

# ACCP Pediatrics PRN member poll - compounded preparations that should be manufactured

Dear Pediatrics PRN members,

Over the past decade, our research collaborative has been engaged in raising awareness of and advocating for the need for additional standards for oral liquids, by either increasing the number of manufactured products or validating formulas compounded nonsterile preparations (CNSPs). In 2016, we published a commentary on the development of an algorithm to identify mass production candidate molecules to develop children's oral medicines: a North American perspective. In addition, several in our group (also Pediatrics PRN members) are working on an Expert Panel within the United States Pharmacopeia (USP) to develop data standards that would facilitate the electronic transmission of CNSPs across health IT platforms. Both of these projects go hand-in-hand to improve formulation and patient safety related to oral liquids.

We have been invited to update the 2016 paper, and request the assistance of the members of the Pediatrics PRN to provide a "real-world" opinion that would inform this work in terms of:

the appropriateness of newly-marketed manufactured products for use in neonatal and pediatric populations; the next wave of candidate medications that should be manufactured instead of compounded; and a proposal for two lists of candidate medications: those that should be considered for manufacturing; and those that should remain as extemporaneously CNSPs and included in the USP Compounding Compendium. We believe that pediatric pharmacists have important insights into these questions, based on their extensive knowledge and experience in clinical practice and patient advocacy.

Thank you very much for your assistance!

## POLL ORGANIZERS:

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 Sandra Benavides, PharmD, FCCP, FPPA, Philadelphia College of Osteopathic Medicine School of Pharmacy  
 Jeff Cies, PharmD, FCCP, FCCM, FPPA, BCPPS, Drexel University College of Medicine; St. Christopher's Hospital for Children  
 Robert MacArthur, PharmD, MS, BCSCP, Rockefeller University

## Based on your knowledge and experience, which of the following currently manufactured products are EITHER APPROPRIATE OR INAPPROPRIATE for neonates and children?

	INAPPROPRIATE	APPROPRIATE
1) metoprolol succinate sprinkles (Kaspargo™)	<input type="radio"/>	<input type="radio"/>
2) metoprolol tartrate 10 mg/mL powder for reconstitution (FIRST-metoprolol™)	<input type="radio"/>	<input type="radio"/>
3) lisinopril 1 mg/mL oral liquid (Qbrelis™)	<input type="radio"/>	<input type="radio"/>
4) amlodipine benzoate 1 mg/mL oral liquid suspension (Katerzia™)	<input type="radio"/>	<input type="radio"/>
5) spironolactone 5 mg/mL oral liquid suspension (Carospir™)	<input type="radio"/>	<input type="radio"/>
6)		

	baclofen 1 mg/mL and 5 mg/mL powder for reconstitution (FIRST-baclofen™)	<input type="radio"/>	<input type="radio"/>
7)	baclofen 1 mg/mL oral solution (Ozobax™)	<input type="radio"/>	<input type="radio"/>
8)	sildenafil citrate 10 mg/mL powder for oral liquid suspension (Revatio™ and generic)	<input type="radio"/>	<input type="radio"/>
9)	levothyroxine sodium (12 strengths between 13 and 200 mcg/mL (Tirosint-SOL™ - unit dose for dilution)	<input type="radio"/>	<input type="radio"/>
10)	topiramate 25 mg/mL oral solution (Eprontia™)	<input type="radio"/>	<input type="radio"/>

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11) For any of those listed above that you believe SHOULD NOT BE USED in neonates or children, please write in the medication name and your reason in the space below.

  
  
  


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12) Based on your knowledge and experience, which of the following manufactured oral liquid products are prescribed for neonates and children at your facility?

☐ cannabidiol (Epidiolex™)    ☐ celecoxib (Elyxib™)    ☐ colchicine (Gloperba™)    ☐ deflazacort (Emflaza™)  
☐ dronabinol (Syndros™)    ☐ fenfluramine (Fintepla™)    ☐ glycopyrrolate (Cuvposa™)  
☐ hydrocortisone (Alkindi™)    ☐ mercaptopurine (Purixan™)    ☐ methotrexate (Xatmep™)  
☐ metronidazole (FIRST-metronidazole™)    ☐ rivaroxaban (Xarelto™)    ☐ sodium zirconium cyclosilicate (Lokelma™)    ☐ stiripentol (Diacomit™)    ☐ tofacitinib (Xeljanz™)    ☐ tramadol (Qdolo™)  
☐ triheptanoin (Dojolvi™)    ☐ vancomycin (Firvanq™)

For the next five questions, you are asked to give your professional opinion on whether these should be MANUFACTURED in a liquid formulation rather than COMPOUNDED extemporaneously.

Criteria that you might use to consider could include:

- has high marketing potential for pediatric populations due to off-label use in prioritized therapeutic categories such as anti-arrhythmics, antibiotics, anti-hypertensives, anti-neoplastics, central nervous system agents, and proton pump inhibitors;
- appears on the FDA list of essential medicines;
- has a standardized concentration identified on the ASHP Standardize4safety list;
- is available in an intravenous formulation which would support potential oral formulation feasibility;
- has a pediatric Biopharmaceutical Classification System (BCS) classification indicating relative ease of generating suitable oral liquid formulations intended primarily for children (either class I or III); and
- is listed as a NIOSH hazardous medication.

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13) Based on your knowledge and experience,

which of the following medications listed below should be manufactured in a liquid formulation rather than compounded extemporaneously?

☐ acetazolamide   ☐ bosentan   ☐ captopril   ☐ clopidogrel   ☐ nifedipine   ☐ pantoprazole  
☐ ursodiol   ☐ valacyclovir   ☐ warfarin

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14) Based on your knowledge and experience,

PLEASE SELECT TWO from the following Biopharmaceutics Classification System (BCS) class I (high solubility/high permeability) medications listed below that should be manufactured in a liquid formulation rather than compounded extemporaneously.

☐ allopurinol   ☐ cyclophosphamide   ☐ flecainide   ☐ labetalol   ☐ trazodone

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15) Based on your knowledge and experience,

PLEASE SELECT FOUR from the following BCS class II (low solubility/high permeability) medications listed below that should be manufactured in a liquid formulation rather than compounded extemporaneously.

☐ amiodarone   ☐ carvedilol   ☐ isradipine   ☐ losartan   ☐ quetiapine   ☐ spironolactone/HCTZ  
☐ tacrolimus   ☐ verapamil

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16) Based on your knowledge and experience,

PLEASE SELECT THREE from the following BCS class III (high solubility/low permeability) medications listed below that should be manufactured in a liquid formulation rather than compounded extemporaneously.

☐ atenolol   ☐ apixaban   ☐ clonidine   ☐ folinic acid   ☐ ganciclovir   ☐ hydralazine

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17) Based on your knowledge and experience,

PLEASE SELECT THREE from the following BCS class IV (low solubility/low permeability) medications listed below that should be manufactured in a liquid formulation rather than compounded extemporaneously.

☐ aprepitant   ☐ azathioprine   ☐ folic acid   ☐ hydrochlorothiazide   ☐ hydroxyurea  
☐ thioguanine   ☐ ticagrelor

**The last two questions relate to the medications listed in the Compounding Compendium of the United States Pharmacopeia. Information about the Compendium is found here.**

- 18) Based on your knowledge and experience, which of the following medications that are currently listed in the United States Pharmacopeia Compounding Compendium (below) should be manufactured in a liquid formulation rather than compounded extemporaneously?

☐ bethanechol   ☐ chloroquine   ☐ dapson   ☐ desmopressin   ☐ diltiazem   ☐ dipyridamole  
☐ dolasetron   ☐ ethambutol   ☐ ketoconazole   ☐ metolazone   ☐ phenoxybenzamine  
☐ phytonadione   ☐ propylthiouracil   ☐ pyrazinamide   ☐ pyridoxine   ☐ pyrimethamine  
☐ quinidine   ☐ rifabutin   ☐ rifampin   ☐ temozolomide   ☐ terbutaline   ☐ tetracycline  
☐ tiagabine

- 19) Based on your knowledge and experience, which of the following medications that are NOT currently listed in the United States Pharmacopeia Compounding Compendium (below) should be manufactured in a liquid formulation rather than compounded extemporaneously?

☐ amiloride   ☐ amitriptyline   ☐ buspirone   ☐ chlorpromazine   ☐ dantrolene   ☐ disopyramide  
☐ ethacrynic acid   ☐ flucytosine   ☐ hydroxychloroquine   ☐ mexiletine   ☐ nadolol  
☐ phenazopyridine   ☐ pravastatin   ☐ primaquine   ☐ procarbazine   ☐ rifaximin   ☐ thiamine  
☐ topotecan   ☐ tretinoin   ☐ valsartan   ☐ venlafaxine   ☐ zinc

- 20) Please write in the name of a medication not listed in this poll that you think should be manufactured in a liquid formulation rather than compounded extemporaneously.

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