Substance: Fentanyl Citrate

General information

Full title:	Fentanyl Citrate
Brand:	Sublimaze
CAS number:	990-73-8

Synonyms

Fentanyl Citrate

Substance classifications

28:08.08 Opiate Agonists

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Products

Fentanyl citrate is available in 2-, 5-, 10-, and 20-mL ampuls and vials, 1- and 2-mL prefilled syringes, 2-mL cartridges, and 50-mL vials.[3686] [3687] [3688] [3689] [3690] Each mL contains fentanyl (as the citrate) 50 mcg (0.05 mg) with hydrochloric acid and/or sodium hydroxide for pH adjustment in water for injection.[368636873688]

pH

The pH of the injection ranges from 4 to 7.5.[368636873688]

Osmolality

The product osmolality was determined to be essentially 0 mOsm/kg.[1233]

Trade Name(s)

Sublimaze

Administration

Fentanyl citrate is administered intramuscularly or intravenously.[368636873688]

Stability

Intact containers should be stored at controlled room temperature and protected from light.[3686] [3687] [3688] Some manufacturers state that the drug should be kept in the carton until time of use.[36873688]

pH Effects

Fentanyl citrate is most stable at pH 3.5 to 7.5.[1638]

Syringes

In 2015, reports of decreased potency of certain drugs (e.g., fentanyl citrate) stored in Becton Dickinson syringes for extended periods (i.e., exceeding 24 hours) were confirmed by the manufacturer of these syringes; the cause of this change was later identified to be the inclusion of an alternate rubber stopper in the plunger of certain product lots of syringes.[3029] [3036] [3037] [3039] [3041] [3042] Decreased potency was not observed when the syringes were filled and used promptly.[3037] Use of the alternate stopper was later discontinued and use of the primary stopper in such syringes was resumed; however, Becton Dickinson states that its general-use syringes are cleared by FDA for immediate use in fluid aspiration and injection and that such syringes, regardless of the stopper material, have not been cleared by FDA for use as a closed-container system.[3391]

Fentanyl citrate undiluted at a fentanyl concentration of 50 mcg/mL was tested for stability in polypropylene syringes. The fentanyl citrate injection was filled into polypropylene syringes that were then capped off. The samples were stored for 28 days under refrigeration at 5°C and at room temperature of 22°C exposed to light. No change in color or clarity occurred. No loss of fentanyl at either set of storage conditions occurred.[2648]

Fentanyl citrate (Hospira or Baxter, unspecified) undiluted at a fentanyl concentration of 50 mcg/mL and diluted to a fentanyl concentration of 10 mcg/mL in dextrose 5% or sodium chloride 0.9% was packaged as 5 mL in 10-mL polypropylene syringes (Becton Dickinson) and stored at ambient room temperature protected from light.[3887] The solutions remained clear and colorless with 1.7% loss of drug in the undiluted solution and no loss in the 10-mcg/mL solutions in 100 days.[3887]

Fentanyl citrate (Elkins Sinn) prepared at a fentanyl concentration of 0.0167 mg/mL in sodium chloride 0.9% packaged in polypropylene syringes (Sherwood) was physically stable and exhibited little or no loss in 24 hours stored at 4 or 23°C in the dark.[2199]

Fentanyl citrate (David Bull) prepared at a fentanyl concentration of 12.5 mcg/mL in sodium chloride 0.9% was packaged as 8 mL in 10-mL polypropylene syringes (Terumo) with attached needles. Fentanyl citrate (David Bull) prepared at a fentanyl concentration of 33.3 mcg/mL in sodium chloride 0.9% was packaged as 18 mL in 20-mL polypropylene syringes (Terumo) with attached needles. The syringes were stored at 5, 22, and 38°C for 7 days. The solutions were visually unchanged with no loss of drug at 5 and 22°C. At 38°C, the 12.5-mcg/mL solution had under 7% loss and the 33.3-mcg/mL solution had no loss.[2202]

Fentanyl citrate (Janssen) prepared at a fentanyl concentration of 35 mcg/mL in sodium chloride 0.9% was packaged in 2 types of polypropylene syringes. The Omnifix (B. Braun) syringes had polyisoprene piston tips while the Terumo syringes had no natural or synthetic rubber in the product. Stored at 4, 21, and 35°C for 30 days, the test solutions exhibited no visible or pH changes. Although the pH remained within the stability range for the drug, this does not demonstrate stability.[2387]

Fentanyl citrate (Hospira) was prepared at a fentanyl concentration of 5 mcg/mL in sodium chloride 0.9% and packaged as 1.1 mL in 12-mL polypropylene syringes (Terumo).[2791] The syringes were stored for 90 days at a controlled temperature of 23 to 27°C and relative humidity of 55 to 65% while being protected from light.[2791] Neither changes in color or clarity nor appreciable changes in pH from baseline values occurred.[2791] Samples exhibited a loss of less than 1% at 90 days.[2791]

Fentanyl citrate (Janssen) was prepared at a fentanyl concentration of 9.6 mcg/mL in dextrose 5% and packaged as 50 mL in 50-mL syringes.[3607] [3608] The syringes were stored for 7 days at a temperature of 25 to 28°C and relative humidity of 70 to 80%.[3607] While visual observations revealed physical compatibility throughout the study period, substantial pH changes were noted after 72 hours.[3607] Fentanyl concentrations were not measured using a stability indicating assay.[36073608]

Ambulatory Pumps

Fentanyl citrate (Merck) prepared at fentanyl concentrations of 50 and 30 mcg/mL in sodium chloride 0.9% was evaluated in CADD-1 and CADD-PRIZM medication cassettes. About 4% drug loss occurred in 14 days at room and refrigeration temperatures.[2717]

Sorption

Fentanyl citrate prepared at a fentanyl concentration of 2 mcg/mL in various buffer solutions ranging from pH 5.5 to pH 6.7 packaged in polyvinyl chloride (PVC) containers (Baxter) was shown to undergo slow sorption to the PVC in amounts dependent on the pH of the solution. The lower pH solutions exhibited less loss with increasing loss as the pH increased. At the highest pH tested of 6.7, 17% fentanyl loss occurred in 1 day. Refrigeration decreased the extent of loss but did not eliminate it. See Table 1. Little or no fentanyl loss was found in identical fentanyl citrate 2-mcg/mL solutions packaged in glass containers.[2305]

Fentanyl citrate undiluted at a fentanyl concentration of 50 mcg/mL was tested for stability in PVC bags. The fentanyl citrate injection was filled into PVC bags that were stored for 28 days under refrigeration at 5°C and at room temperature of 22°C exposed to light. No change in color or clarity occurred. No loss of fentanyl citrate at either set of storage conditions occurred.[2648]

Table 1. Percentage of Fentanyl 2 mcg/mL Remaining After Storage for 30 Days at 23°C in PVC Containers[2305]

Buffer pH	Fentanyl Remaining (%)
5.5	85
5.8	77
6.3	56
6.7	27

Filtration

Fentanyl citrate (Janssen) prepared at a fentanyl concentration of 2.5 mcg/mL in dextrose 5% or sodium chloride 0.9% was delivered over 4 hours through 3 kinds of 0.2-µm membrane filters varying in size and composition. No fentanyl loss occurred due to sorption to the filter.[1399]

Central Venous Catheter

Fentanyl citrate (Abbott) prepared at a fentanyl concentration of 10 mcg/mL in dextrose 5% was found to be compatible with the ARROWg+ard Blue Plus (Arrow International) chlorhexidine-bearing triple-lumen central catheter. Essentially complete delivery of the drug was found with little or no drug loss occurring. Furthermore, chlorhexidine delivered from the catheter remained at trace amounts with no substantial increase due to the delivery of the drug through the catheter.[2335]

Standardize 4 Safety

The recommended standard concentrations for continuous infusion of fentanyl in adults and in pediatric patients weighing less than 50 kg are **10 and 50 mcg/mL** .[3635] [3636] (See Standardize 4 Safety in Users Guide.) Updates may be available atwww.ashp.org/pharmacy-practice/standardize-4-safety-initiative.

Compatibility Information

Solution Compatibility

Fentanyl citrate

Test Soln Name	Test Soln Mfr	Base Drug Mfr	Base Drug Conc/L or %	Remarks	Refs	Compat
Dextrose 5%	DB, [a]TR [b]	JN	5 mg	Physically compatible. No loss in 48 hr at 22°C in light	1357	C
Dextrose 5%	HOS [c]		10 mg	Visually compatible with no loss in 100 days at 20 to 25°C in dark	3887	C
Dextrose 5%	AB	JN	20 and 40 mg	Visually compatible. 3% or less loss in 3 hr at 24°C	1852	C
Sodium chloride 0.9%	TR [b]	JN	20 mg	Physically compatible. Little loss in 30 days at 3 and 23°C	1356	C
Sodium chloride 0.9%	DB, [a]TR [b]	JN	5 mg	Physically compatible. No loss in 48 hr at 22°C in light	1357	C
Sodium chloride 0.9%	HOS [c]		10 mg	Visually compatible with no loss in 100 days at 20 to 25°C in dark	3887	C

[a] Tested in glass containers.
[b] Tested in PVC containers.
[c] Tested in polypropylene syringes.

Additive Compatibility

Fentanyl citrate

Test Drug	Test Drug Mfr	Test Drug Conc/L or %	Base Drug Mfr	Base Drug Conc/L or %	Test Solution	Remarks	Refs	Compat
Bupivacaine HCl	WI	1.25 g	JN	20 mg	NS [a]	Physically compatible with little or no loss of either drug in 30 days at 3 and 23°C	1396	C
Bupivacaine HCl		1.25 g		2 mg	NS [a]	Physically compatible with no bupivacaine loss and about 6 to 7% fentanyl loss in 30 days at 4 and 23°C	2305	C
Bupivacaine HCl		600 mg		2 mg	NS [a]	Physically compatible with no bupivacaine loss and about 2 to 4% fentanyl loss in 30 days at 4 and 23°C	2305	C
Bupivacaine HCl	HOS	10 mg	SZ	0.15 mg	NS [p]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	HOS	10 mg	SZ	43 mg	NS [p]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	[q]	20 g	SZ	0.15 mg	NS [p]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	[q]	20 g	SZ	25 mg	NS [p]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	[q]	37.5 g	SZ	0.15 mg	NS [p]	Physically compatible for 28 days at 5°C protected from light	3777	C

Bupivacaine HCl [g]	AST	1 g	JN	35 mg	NS [a]	Visually compatible with less than 10% change of any drug in 28 days at 4°C and 24 days at 25°C in the dark	2437	C
Bupivacaine HCl [h]	WI [h]	440 mg	JN	1.25 mg	[e]	No bupivacaine and fentanyl loss and 10% epinephrine loss in 30 days at 3 and 23°C then 48 hr at 30°C	1627	C
Bupivacaine HCl [i]	IVX	1 g	IVX	2 mg		Visually compatible with less than 10% loss of epinephrine and no loss of other drugs in 182 days at 4 and 22°C	2613	C
Clonidine HCl [j]	BI	9 mg	JN	35 mg	NS [a]	Visually compatible with less than 10% change of any drug in 28 days at 4°C and 24 days at 25°C in the dark	2437	C
Droperidol [m]	JN	50 mg	DB	10 mg	NS [a]	Visually compatible. 5% increase in all drugs in 30 days at 4 and 25°C due to water loss	2653	C
Droperidol [m]	JN	50 mg	DB	10 mg	NS [d]	Visually compatible with little loss of the drugs in 30 days at 25°C	2653	C
Epinephrine HCl [i]	PHX [o]	2 mg	IVX	2 mg		Visually compatible with less than 10% loss of epinephrine and no loss of other drugs in 182 days at 4 and 22°C	2613	C
Epinephrine HCl [k]	AB	0.69 mg	JN	1.25 mg	[e]	No bupivacaine and fentanyl loss and 10% epinephrine loss in 30 days at 3 and 23°C then 48 hr at 30°C	1627	C
Fluorouracil	AB	1 and 16 g	AB	12.5 mg	D5W, NS [a]	25% fentanyl loss in 15 min due to sorption to PVC	2064	I
Ketamine HCl [n]	JN	1 g	DB	10 mg	NS [a]	Visually compatible. 5% increase in all drugs in 30 days at 4 and 25°C due to water loss	2653	C
Ketamine HCl [n]	JN	1 g	DB	10 mg	NS [d]	Visually compatible with little loss of the drugs in 30 days at 25°C	2653	C
Lidocaine HCl	AST	2.5 g		2 mg	NS [a]	Physically compatible with no loss of lidocaine or fentanyl at pH 5.8 in 30 days at 4 and 23°C	2305	C
Lidocaine HCl	BRN	2.5 g		2 mg	NS [a]	Physically compatible with little lidocaine loss but 18% fentanyl loss at 23°C and 10% loss at 4°C in 2 days due to sorption at pH 6.7 from higher pH lidocaine product	2305	I
Naloxone HCl	ENH	4 mg	KLN	20 mg	NS [a] [d]	Physically compatible with no loss of either drug in 72 hours at 4 and 25°C in the dark	3717	C
Ropivacaine HCl	ASZ	1 g	JN	1 mg	NS [b]	Physically compatible. No loss of either drug in 30 days at 30°C in the dark	2433	C
Ropivacaine HCl	ASZ	2 g	JN	1 mg	[b]	Physically compatible. No loss of either drug in 30 days at 30°C in the dark	2433	C
Ropivacaine HCl	ASZ	2 g	JN	10 mg	[b]	Physically compatible. No loss of either drug in 30 days at 30°C in the dark	2433	C
Ropivacaine HCl	ASZ	1.5 g	CUR	3 mg	NS [c]	Physically compatible. No loss of either drug in 51 days at 20 and 4°C	2498	C
Ropivacaine HCl	ASZ	1.5 g	CUR	3 mg	NS [a]	Physically compatible. No loss of either drug in 7 days at 20 and 4°C	2498	C
Ziconotide acetate	ELN	25 mg [b]	BB	1 g [f]		10% ziconotide loss in 26 days. No fentanyl loss in 40 days at 37°C	2772	C

[a] Tested in PVC containers.
[b] Tested in polypropylene bags (Mark II Polybags).
[c] Tested in glass and ethylene vinyl acetate containers.
[d] Tested in glass containers.
[e] Tested in portable infusion pump reservoirs (Pharmacia Deltec).
[f] Fentanyl citrate powder dissolved in ziconotide acetate injection.
[g] Tested with clonidine HCl (BI) 9 mg/L.
[h] Tested with epinephrine HCl (AB) 0.69 mg/L.
[i] Tested with epinephrine bitartrate (PHX) 2 mg/L.
[j] Tested with bupivacaine HCl (AST) 1 g/L.
[k] Tested with bupivacaine HCl (WI) 440 mg/L.
[l] Tested with bupivacaine HCl (IVX) 1 g/L.
[m] Tested with ketamine HCl (JN) 1 g/L.
[n] Tested with droperidol (JN) 50 mg/L.
[o] Bitartrate salt of epinephrine tested.
[p] Tested in non-DEHP containers.
[q] Extemporaneously compounded.

Drugs in Syringe Compatibility

Fentanyl citrate

Test Drug	Test Drug Mfr	Test Drug Amt	Base Drug Mfr	Base Drug Amt	Remarks	Refs	Compat
Atracurium besylate	BW	10 mg/mL		50 mcg/mL	Physically compatible and atracurium stable for 24 hr at 5 and 30°C	1694	C
Atropine sulfate		0.6 mg/1.5 mL	MN	100 mcg/1 mL	Physically compatible for at least 15 min	14	C
Atropine sulfate	ST	0.4 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Bupivacaine HCl	HOS	0.01 mg/mL [a]	SZ	0.15 mcg/mL [a]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	HOS	0.01 mg/mL [a]	SZ	43 mcg/mL [a]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	[k]	20 mg/mL [a]	SZ	0.15 mcg/mL [a]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	[k]	20 mg/mL [a]	SZ	25 mcg/mL [a]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl	[k]	37.5 mg/mL [a]	SZ	0.15 mcg/mL [a]	Physically compatible for 28 days at 5°C protected from light	3777	C
Bupivacaine HCl [c]	AST	50 mg	JN	1.75 mg	Diluted to 50 mL with NS. Visually compatible with less than 10% loss of any drug in 25 days at 4 and 25°C in the dark	2437	C
Bupivacaine HCl [d]	SW	1.5 mg/mL	JN	0.01 mg/mL	Diluted to 5 mL with NS. Visually compatible with no new GC/MS peaks in 1 hr at room temperature	1956	C
Butorphanol tartrate	BR	4 mg/2 mL	MN	0.1 mg/2 mL	Physically compatible for 30 min at room temperature	566	C
Caffeine citrate		20 mg/1 mL	ES	50 mcg/1 mL	Visually compatible for 4 hr at 25°C	2440	C
Chlorpromazine HCl	PO	50 mg/2 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Clonidine HCl [e]	BI	0.45 mg	JN	1.75 mg	Diluted to 50 mL with NS. Visually compatible with less than 10% loss of any drug in 25 days at 4 and 25°C in the dark	2437	C
Clonidine HCl [f]	BI	0.03 mg/mL	JN	0.01 mg/mL	Diluted to 5 mL with NS. Visually compatible with no new GC/MS peaks in 1 hr at room temperature	1956	C
Dimenhydrinate	HR	50 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Diphenhydramine HCl	PD	50 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Droperidol	MN	2.5 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Heparin sodium		2500 units/1 mL	JN	0.1 mg/2 mL	Physically compatible for at least 5 min	1053	C
Hydromorphone HCl	KN	4 mg/2 mL	MN	0.05 mg/1 mL	Physically compatible for 30 min	517	C
Hydroxyzine HCl	PF	50 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Hydroxyzine HCl	PF	50 mg/1 mL	CR	0.05 mg/1 mL	Physically compatible	771	C
Hydroxyzine HCl	PF	100 mg/2 mL	CR	0.05 mg/1 mL	Physically compatible	771	C
Ketamine HCl	PF	1 mg/mL		40 mcg/mL	Diluted in sodium chloride 0.9%. Physically compatible for 96 hr at 25°C	2563	C
Ketamine HCl [g]	PD	2 mg/mL	JN	0.01 mg/mL	Diluted to 5 mL with NS. Visually compatible with no new GC/MS peaks in 1 hr at room temperature	1956	C

Lidocaine HCl [h]	AST	2 mg/mL	JN	0.01 mg/mL	Diluted to 5 mL with NS. Visually compatible with no new GC/MS peaks in 1 hr at room temperature	1956	C
Meperidine HCl	WI	50 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Metoclopramide HCl	NO	10 mg/2 mL	MN	0.05 mg/1 mL	Physically compatible for 15 min at room temperature	565	C
Metoclopramide HCl [i]	AST	20 mg/4 mL	DB	1 mg/20 mL	Visually compatible with 7% or less loss of each drug in 10 days at 32°C	2268	C
Midazolam HCl	RC	5 mg/1 mL	ES	0.1 mg/2 mL	Physically compatible for 4 hr at 25°C	1145	C
Midazolam HCl	RC	0.625 and 0.938 mg/mL [a]	DB	12.5 mcg/mL [a]	Visually compatible. Little fentanyl loss. 7 and 9% midazolam loss in 7 days at 5 and 22°C, respectively	2202	C
Midazolam HCl	RC	0.625 mg/mL [a]	DB	37.5 mcg/mL [a]	Visually compatible. No fentanyl loss. 5 and 8% midazolam loss in 7 days at 5 and 22°C, respectively	2202	C
Midazolam HCl	RC	0.938 mg/mL [a]	DB	37.5 mcg/mL [a]	Visually compatible. Little fentanyl loss. 7 and 9% midazolam loss in 7 days at 5 and 22°C, respectively	2202	C
Midazolam HCl	RC	0.278 and 0.833 mg/mL [a]	DB	33.3 mcg/mL [a]	Visually compatible. No fentanyl loss. 5 and 7% midazolam loss in 7 days at 5 and 22°C, respectively	2202	C
Midazolam HCl [j]	RC	15 mg/3 mL	DB	1 mg/20 mL	Visually compatible with 7% or less loss of each drug in 10 days at 32°C	2268	C
Morphine sulfate	ST	15 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Ondansetron HCl	GW	1.33 mg/mL [a]	ES	16.7 mcg/mL [a]	Physically compatible. Little loss of either drug in 24 hr at 4 or 23°C	2199	C
Pantoprazole sodium	[b]	4 mg/1 mL		50 mcg/1 mL	Possible precipitate within 15 min	2574	I
Pentazocine lactate	WI	30 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Pentobarbital sodium	AB	50 mg/1 mL	MN	0.05 mg/1 mL	Physically incompatible within 15 min	326	I
Prochlorperazine edisylate	PO	5 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Promethazine HCl	PO	50 mg/2 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C
Ranitidine HCl	GL	50 mg/2 mL	JN	0.1 mg/2 mL	Physically compatible for 1 hr at 25°C	978	C
Scopolamine HBr		0.6 mg/1.5 mL	MN	100 mcg/1 mL	Physically compatible for at least 15 min	14	C
Scopolamine HBr	ST	0.4 mg/1 mL	MN	0.05 mg/1 mL	Physically compatible for at least 15 min	326	C

[a] Tested in sodium chloride 0.9%.
[b] Test performed using the formulation WITHOUT edetate disodium.
[c] Tested with clonidine HCl (BI) 0.45 mg.
[d] Tested with ketamine HCl (PD) 2 mg/mL.
[e] Tested with bupivacaine HCl (AST) 50 mg.
[f] Tested with lidocaine HCl (AST) 2 mg/mL.
[g] Tested with bupivacaine HCl (SW) 1.5 mg/mL.
[h] Tested with clonidine HCl (BI) 0.03 mg/mL.
[i] Tested with midazolam HCl (RC) 15 mg/3 mL.
[j] Tested with metoclopramide (AST) 20 mg/4 mL.
[k] Extemporaneously compounded.

Y-Site Injection Compatibility (1:1 Mixture)

Fentanyl citrate

Test Drug	Test Drug Mfr	Test Drug Conc	Base Drug Mfr	Base Drug Conc	Remarks	Refs	Compat
Abciximab	LI	36 mcg/mL [a]	AB	50 mcg/mL	Visually compatible for 12 hr at 23°C	2374	C
Acetaminophen	CAD	10 mg/mL	TAY, HOS	50 mcg/mL	Physically compatible with less than 10% acetaminophen loss over 4 hr at room temperature	2841, 2844	C
Acetaminophen	FIN	10 mg/mL	GSK	50 mcg/mL	Particles form in 4 hr	3666, 3685	I
Acyclovir sodium	BV	5 mg/mL [b]	HOS	50 mcg/mL	Physically compatible	2794	C
Alprostadil	BED	7.5 mcg/mL [k,l]	JN	10 mcg/mL [l]	Visually compatible for 1 hr	2746	C
Alprostadil	PF	20 mcg/mL [a]	KE	40 mcg/mL [b]	Physically compatible for up to 4 hr at 22 to 25°C	3664, 3680	C
Amiodarone HCl	WY	6 mg/mL [a]	BA	50 mcg/mL	Visually compatible for 24 hr at 22°C	2352	C
Anidulafungin	VIC	0.5 mg/mL [a]	AB	50 mcg/mL	Physically compatible for 4 hr at 23°C	2617	C

Argatroban	GSK	1 mg/mL [b]	ES	50 mcg/mL	Visually compatible for 24 hr at 23°C	2391	C
Atracurium besylate	BW	0.5 mg/mL [a]	ES	10 mcg/mL [a]	Physically compatible for 24 hr at 28°C	1337	C
Atropine sulfate	LY	0.4 mg/mL	JN	25 mcg/mL [a]	Physically compatible for 48 hr at 22°C	1706	C
Azithromycin	PF	2 mg/mL [b]	AB	50 mcg/mL [i]	Whitish-yellow microcrystals found	2368	I
Bivalirudin	TMC	5 mg/mL [a]	AB	50 mcg/mL	Physically compatible for 4 hr at 23°C	2373	C
Bivalirudin	TMC	5 mg/mL [a] [b]	TAY	50 mcg/mL	Visually compatible for 6 hr at 23°C	2680	C
Caffeine citrate		20 mg/mL		10 mcg/mL [a]	Compatible and stable for 24 hr at room temperature	1(1/08)	C
Cangrelor tetrasodium	TMC	1 mg/mL [b]		12.5 mcg/mL [b]	Physically compatible for 4 hr	3243	C
Caspofungin acetate	ME	0.7 mg/mL [b]	HOS	0.05 mg/mL	Physically compatible for 4 hr at room temperature	2758	C
Caspofungin acetate	ME	0.5 mg/mL [b]	HOS	0.05 mg/mL	Physically compatible with fentanyl citrate i.v. push over 2 to 5 min	2766	C
Cefiderocol sulfate tosylate	SHI	20 mg/mL [o]	HOS	50 mcg/mL	Physically compatible for up to 4 hr at 21 to 25°C	3662, 3670	C
Ceftaroline fosamil	FOR	2.22 mg/mL [a] [b] [m]	HOS	50 mcg/mL	Physically compatible for 4 hr at 23°C	2826	C
Ceftolozane sulfate–tazobactam sodium	CUB	10 mg/mL [o] [p]	WW	50 mcg/mL	Physically compatible for 2 hr	3247, 3262	C
Cisatracurium besylate	GW	0.1, 2, 5 mg/mL [a]	AB	12.5 mcg/mL [a]	Physically compatible for 4 hr at 23°C	2074	C
Clonidine HCl	BI	18 mcg/mL [b]	ALP	50 mcg/mL	Visually compatible	2642	C
Cloxacillin sodium	SMX	100 mg/mL	SZ	50 mcg/mL	Physically compatible for up to 4 hr at room temperature	3245	C
Dexamethasone sodium phosphate	AMR	1 mg/mL [a]	JN	0.025 mg/mL [a]	Physically compatible for 48 hr at 22°C	1706	C
Dexmedetomidine HCl	HOS	4 mcg/mL [b]			Stated to be compatible	3181	C
Diazepam	ES	0.5 mg/mL [a]	JN	0.025 mg/mL [a]	Physically compatible for 48 hr at 22°C	1706	C
Diltiazem HCl	MMD	1 mg/mL [a]	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C
Diphenhydramine HCl	SCN	2 mg/mL [a]	JN	0.025 mg/mL [a]	Physically compatible for 48 hr at 22°C	1706	C
Dobutamine HCl	LI	4 mg/mL [a]	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C
Dopamine HCl	AB	3.2 mg/mL [a]	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C
Doripenem	JJ	5 mg/mL [a] [b]	HOS	0.05 mg/mL	Physically compatible for 4 hr at 23°C	2743	C
Doxapram HCl	RB	2 mg/mL [a]	ESL	25 mcg/mL [a]	Visually compatible for 4 hr at 23°C	2470	C
Enalaprilat	MSD	0.05 mg/mL [b]	ES	2 mcg/mL [a]	Physically compatible for 24 hr at room temperature under fluorescent light	1355	C
Epinephrine HCl	AB	0.02 mg/mL [a]	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C
Eravacycline dihydrochloride	TET	0.6 mg/mL [b]	WW	50 mcg/mL	Physically compatible for 2 hr at room temperature	3532	C
Esmolol HCl	DCC	1 g/100 mL [c]	JN	0.05 mg/1 mL	Physically compatible when fentanyl is injected into Y-site of flowing admixture [d]	1168	C
Esmolol HCl	DCC	10 mg/mL [c]	JN	0.05 mg/mL	Physically compatible. No drug loss in 8 hr at room temperature in light	1168	C
Etomidate	AB	2 mg/mL	ES	0.05 mg/mL	Visually compatible for 7 days at 25°C	1801	C
Fenoldopam mesylate	AB	80 mcg/mL [b]	AB	12.5 mcg/mL [b]	Physically compatible for 4 hr at 23°C	2467	C
Furosemide	AMR	10 mg/mL	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C
Haloperidol lactate	MN	0.2 mg/mL [a]	JN	0.025 mg/mL [a]	Physically compatible for 48 hr at 22°C	1706	C
Heparin sodium	UP	1000 units/L [e]	MN	0.05 mg/mL	Physically compatible for 4 hr at room temperature	534	C
Heparin sodium	ES	100 units/mL [a]	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C
Hetastarch in lactated electrolyte	AB	6%	ES	12.5 mcg/mL [a]	Physically compatible for 4 hr at 23°C	2339	C
Hydrocortisone sodium succinate	UP	10 mg/L [e]	MN	0.05 mg/mL	Physically compatible for 4 hr at room temperature	534	C
Hydromorphone HCl	KN	1 mg/mL	ES	0.05 mg/mL	Visually compatible for 4 hr at 27°C	2062	C