No PK studies published	Anecdotal reports support clinical effectiveness administered rectally. Rectal administration of tablets is a standard of practice in hospice
	Prochlorperazine	Similar to oral	(4)
	Promethazine	70% -97% of oral	(4)
	Odansetron	30% of oral	Reported Clinically effective (4)
	Diphenhydramine	No PK studies published	Commonly used in suppositories
	Hydroxyzine	No PK studies published	Commonly used in suppositories
	Dexamethasone	No PK studies published	Satisfactory results have been obtained in several studies with rectal corticosteroids (16). Large amount of anecdotal evidence for effectiveness of BRD suppositories. Case Study on BRD(17)
	Lorazepam	80% -100% of oral	2x Faster than SL and Oral (30,31) Rectal T-max = 1.12hr vs 2.37hr (oral) 2.35hr (SL)

Event	Antibiotics	Rectal bioavailability	References and Pharmacy Notes
Infection	Amoxicillin	87-99% of oral	Study used hydrophilic suppository (4)
	Erythromycin	250-300% of oral	(4)
	Metronidazole	80% of oral	PEG suppository compared to oral suspension (4)
	Ceftizoxime	Therapeutic Levels	2/3 parenteral bioavai. with caprate, 1/3 bioavail. without caprate (4)

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Event	Medications Indicated	Standard Enema Guidelines	References and Pharmacy Notes
Constipation/ Elevated NH3	Lactulose Enema	Follow agency guidelines for preparation and administration. Place Macy Catheter. Instill enema with 60ml enteral syringe or gravity bag . Retain in rectum for 30-60 minutes. Deflate balloon and allow patient to expell in bedpan or commode.	May repeat every 4 to 6 hours (23, 29)

Event	Medications Indicated	Rectal bioavailability	References and Pharmacy Notes
Hiccups	Chlorpromazine	Similar to oral	(4)
	Haloperidol	No PK Studies published	Anecdotal support of clinical effectiveness administered rectally

Event	Fluids	Bolus Info	References and Pharmacy Notes
Fluid Replacement (Dehydration)	Hypotonic fluids (H2O, 1/2NS, 1/4NS etc.)	Follow agency protocol. Bolus volumes up to 500ml over 2 to 4 hours with a maximum 24hour volume of 1500ml/day have been well tolerated.(22,26)	(22, 26)

Event	Medications Indicated	Rectal bioavailability (% of Oral)	References and Pharmacy Notes
Fluid Overload	Furosemide	Similar to oral	Therapeutic effect similar to oral at same dose (20)

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## Alphabetical Listing

Acetaminophen	90% of oral	As aqueous suspension- (6)
Amoxicillin	87-99% of oral	Study used hydrophilic suppository (4)
Aspirin	Similar to oral	As suspension at pH of 4 (4,6)
Atropine	31% of IV	Pediatric Study Tmax 15min to 30min(4,27)
Carbamazepine	67% of oral	Study tested only Fatty suppository (4)
Ceftizoxime	Therapeutic Levels	2/3 parenteral bioavail. with caprate, 1/3 bioavail. without caprate (4)
Chlorpromazine (Thorazine)	Similar to oral	(4)
Clomipramine	Similar to oral	(4)
Dexamethasone	Rectal absorption not studied	Satisfactory results have been obtained in several studies with rectal corticosteroids(16). Large amount of anecdotal evidence for effectiveness of BRD suppositories. Case Study on BRD (17)
Diazepam	Similar to oral	Tmax =17 min(rectal suspension) vs 82 min(suppos) vs 52 min(oral tablet)(12)
Diphenhydramine	No studies	Commonly used in suppositories
Doxepin	Therapeutic Blood Levels	(4,8)
Erythromycin	250-300% of oral	(4)
Furosemide	Similar to oral	Therapeutic effect similar to oral at same dose (20)
Haloperidol	No studies	Anecdotal reports support clinical effectiveness administered rectally
Hydromorphone	50% of oral	Note: Study done only on suppositories, not suspension (4)
Hydroxyzine	No studies	Commonly used in suppositories
Ibuprofen	88% of oral	Slower rectal Tmax 1.1h vs 33min oral(4)
Imipramine	Similar to oral	(4)

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Ketamine	150% of oral	(14)
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Odansetron	30% of oral	Reported Clinically effective(4)
Oxycodone	Similar to oral	Analgesia onset fast = 30min -1h(2)
Phenobarbital	Similar as oral	Faster absorption and less variability via microenema suspension vs suppository (10,11,25)
Prochlorperazine	Similar to oral	(4)
Promethazine	70% -97% of oral	(4)
Tap water	Well absorbed	Well tolerated (N=76) up to >250ml/hr(22)
Trazodone	Clinically effective	(4)
Valproic Acid	89% to 100%	(4)
Quetiapine	189% to oral	Tmax comparable and variability less with rectal vs oral (102+/- 21min rectal vs 93+/-68.5 min oral) (24)

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