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Y-Site Compatibility of Medications with Parenteral Nutrition

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Providing parenteral nutrition to pediatric patients requiring various other intravenous products can be challenging. Evaluation of compatibility is essential; however, information is limited and sometimes conflicting. We strove to critically evaluate and present the available published data as a comprehensive and practical reference. To accomplish this, we weighed the strength of evidence supporting compatibility versus incompatibility and provided specific conditions affecting compatibility, where appropriate. Many commonly used medications in pediatric patients have consistently demonstrated Y-site compatibility with parenteral nutrition and may be safely administered simultaneously. Exceptions must be noted and these medications should preferentially be administered through a separate line, if available, or the same line may be used only after stopping the parenteral nutrition infusion and flushing the line before and after drug administration.

KEYWORDS medication, compatibility, parenteral nutrition, y-site

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Many pediatric conditions such as abdominal wall defects of the newborn and short bowel syndrome warrant the use of parenteral nutrition. Obtaining and maintaining venous access in pediatric patients complicates the administration of this form of nutrition. Many patients require multiple treatment modalities to be administered intravenously including, medications, fluids, blood products and nutrition. Clinicians must optimize available access to ensure appropriate and timely administration of all products prior to establishing additional access. This may require simultaneous administration of medications and parenteral nutrition, therefore compatibility considerations become essential. It is important to recognize that compatibility only reflects the physical interactions such as formation of a precipitate and does not necessarily address stability or pharmacologic activity of the products. Published data may report both compatibility and stability, however most evaluate compatibility alone. Currently there are multiple resources to use when answering the question of compatibility with parenteral nutrition. We strove to evaluate and present the available published data as a comprehensive and practical reference. We sought out primary literature regarding y-site compatibility of multiple drugs commonly used in pediatric patients with three different parenteral nutrition formulas, 3-in-1, 2-in-1 and lipids alone. When conflicting results were encountered the clinical strength was considered. When published data were not accessible Trissel's Handbook on Injectable Drugs[1] was used. Below please find each of the classifications utilized in this reference:

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C Compatibility has been demonstrated. When Y-site compatibility was not available, medications compatible in-solution for 24 hours were assumed to be Y-site compatible. Medications compatible with 3-in-1 admixtures were assumed to be compatible with lipids alone.[1]
I Incompatibility has been demonstrated
— Compatibility data not available
C/I Conflicting compatibility has been demonstrated and strength of the evidence supports compatible
I/C Conflicting compatibility has been demonstrated and strength of the evidence supports incompatible

Medication	Admixture Type			Comments	References	
	2-in-1	*lipids*	*3-in-1*		*C*	*I*
Acetazolamide	**I**	—	—	White precipitate forms immediately		2
Acyclovir	**I**	**I**	**I**	White precipitate forms immediately		2,3,4
Amikacin	**C**	**C/I**	**C/I**	Visual breaking of emulsion within 1 hour in select formulations	2,3,4,5,6,7	8
Aminophylline	**C/I**	**C**	**C**		3,4,9,10	2
Amphotericin B	**I**	**I**	**I**	Yellow precipitate formed immediately		3,4
Ampicillin sodium	**C/I**	**C**	**C**		3,4,11	2,5,7,12
Ampicillin sodium - Sulbactam sodium	**C**	**C**	**C**		3,4	
Atracurium besylate	**C**	—	—		13	
Aztreonam	**C**	**C**	**C**		3,4	
Bumetanide	**C**	**C**	**C**		3,4	
Caffeine	**C**	—	—		14	
Cefamandole	**C**	**C**	**C**		5,7,11	
Cefazolin Sodium	**C/I**	**C**	**C**	Incompatible at a dextrose concentration of 25%	3,4,5,14	3
Cefepime	**C**	—	—		15	
Cefoperazone sodium	**C**	**C**	**C**		3,4,5	
Cefotaxime sodium	**C**	**C**	**C**		2,3,4,5	
Cefotetan disodium	**C**	**C**	**C**		3,4	
Cefoxitin sodium	**C**	**C**	**C**		3,4,5,11	
Ceftazidime	**C**	**C**	**C**		2,3,4,16	
Ceftriaxone sodium	**C**	**C**	**C**		3,4,13	
Cefuroxime sodium	**C**	**C**	**C**		3,4	
Cephalothin sodium	**C**	—	—		5,7,12	
Chloramphenicol sodium succinate	**C**	**C**	—		1,5	
Chlorpromazine HCl	**C**	**C**	**C**		3,4	
Cimetidine HCl	**C**	**C**	**C**		3,4,17	
Ciprofloxacin lactate	**I**	**C**	**C**	Amber discoloration in 1 to 4 hours	4	3
Cisplatin	**I**	**C**	**C**	Amber discoloration in 1 to 4 hours	4	3
Clindamycin phosphate	**C**	**C**	**C**		4,5,11	

Co-Trimoxazole	**C**	**C**	**C**		3,4	
Cyclophosphamide	**C**	**C**	**C**		3,4	
Cyclosporine	**C/I**	**C/I**	**C/I**	For 2:1, found to be compatible with Dextrose 5%/Amino Acids 4.25%, but not compatible with Dextrose 25%/ Amino Acid 3.5%	3,4,18	3,4
Dexamethasone sodium phosphate	**C**	**C**	**C**		2,3,4	
Digoxin	**C**	**C**	**C**		3,4,19	
Diphenhydramine HCl	**C**	**C**	**C**		3,4	
Dobutamine HCl	**C**	**C**	**C**		2,3,4,6	
Dopamine HCl	**C**	**C/I**	**C/I**		2,3,4,19	4
Doxycycline hyclate	**C**	**I**	**I**	Emulsion disruption occurs immediately	3,5	4
Droperidol	**C**	**I**	**I**	Emulsion disruption occurs in 1 to 4 hours	3	4
Enalaprilat	**C**	**C**	**C**		3,4	
Epinephrine HCl	**C**	**—**	**—**		13	
Epoetin alfa	**C**	**—**	**—**		20	
Erythromycin lactobionate	**C**	**C**	**C**		5,11,13	
Famotidine	**C**	**C**	**C**		3,4,17,21,22,23,24,25	
Fentanyl citrate	**C**	**C**	**C**		2,3,4,26	
Fluconazole	**C**	**C**	**C**		3,4,27	
Foscarnet	**C**	**—**	**—**		28	
Furosemide	**C/I**	**C**	**C**	Small amount of precipitate formed in 4 hours in select formulations	2,4,13,19	3
Ganciclovir sodium	**I/C**	**I**	**I**	Concentrations of ≥ 10mg/mL resulted in precipitation within 0 to 30 mins	29,30	3,4,29
Gentamicin sulfate	**C**	**C**	**C**		2,3,4,5,6,7,8,11,12,13	
Granisetron HCl	**C**	**C**	**C**		3,4	
Haloperidol lactate	**C**	**I**	**I**	Emulsion disruption occurs immediately	3,13	4
Heparin sodium	**C**	**I**	**I**	Emulsion disruption occurs immediately with heparin 100 units/ mL	3,13	4
Hydrochloric Acid	**C**	**—**	**—**		31	
Hydrocortisone sodium / phosphate / succinate	**C**	**C**	**C**		3,4,13	
Ifosfamide	**C**	**C**	**C**		3,4	
Imipenem-Cilastatin Sodium	**C**	**C**	**C**		3,4	
Immune Globulin	**—/C**	**—**	**—**	Only supportive of Gammagard® 2.5%; not recommended to infuse with other drugs or solutions	32	
Indomethacin sodium trihydrate	**I**	**—**	**—**			33

Insulin, regular human	**C**	**C**	**C**		3,4,13	
Iron dextran	**C/I**	**—**	**I/C**	For 2:1, found to be compatible in solution at amino acid concentrations of 2% or greater	34,35,36	35,37
Isoproterenol HCl	**C**	**C**	**C**	For 2:1, compatible with dextrose 25%/amino acids 4.25% (electrolytes were not added)	19,38	
Kanamycin sulfate	**C**	**C**	**C**		11,12,38,39	
Lidocaine HCl	**C**	**C**	**C**	For 2:1, compatible with dextrose 25%/amino acids 4.25% (electrolytes were not added)	19,38	
Linezolid	**C**	**—**	**—**	Compatible with dextrose 20%/amino acids 4.9%; electrolytes were not added	40	
Lorazepam	**C**	**I**	**I**	Partial emulsion disruption occurs in 1 hour	3	4
Magnesium sulfate	**C**	**C**	**C**		3,4	
Mannitol	**C**	**C**	**C**		3,4	
Meperidine HCl	**C**	**C**	**C**		3,4,41	
Meropenem	**—**	**C**	**C**		4	
Methotrexate	**I**	**C**	**C**	For 2:1, hazy precipitate formed in 0 to 1 hour	4	3
Methyldopate HCl	**C**	**C/I**	**C/I**	For 2:1, compatible with dextrose 25%/amino acids 4.25% (electrolytes were not added); cracked the lipid emulsion in select formulations	19,38	20
Methylprednisolone sodium succinate	**C**	**C**	**C**		3,4	
Metoclopramide HCl	**I/C**	**C**	**C**	Substantial loss of natural turbidity occurred immediately in select formulations	1,4	3
Metronidazole HCl	**C**	**C**	**C**		2,3,4,13	
Mezlocillin sodium	**C**	**—**	**—**		3	
Miconazole	**C**	**C**	**C**		3,4,5	
Midazolam HCl	**I/C**	**I**	**I**	White precipitate forms immediately in select formulations	42	3,4,13
Milrinone lactate	**C**	**—**	**—**		43,44	
Morphine sulfate	**C**	**C/I**	**C/I**	For 3:1, morphine 1 mg/mL compatible, but 15 mg/mL was not compatible; emulsion disruption occurs immediately in select formulations	3,4,13,41	4
Nafcillin sodium	**C**	**C**	**C**		3,4,5,7	
Nitroglycerin	**C**	**C**	**C**		3,4	
Norepinephrine bitartrate	**C**	**C**	**C**		3,19	
Octreotide acetate	**C**	**C**	**C**		3,4	
Ondansetron HCl	**C**	**I**	**I**	Emulsion disruption occurs immediately	3	4
Oxacillin sodium	**C**	**C**	**C**		5,7,11	

Penicillin G potassium	C	C	C		2,5,7,11,13	
Penicillin G sodium	C	—	—		5,7	
Pentobarbitol sodium	C	I	I	Emulsion disruption occurs immediately	3	4
Phenobarbitol sodium	C	I	I	Emulsion disruption occurs immediately	3	4
Phenytoin sodium	I	I	—	Heavy white precipitate forms immediately; incompatible with dextrose		1,13
Piperacillin sodium	C	C	C		3,4,5,7	
Piperacillin sodium / Tazobactam sodium	C	C	C		3,4	
Potassium chloride	C	C	C		3,4	
Potassium phosphate	I	I	I	Emulsion disruption occurs immediately; increased turbidity occurs immediately		3,4
Promethazine HCl	C/I	C	C	Amber discoloration in 4 hours in select formulations	3,4	3
Propofol	C	—	—	Propofol injection contains approximately 10 gm fat / 100 mL	45	
Ranitidine HCl	C	C	C		2,3,4,13,17	
Sargramostim	C	—	—		46	
Sodium bicarbonate	I/C	C	C	Small amount of precipitate formed in 1 hour in select formulations	3,5	3
Sodium nitroprusside	C	C	C		3,4	
Tacrolimus	C	C	C		3,4	
Ticarcillin disodium	C	C	C		3,4,5,7,11	
Ticarcillin disodium-Clavulanate potassium	C	C	C		3,4,13	
Tobramycin sulfate	C	C	C		2,3,4,5,6,7,8,11	
Urokinase	C	—	—		1	
Vancomycin HCl	C	C	C		2,3,4,5,6,13	
Vecuronium bromide	C	—	—		13	
vitamin K1 - phytonadione	C	C	—		12,47	
Zidovudine	C	C	C		2,3,4	

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