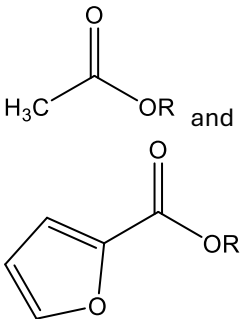
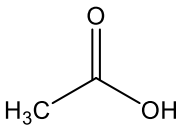
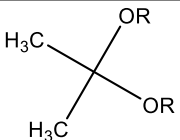
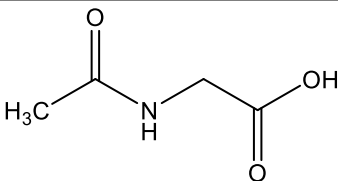
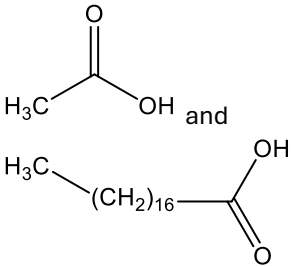
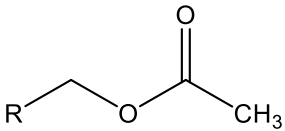
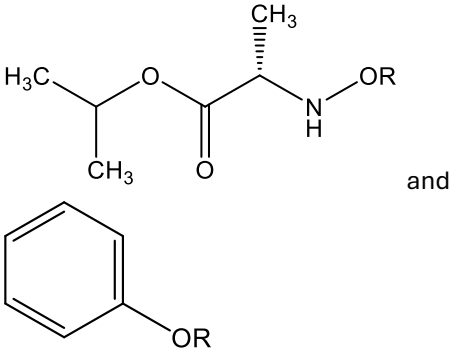
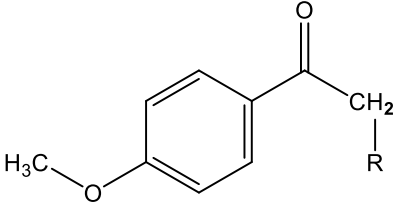
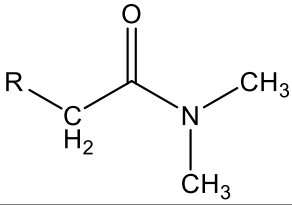


Modifiers for Pharmaceutical Salts, Esters, and Radicals Used in Adopted USAN

General notes:

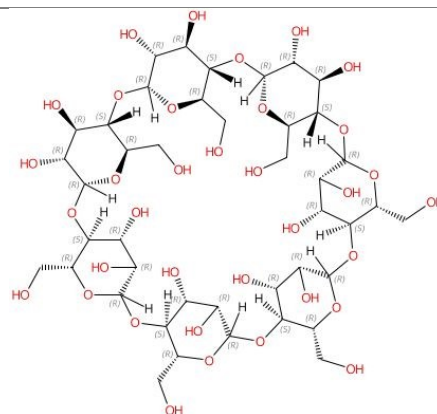
- For carboxylic acids, the modifier is used for the acid form, as well as the anion and ester forms.
- R in the structural drawings refers to an organic group (usually the active drug) attached at that location.
- New modifiers are added following review at the USAN Council meeting after they are used for the first time in an adopted USAN.
- Names for payloads of conjugates or the second word in nomenclature schemes for advanced therapies do not appear on this list.

Modifier	Chemical Description	Structure	Examples
acefurate	acetate ester and furan-2-carboxylate ester		dexamethasone acefurate
acetate	acetic acid and its anion and esters		abiraterone acetate, prednisone acetate, flecainide acetate, ciraparantag acetate, rentosertib acetate
acetoneide	propane-2,2-diol ester		tribenoside acetoneide
aceturate	N-acetylglycinic acid, and salts or esters of its anion		closiramine aceturate, diminazene aceturate

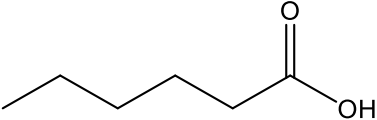
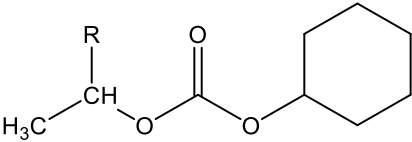
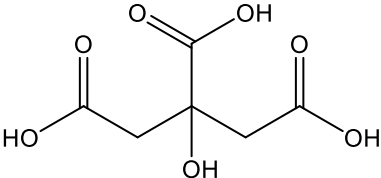
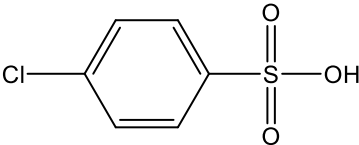
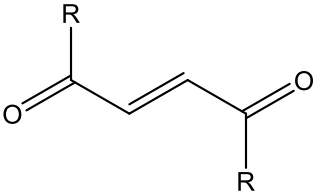
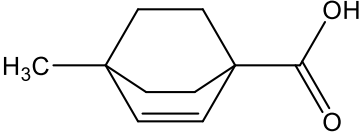
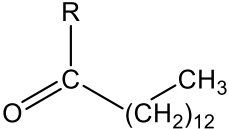
acistrate	Acetate ester and stearate salt		erythromycin acistrate
acoxil	(acetyloxy)methyl (also called methyl acetate) radical		ritipenem acoxil
alafenamide	isopropyl-L-alanine amide and phenyl ester		tenofovir alafenamide (phosphate ester)
anisatil	2-(4-methoxyphenyl)-2-oxoethyl radical		isotretinoin anisatil
arbamel	2-(dimethylamino)-2-oxoethyl radical		tilnoprofen arbamel
argine	30 ^β α-L-arginine-30 ^β β-L-arginine	-Arg-Arg-OH	insulin argine

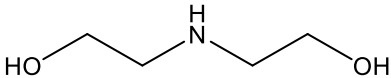
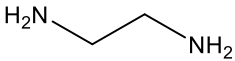
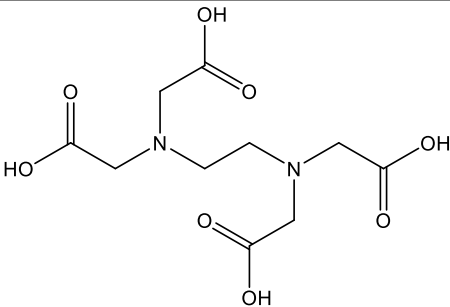
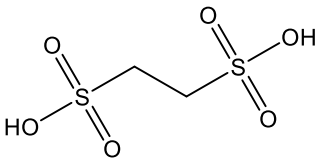
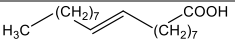
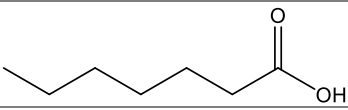
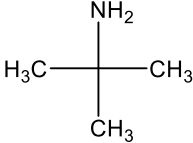
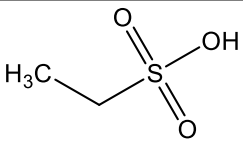
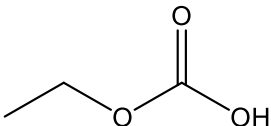
arginine	L-arginine		etrasimod arginine
aspart	28 ^B -L-aspartic acid	-Asp-	insulin aspart
axetil	(RS)-1-(acetyloxy)ethyl radical		cefuroxime acetyl, flurbiprofen axetil
beloxil	benzyloxy radical		dexamethasone beloxil
benzoate	benzoic acid, benzoate salt, or benzoate ester		denatonium benzoate, alogliptin benzoate
besylate	benzenesulfonic acid, and its anion and esters *no esters so far because this is a very labile leaving group		prasugrel besylate, tivumecirnon besylate, cisatracurium besylate, amlodipine besylate
betadex	β-cyclodextrin		piroxicam betadex

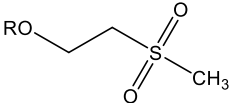
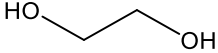
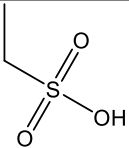
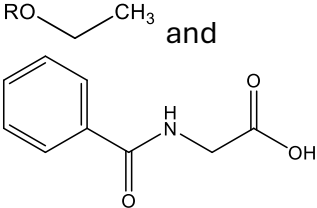
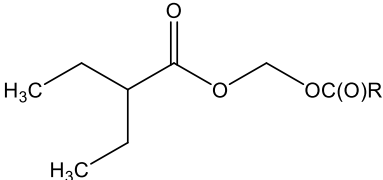
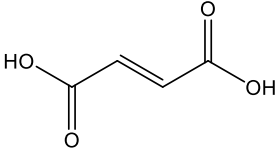
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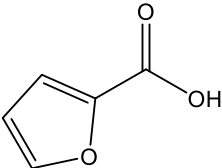
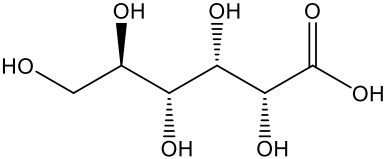
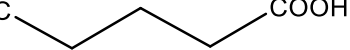
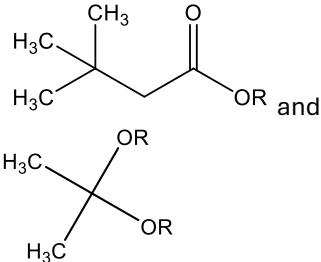


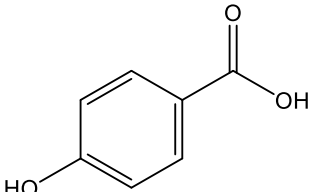
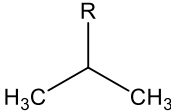
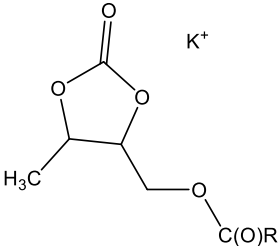
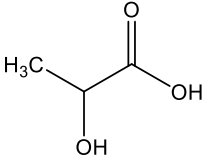
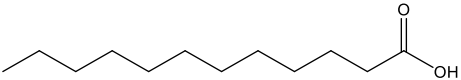
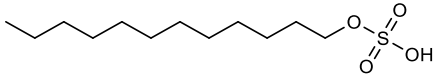
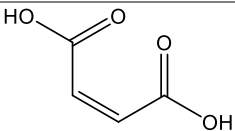
bromide	bromide salt	Br ⁻	umeclidinium bromide, acridinium bromide,
butanedisulfonate	butane-1,4-disulfonic acid, and salts or esters of its anion(s)		nilotinib butanedisulfonate
butyrate (INN: butirate)	butyric acid and its anion and esters		clevidipine butyrate, resocortol butyrate
calcium	calcium salt	Ca ²⁺	atorvastatin calcium, mupirocin calcium, acamprosate calcium
camsylate (INN: camsilate)	(7,7-dimethyl-2-oxobicyclo[2.2.1]heptan-1-yl)methanesulfonic acid and its enantiomers, and their anions and esters		rucaparib camsylate, lanabecestat camsylate

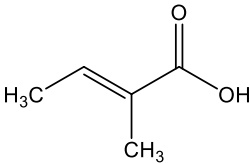
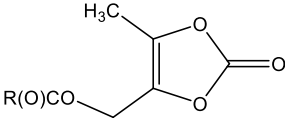
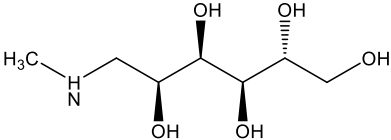
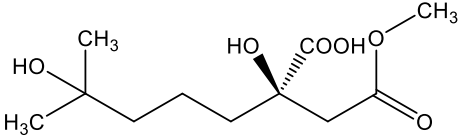
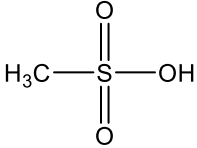
caproate	hexanoic acid and its anion and esters		gestonorone caproate
chloride	chloride salt	Cl ⁻	maralixibat chloride, acuronium chloride
cilexetil	(<i>RS</i>)-1-[[[(cyclohexyloxy)carbonyl] oxy]ethyl radical (also called cyclohexyl ethyl carbonate radical)		candesartan cilexetil, sanfetrinem cilexetil
citrate	citric acid (2-hydroxypropane-1,2,3-tricarboxylic acid) and its anion and esters		clomiphene citrate, tamoxifen citrate
closylate (INN: closilate)	4-chlorobenzene-1-sulfonic acid, and its anion and esters		thenium closylate
crofumaril	(<i>2E</i>)-but-2-enediyl radical		hemoglobin crofumaril
cyclotate (INN: ciclotate)	4-methylbicyclo[2.2.2]oct-2-ene-1-carboxylic acid, and salts and esters of its carboxylate anion		nandrolone cyclotate
detemir	tetradecanoyl radical		insulin detemir

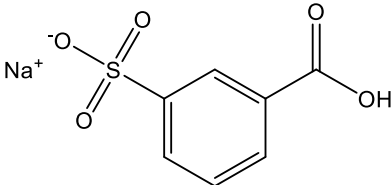
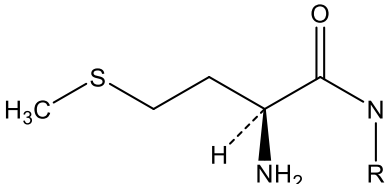
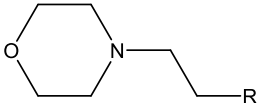
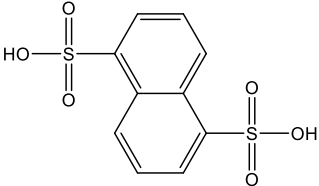
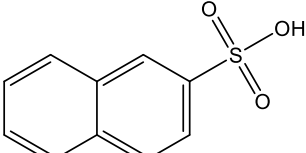
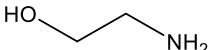
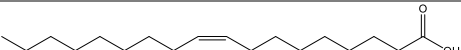
diolamine	2-2'-azanediyl diethanol, also called diethanolamine		picotrin diolamine, trepostinil diolamine
edamine	ethane-1,2-diamine (also called ethylenediamine)		pobilukast edamine, enrasentan edamine
edetate	2,2',2'',2'''-(ethane-1,2-diylbis(azanetriyl))tetraacetic acid (EDTA) and all anions derived EDTA		trisodium edetate, calcium disodium edetate
edisylate	1,2-ethanedisulfonate		clomethiazole edisylate
elaidate	(E)-octadec-9-enoic acid and its anion and esters		gemcitabine elaidate
enanthate (INN: enantate)	heptanoate		methenolone enanthate
erbumine	T-butylamine		perindopril erbumine
esylate	ethanesulfonic acid, and its anion and esters		epetirimod esylate, nintedanib esylate
etabonate	ethyl hydrogen carbonate (also known as ethyl carbonate) and its anion and esters		loteprednol etabonate, remogliflozin etabonate

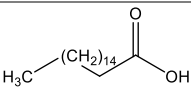
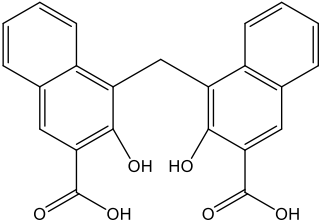
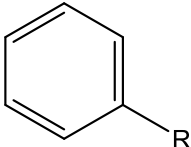
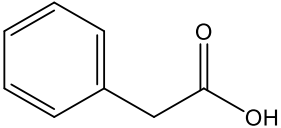
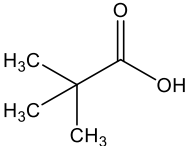
etemesil	2-(methylsulfonyl)ethanol esters		naproxen etemesil
etexilate	ethyl and hexyl esters	R-C(O)-O-CH ₂ CH ₃ and R-C(O)-O-CH ₂ (CH ₂) ₄ CH ₃	dabigatran etexilate
ethanediol	2-hydroxyethanol, and its esters		aganepag ethanediol
ethyl	ethyl radical	R-CH ₂ CH ₃	icosapent ethyl, telotristat ethyl, rodatristat ethyl
ethylsulfate (INN: etilsulfate)	ethanesulfonic acid, and its anion and esters		mecetronium ethylsulfate
etiprate	ethyl ester and 2-benzamidoacetic acid (or its salt)		telotristat etiprate
etzadroxil	(2-ethylbutanoyloxy)methanolate ester		sulopenem etzadroxil
fumarate	(2E)-2-butenedioic acid, and its anions and esters		tenofovir alafenamide fumarate, gilteritinib fumarate, siponimod fumarate, quetiapine fumarate

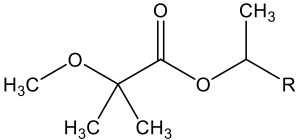
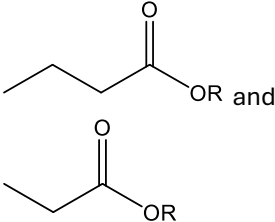
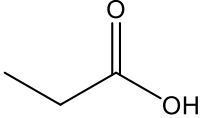
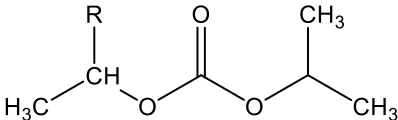
furoate	furan-2-carboxylic acid, and its anion and chloresters		fluticasone furoate, mometasone furoate
glargine gluconate	21 ^Λ -glycine-30 ^β α-L-arginine-30 ^β β-L-arginine (2R,3S,4R,5R)-2,3,4,5,6-pentahydroxyhexanoic acid, and its salts/esters (none yet)	Gly- and -Arg-Arg 	insulin glargine chlorhexidine gluconate
glulisine glurate	3 ^β -L-lysine, 29 ^β -L-glutamic acid glutaric acid, or its esters or anions	-Lys- and -Glu- ROOC-  -COOH	insulin glulisine linaprazan glurate
hexacetonide	3-3-dimethylbutyrate ester and acetonide		triamcinolone hexacetonide
hyclate	monohydrochloride, hemimethanolate and hemihydrate	HCl•1/2C ₂ H ₅ OH•1/2H ₂ O	doxycycline hyclate
hydrobromide	hydrobromic acid salt	HBr	tedatioxetine hydrobromide, vortioxetine hydrobromide, peficitinib hydrobromide
hydrochloride	hydrochloric acid salt	HCl	gusacitinib hydrochloride, navacaprant hydrochloride

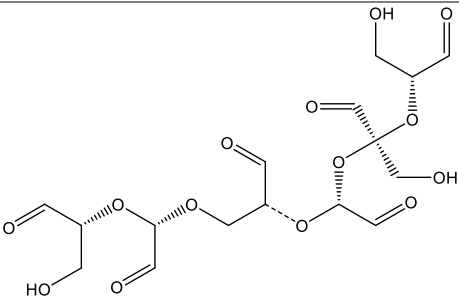
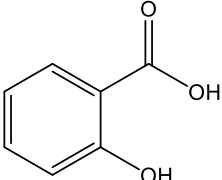
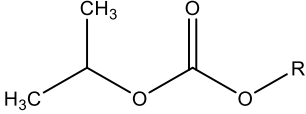
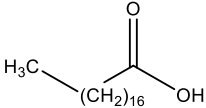
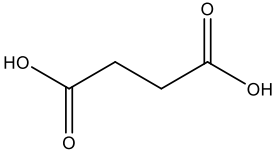
hydroxybenzoate	4-hydroxybenzoic acid or its salt or ester		mevidalen hydroxybenzoate
iodide	iodine anion	I ⁻	stilonium iodide, stilbazium iodide
isopropyl	isopropyl radical		simenepag isopropyl, taprenepag isopropyl
kamedoxomil	4-(hydroxymethyl)-5-methyl-1,3-dioxolan-2-one ester and potassium salt		azilsartan kamedoxomil
lactate	2-hydroxypropanoate (lactic acid) and its anion and esters		pentazocine lactate, onalespib lactate, dovitinib lactate, tozasertib lactate
laurate	dodecanoic acid and its anion and esters		testosterone ketolaurate
laurylsulfate	dodecyl hydrogen sulfate and salts or esters of its anion		cabozantinib laurylsulfate, nilotinib laurylsulfate, dasatinib laurylsulfate
lispro	28 ^B -L-lysine-29 ^B -L-proline	-Lys-Pro	insulin lispro
maleate	maleic acid and its anions and esters		nomifensine maleate, piperamide maleate, carphenazine

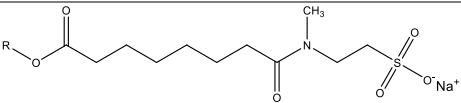
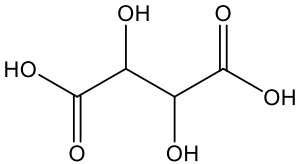
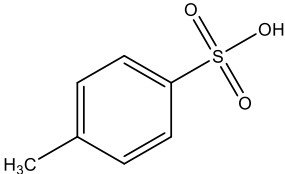
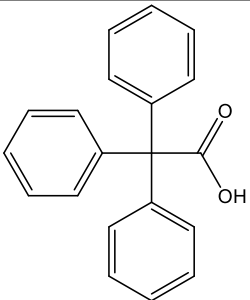
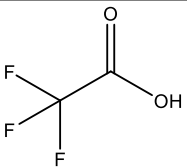
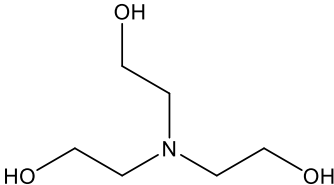
			maleate, pyroxamine maleate
mebutate	(E)-2-methylbut-2-enoic acid and its anion and esters		ingenol mebutate
mecarbil	methyl ester	R-C(O)-O-CH ₃	omecative mecarbil
medoxomil	(5-methyl-2-oxo-1,3-dioxol-4-yl)methyl ester		azilsartan medoxomil, olmesartan medoxomil, azilsartan kamedoxomil (TT-132)
meolumine	(2R,3R,4R,5S)-6-(methylamino)hexane-1,2,3,4,5-pentaol, also called <i>N</i> -methylglucamine		tetrazolast meolumine, bevirimat meolumine, delafloxacin meolumine, tafamidis meolumine
mepesuccinate	(R)-2,6-dihydroxy-2-(2-methoxy-2-oxoethyl)-6-methylheptanoic acid and its anion and esters		omacetaxine mepesuccinate
mesylate (INN: mesilate)	methanesulfonate and its anion and esters		pergolide mesylate, emavusertib mesylate, fipravirimat mesilate, endralazine mesylate, danofloxacin mesylate, naquotinib mesylate

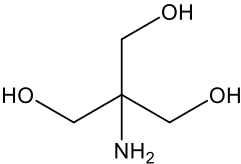
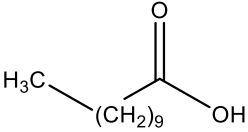
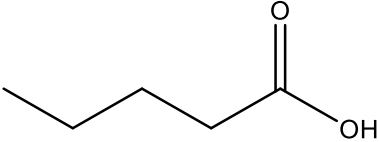
metazoate	sodium 3-carboxybenzenesulfonate		prednisolone sodium metazolate
methionil	methionine amide		pomaglumetad methionil
methyl	methyl radical	R-CH ₃	carboprost methyl, bardoxolone methyl
mofetil	4-ethylmorpholine radical		mycophenolate mofetil
napadisylate	naphthalene-1,5-disulfonic acid and its anions and esters		acalatonium napadisylate, abediterol napadisylate
napsylate	naphthalene-2-sulfonic acid and its anion and esters		levopropoxyphene napsylate
nitrate	nitric acid or nitrate anion	HNO ₃ , NO ₃ ⁻	butoconazole nigrate, niconazole nitrate, omoconazole nitrate
olamine	ethanolamine (also called 2-aminoethanol)		piroctone olamine, eltrombopag olamine
oleate	(9Z)-octadec-9-enolic acid (oleic acid) and its anion and esters		ethanolamine oleate

palmitate	hexadecanoic acid (palmitic acid), and its anion and esters		pipotiazine palmitate, paliperidone palmitate
pamoate (INN: embonate)	4,4'-methylenebis(3-hydroxy-2-naphthoic acid), also called pamoic acid, and its anions and esters		cycloguanil pamoate, octreotide pamoate, olanzapine pamoate
pegol	α -(2-carboxyethyl)- ω -methoxypoly(oxyethane-1,2-diyl)		firtecán pegol, egaptivon pegol, certolizumab pegol
peroxide	peroxide	H_2O_2	benzoyl peroxide
phenyl	phenyl radical		phenyl aminosalicylate, sodium phenylacetate
phenylacetate	2-phenylacetic acid, its anion, and its esters		testosterone phenylacetate, ornithine phenylacetate
phosphate	phosphoric acid and salts derived from phosphoric acid	H_3PO_4 , HPO_4^{2-} , $H_2PO_4^-$ or PO_4^{3-}	clindamycin phosphate, betamethasone disodium phosphate, metronidazole phosphate, deuruxolitinib phosphate, sonidegib phosphate
pivalate	pivalic acid (also called trimethylacetic acid), its anion, and its esters		clocortolone pivalate, flumethasone pivalate

pivoxetil	1-[(2-methoxy-2-methylpropionyl)oxy]ethyl radical		cefuroxime pivoxetil
potassium	potassium salts	K ⁺	ccarbenicillin potassium, polacrilin potassium, avutometinib potassium, pemirolast potassium, diclofenac potassium
probutate	propionate ester and butyrate ester		hydrocortisone probutate
propionate	propionic acid, its anion, and its esters		betamethasone dipropionate, rosaramicin propionate, cloticasone propionate, dexamethasone propionate
proxetil	1-[(isopropoxycarbonyl)oxy]ethyl radical		cefepodoxime proxetil

raffimer	(2R,4S,6R,8R,11S,13R)-1,14-dihydroxy-4-(hydroxymethyl)-3,5,7,10,12-pentaoxatetradecane-2,4,6,8,11,13-hexacarbalddehyde, a cross-linking agent that polymerizes with reaction at the aldehyde groups, and its polymerized form (without aldehydes)		hemoglobin raffimer
salicylate	2-hydroxybenzoic acid (salicylic acid), its anion, and its esters		meglumine salicylate
sodium	sodium salt	Na ⁺	ampicillin sodium, cefazolin sodium, diclofenac sodium, valproate sodium
soproxil	isopropyl carbonate ester		inarigivir soproxil
stearate	octadecanoic acid (stearic acid), its anion, and its esters		rosaramicin stearate, valomaciclovir stearate
succinate	succinic acid, its salts, salts of its anions, and esters of its anions		levamfetamine succinate, sumatriptan succinate, metoprolol succinate, abacavir succinate, frotriptan succinate
sulfate	sulfate and sulfuric acid	SO ₄ ²⁻ , H ₂ SO ₄	gentamicin sulfate, guanacline sulfate, vinblastine sulfate,

suleptanate	7-methyl[(2-sulfoethyl)carbamoyl]heptanoate ester, monosodium salt		vincristine sulfate, vindesine sulfate, tasipimidine sulfate methylprednisolone suleptanate
tartrate	(2R,3R)-2,3-dihydroxysuccinic acid (tartaric acid) , its salts, and esters of its anion		upadacitinib tartrate, vinorelbine tartrate, afegostat tartrate, vinflunine ditartrate, pozanicline tartrate
tosylate (INN: tosilate)	4-methylbenzenesulfonic acid, its salts, and esters of its anion		valbenazine tosylate, lumateperone tosylate, brepocitinib tosylate
trifenatate	2,2,2-triphenylacetate		vilanterol trifenate
triflutate	trifluoroacetate		fexapotide triflutate, etirinotecan pegol tetratriflutate
trolamine	triethanolamine, also called 2,2',2''-nitrilotriethanol		prinomide trolamine

tromethamine	2-amino-2-(hydroxymethyl) propane-1,3-diol		ocarcoxib tromethamine, danuglipron tromethamine
undecylate	undecenoic acid and its anion or esters		estradiol undecylate
valerate	pentanoic acid (valeric acid) and its anion or esters		betamethasone valerate, fluprednisolone valerate
xinafoate	1-hydroxy-2-naphthoic acid and its anion or esters	