

AMERICAN ACADEMY OF PEDIATRICS

Committee on Drugs

The Transfer of Drugs and Other Chemicals Into Human Milk

ABSTRACT. The American Academy of Pediatrics places emphasis on increasing breastfeeding in the United States. A common reason for the cessation of breastfeeding is the use of medication by the nursing mother and advice by her physician to stop nursing. Such advice may not be warranted. This statement is intended to supply the pediatrician, obstetrician, and family physician with data, if known, concerning the excretion of drugs into human milk. Most drugs likely to be prescribed to the nursing mother should have no effect on milk supply or on infant well-being. This information is important not only to protect nursing infants from untoward effects of maternal medication but also to allow effective pharmacologic treatment of breastfeeding mothers. Nicotine, psychotropic drugs, and silicone implants are 3 important topics reviewed in this statement.

INTRODUCTION

A statement on the transfer of drugs and chemicals into human milk was first published in 1983,¹ with revisions in 1989² and 1994.³ Information continues to become available. The current statement is intended to revise the lists of agents transferred into human milk and describe their possible effects on the infant or on lactation, if known (Tables 1–7). If a pharmacologic or chemical agent does not appear in the tables, it does not mean that it is not transferred into human milk or that it does not have an effect on the infant; it only indicates that there were no reports found in the literature. These tables should assist the physician in counseling a nursing mother regarding breastfeeding when the mother has a condition for which a drug is medically indicated.

BREASTFEEDING AND SMOKING

In the previous edition of this statement, the Committee on Drugs placed nicotine (smoking) in Table 2, "Drugs of Abuse-Contraindicated During Breastfeeding." The reasons for placing nicotine and, thus, smoking in Table 2 were documented decrease in milk production and weight gain in the infant of the smoking mother and exposure of the infant to environmental tobacco smoke as demonstrated by the presence of nicotine and its primary metabolite, cotinine, in human milk.^{4–12} There is controversy regarding the effects of nicotine on infant size at 1 year of age.^{13,14} There are hundreds of compounds in tobacco smoke; however, nicotine and its metabolite acotinine are most often used as markers of tobacco

exposure. Nicotine is not necessarily the only component that might cause an increase in respiratory illnesses (including otitis media) in the nursing infant attributable to both transmammary secretion of compounds and environmental exposure. Nicotine is present in milk in concentrations between 1.5 and 3.0 times the simultaneous maternal plasma concentration,¹⁵ and elimination half-life is similar—60 to 90 minutes in milk and plasma.⁷ There is no evidence to document whether this amount of nicotine presents a health risk to the nursing infant.

The Committee on Drugs wishes to support the emphasis of the American Academy of Pediatrics on increasing breastfeeding in the United States. Pregnancy and lactation are ideal occasions for physicians to urge cessation of smoking. It is recognized that there are women who are unable to stop smoking cigarettes. One study reported that, among women who continue to smoke throughout breastfeeding, the incidence of acute respiratory illness is decreased among their infants, compared with infants of smoking mothers who are bottle fed.¹⁶ It may be that breastfeeding and smoking is less detrimental to the child than bottle feeding and smoking. The Committee on Drugs awaits more data on this issue. The Committee on Drugs therefore has not placed nicotine (and thus smoking) in any of the Tables but hopes that the interest in breastfeeding by a smoking woman will serve as a point of discussion about smoking cessation between the pediatrician and the prospective lactating woman or nursing mother. Alternate (oral, transcutaneous) sources of nicotine to assist with smoking cessation, however, have not been studied sufficiently for the Committee on Drugs to make a recommendation for or against them in breastfeeding women.

PSYCHOTROPIC DRUGS

Anti-anxiety drugs, antidepressants, and neuroleptic drugs have been placed in Table 4, "Drugs for Which the Effect on Nursing Infants is Unknown but May Be of Concern." These drugs appear in low concentrations (usually with a milk-to-plasma ratio of 0.5–1.0) in milk after maternal ingestion. Because of the long half-life of these compounds and some of their metabolites, nursing infants may have measurable amounts in their plasma and tissues, such as the brain. This is particularly important in infants during the first few months of life, with immature hepatic and renal function. Nursing mothers should be informed that if they take one of these drugs, the infant will be exposed to it. Because these drugs affect neurotransmitter function in the developing central

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

PEDIATRICS (ISSN 0031 4005). Copyright © 2001 by the American Academy of Pediatrics.

nervous system, it may not be possible to predict long-term neurodevelopmental effects.

SILICONE BREAST IMPLANTS AND BREASTFEEDING

Approximately 800 000 to 1 million women in the United States have received breast implants containing silicone (elemental silicon with chemical bonds to oxygen) in the implant envelope or in the envelope and the interior gel. Concern has been raised about the possible effects to the nursing infant if mothers with implants breastfeed. This concern was initially raised in reports that described esophageal dysfunction in 11 children whose mothers had implants.^{17,18} This finding has not been confirmed by other reports. Silicone chemistry is extremely complex; the polymer involved in the covering and the interior of the breast implant consists of a polymer of alternating silicon and oxygen atoms with methyl groups attached to the oxygen groups (methyl polydimethylsiloxane).¹⁹ The length of the polymer determines whether it is a solid, gel, or liquid. There are only a few instances of the polymer being assayed in the milk of women with implants; the concentrations are not elevated over control samples.²⁰ There is no evidence at the present time that this polymer is directly toxic to human tissues; however, concern also exists that toxicity may be mediated through an immunologic mechanism. This has yet to be confirmed in humans. Except for the study cited above, there have been no other reports of clinical problems in infants of mothers with silicone breast implants.²¹ It is unlikely that elemental silicon causes difficulty, because silicon is present in higher concentrations in cow milk and formula than in milk of humans with implants.²² The anticolic compound simethicone is a silicone and has a structure very similar to the methyl polydimethylsiloxane in breast implants. Simethicone has been used for decades in this country and Europe without any evidence of toxicity to infants. The Committee on Drugs does not feel that the evidence currently justifies classifying silicone implants as a contraindication to breastfeeding.

DRUG THERAPY OF THE LACTATING WOMAN

The following should be considered before prescribing drugs to lactating women:

1. Is drug therapy really necessary? If drugs are required, consultation between the pediatrician and the mother's physician can be most useful in determining what options to choose.
2. The safest drug should be chosen, for example, acetaminophen rather than aspirin for analgesia.
3. If there is a possibility that a drug may present a risk to the infant, consideration should be given to measurement of blood concentrations in the nursing infant.
4. Drug exposure to the nursing infant may be minimized by having the mother take the medication just after she has breastfed the infant or just before the infant is due to have a lengthy sleep period.

Data have been obtained from a search of the medical literature. Because methodologies used to

quantitate drugs in milk continue to improve, this information will require frequent updating. Drugs cited in Tables 1 through 7 are listed in alphabetical order by generic name; brand names are available from the current *Physicians' Desk Reference*,²³ *USP DI 2001: Drug Information for the Health Care Professional, Volume I*,²⁴ and *USP Dictionary of USAN and International Drug Names*.²⁵ The reference list is not inclusive of all articles published on the topic.

Physicians who encounter adverse effects in infants who have been receiving drug-contaminated human milk are urged to document these effects in a communication to the Food and Drug Administration (<http://www.fda.gov/medwatch/index.html>) and to the Committee on Drugs. This communication should include the generic and brand names of the drug, the maternal dose and mode of administration, the concentration of the drug in milk and maternal and infant blood in relation to the time of ingestion, the method used for laboratory identification, the age of the infant, and the adverse effects. Such reports may substantially increase the pediatric community's fund of knowledge regarding drug transfer into human milk and the potential or actual risk to the infant.

COMMITTEE ON DRUGS, 2000–2001
Robert M. Ward, MD, Chairperson
Brian A. Bates, MD
William E. Benitz, MD
David J. Burchfield, MD
John C. Ring, MD
Richard P. Walls, MD, PhD
Philip D. Walson, MD

LIAISONS
John Alexander, MD
Food and Drug Administration Alternate
Donald R. Bennett, MD, PhD
American Medical Association/United States Pharmacopeia
Therese Cvetkovich, MD
Food and Drug Administration
Owen R. Hagino, MD
American Academy of Child and Adolescent Psychiatry
Stuart M. MacLeod, MD, PhD
Canadian Paediatric Society
Siddika Mithani, MD
Bureau of Pharmaceutical Assessment Health Protection Branch, Canada
Joseph Mulinare, MD, MSPH
Centers for Disease Control and Prevention
Laura E. Riley, MD
American College of Obstetricians and Gynecologists
Sumner J. Yaffe, MD
National Institutes of Health

SECTION LIAISONS
Charles J. Coté, MD
Section on Anesthesiology
Eli O. Meltzer, MD
Section on Allergy and Immunology

CONSULTANT
Cheston M. Berlin, Jr, MD

STAFF
Raymond J. Koterak, MHA

TABLE 1. Cytotoxic Drugs That May Interfere With Cellular Metabolism of the Nursing Infant

Drug	Reason for Concern, Reported Sign or Symptom in Infant, or Effect on Lactation	Reference No.
Cyclophosphamide	Possible immune suppression; unknown effect on growth or association with carcinogenesis; neutropenia	26, 27
Cyclosporine	Possible immune suppression; unknown effect on growth or association with carcinogenesis	28, 29
Doxorubicin*	Possible immune suppression; unknown effect on growth or association with carcinogenesis	30
Methotrexate	Possible immune suppression; unknown effect on growth or association with carcinogenesis; neutropenia	31

* Drug is concentrated in human milk.

TABLE 2. Drugs of Abuse for Which Adverse Effects on the Infant During Breastfeeding Have Been Reported*

Drug	Reported Effect or Reasons for Concern	Reference No.
Amphetamin†	Irritability, poor sleeping pattern	32
Cocaine	Cocaine intoxication: irritability, vomiting, diarrhea, tremulousness, seizures	33
Heroin	Tremors, restlessness, vomiting, poor feeding	34
Marijuana	Only 1 report in literature; no effect mentioned; very long half-life for some components	35
Phencyclidine	Potent hallucinogen	36

* The Committee on Drugs strongly believes that nursing mothers should not ingest drugs of abuse, because they are hazardous to the nursing infant and to the health of the mother.

† Drug is concentrated in human milk.

TABLE 3. Radioactive Compounds That Require Temporary Cessation of Breastfeeding*

Compound	Recommended Time for Cessation of Breastfeeding	Reference No.
Copper 64 (⁶⁴ Cu)	Radioactivity in milk present at 50 h	37
Gallium 67 (⁶⁷ Ga)	Radioactivity in milk present for 2 wk	38
Indium 111 (¹¹¹ In)	Very small amount present at 20 h	39
Iodine 123 (¹²³ I)	Radioactivity in milk present up to 36 h	40, 41
Iodine 125 (¹²⁵ I)	Radioactivity in milk present for 12 d	42
Iodine 131 (¹³¹ I)	Radioactivity in milk present 2–14 d, depending on study	43–46
Iodine ¹³¹	If used for treatment of thyroid cancer, high radioactivity may prolong exposure to infant	47, 48
Radioactive sodium	Radioactivity in milk present 96 h	49
Technetium 99m (^{99m} Tc), ^{99m} Tc macroaggregates, ^{99m} Tc O ₄	Radioactivity in milk present 15 h to 3 d	41, 50–55

* Consult nuclear medicine physician before performing diagnostic study so that radionuclide that has the shortest excretion time in breast milk can be used. Before study, the mother should pump her breast and store enough milk in the freezer for feeding the infant; after study, the mother should pump her breast to maintain milk production but discard all milk pumped for the required time that radioactivity is present in milk. Milk samples can be screened by radiology departments for radioactivity before resumption of nursing.

TABLE 4. Drugs for Which the Effect on Nursing Infants Is Unknown but May Be of Concern*

Drug	Reported or Possible Effect	Reference No.
Anti-anxiety		
Alprazolam	None	57
Diazepam	None	58–62
Lorazepam	None	63
Midazolam	—	64
Perphenazine	None	65
Prazepam†	None	66
Quazepam	None	67
Temazepam	—	68
Antidepressants		
Amitriptyline	None	69, 70
Amoxapine	None	71
Bupropion	None	72
Clomipramine	None	73
Desipramine	None	74, 75
Dothiepin	None	76, 77
Doxepin	None	78
Fluoxetine	Colic, irritability, feeding and sleep disorders, slow weight gain	79–87
Fluvoxamine	—	88
Imipramine	None	74
Nortriptyline	None	89, 90
Paroxetine	None	91
Sertraline†	None	92, 93
Trazodone	None	94
Antipsychotic		
Chlorpromazine	Galactorrhea in mother; drowsiness and lethargy in infant; decline in developmental scores	95–98
Chlorprothixene	None	99
Clozapine†	None	100
Haloperidol	Decline in developmental scores	101–104
Mesoridazine	None	105
Trifluoperazine	None	104
OTHERS		
Amiodarone	Possible hypothyroidism	106
Chloramphenicol	Possible idiosyncratic bone marrow suppression	107, 108
Clofazimine	Potential for transfer of high percentage of maternal dose; possible increase in skin pigmentation	109
Lamotrigine	Potential therapeutic serum concentrations in infant	110
Metoclopramide†	None described; dopaminergic blocking agent	111, 112
Metronidazole	In vitro mutagen; may discontinue breastfeeding for 12–24 h to allow excretion of dose when single-dose therapy given to mother	113, 114
Tinidazole	See metronidazole	115

* Psychotropic drugs, the compounds listed under anti-anxiety, antidepressant, and antipsychotic categories, are of special concern when given to nursing mothers for long periods. Although there are very few case reports of adverse effects in breastfeeding infants, these drugs do appear in human milk and, thus, could conceivably alter short-term and long-term central nervous system function.⁵⁶ See discussion in text of psychotropic drugs.

† Drug is concentrated in human milk relative to simultaneous maternal plasma concentrations.

TABLE 5. Drugs That Have Been Associated With Significant Effects on Some Nursing Infants and Should Be Given to Nursing Mothers With Caution*

Drug	Reported Effect	Reference No.
Acebutolol	Hypotension; bradycardia; tachypnea	116
5-Aminosalicylic acid	Diarrhea (1 case)	117–119
Atenolol	Cyanosis; bradycardia	120–124
Bromocriptine	Suppresses lactation; may be hazardous to the mother	125, 126
Aspirin (salicylates)	Metabolic acidosis (1 case)	127–129
Clemastine	Drowsiness, irritability, refusal to feed, high-pitched cry, neck stiffness (1 case)	130
Ergotamine	Vomiting, diarrhea, convulsions (doses used in migraine medications)	131
Lithium	One-third to one-half therapeutic blood concentration in infants	132–134
Phenindione	Anticoagulant: increased prothrombin and partial thromboplastin time in 1 infant; not used in United States	135
Phenobarbital	Sedation; infantile spasms after weaning from milk containing phenobarbital, methemoglobinemia (1 case)	136–140
Primidone	Sedation, feeding problems	136, 137
Sulfasalazine (salicylazosulfapyridine)	Bloody diarrhea (1 case)	141

* Blood concentration in the infant may be of clinical importance.

TABLE 6. Maternal Medication Usually Compatible With Breastfeeding*

Drug	Reported Sign or Symptom in Infant or Effect on Lactation	Reference No.
Acetaminophen	None	142–144
Acetazolamide	None	145
Acitretin	—	146
Acyclovir†	None	147, 148
Alcohol (ethanol)	With large amounts, drowsiness, diaphoresis, deep sleep, weakness, decrease in linear growth, abnormal weight gain; maternal ingestion of 1 g/kg daily decreases milk ejection reflex	4, 149–152
Allopurinol	—	153
Amoxicillin	None	154
Antimony	—	155
Atropine	None	156
Azapropazone (apazone)	—	157
Aztreonam	None	158
B ₁ (thiamin)	None	159
B ₆ (pyridoxine)	None	160–162
B ₁₂	None	163
Baclofen	None	164
Barbiturate	See Table 5	
Bendroflumethiazide	Suppresses lactation	165
Bishydroxycoumarin (dicumarol)	None	166
Bromide	Rash, weakness, absence of cry with maternal intake of 5.4 g/d	167
Butorphanol	None	168
Caffeine	Irritability, poor sleeping pattern, excreted slowly; no effect with moderate intake of caffeinated beverages (2–3 cups per day)	169–174
Captopril	None	175
Carbamazepine	None	176, 177
Carbetocin	None	178
Carbimazole	Goiter	83, 179, 180
Cascara	None	181
Cefadroxil	None	154
Cefazolin	None	182
Cefotaxime	None	183
Cefoxitin	None	183
Cefprozil	—	184
Ceftazidime	None	185
Ceftriaxone	None	186
Chloral hydrate	Sleepiness	187
Chloroform	None	188
Chloroquine	None	189–191
Chlorothiazide	None	192, 193
Chlorthalidone	Excreted slowly	194
Cimetidine†	None	195, 196
Ciprofloxacin	None	197, 198
Cisapride	None	199
Cisplatin	Not found in milk	30
Clindamycin	None	200
Clogestone	None	201
Codeine	None	144, 156, 202
Colchicine	—	203–205
Contraceptive pill with estrogen/progesterone	Rare breast enlargement; decrease in milk production and protein content (not confirmed in several studies)	206–213
Cycloserine	None	214
D (vitamin)	None; follow up infant's serum calcium level if mother receives pharmacologic doses	215–217
Danthron	Increased bowel activity	218
Dapsone	None; sulfonamide detected in infant's urine	191, 219
Dexbrompheniramine maleate with <i>d</i> -isoephedrine	Crying, poor sleeping patterns, irritability	220
Diatrizoate	None	221
Digoxin	None	222, 223
Diltiazem	None	224
Dipyrene	None	225
Disopyramide	None	226, 227
Domperidone	None	228
Dyphylline†	None	229
Enalapril	—	230
Erythromycin†	None	231
Estradiol	Withdrawal, vaginal bleeding	232
Ethambutol	None	214
Ethanol (cf. alcohol)	—	

TABLE 6. Continued

Drug	Reported Sign or Symptom in Infant or Effect on Lactation	Reference No.
Ethosuximide	None, drug appears in infant serum	176, 233
Fentanyl	—	234
Fexofenadine	None	235
Flecainide	—	236, 237
Fleroxacin	One 400-mg dose given to nursing mothers; infants not given breast milk for 48 h	238
Fluconazole	None	239
Flufenamic acid	None	240
Fluorescein	—	241
Folic acid	None	242
Gadopentetic (Gadolinium)	None	243
Gentamicin	None	244
Gold salts	None	245–249
Halothane	None	250
Hydralazine	None	251
Hydrochlorothiazide	—	192, 193
Hydroxychloroquine†	None	252, 253
Ibuprofen	None	254, 255
Indomethacin	Seizure (1 case)	256–258
Iodides	May affect thyroid activity; see iodine	259
Iodine	Goiter	259
Iodine (povidone-iodine, eg, in a vaginal douche)	Elevated iodine levels in breast milk, odor of iodine on infant's skin	259
Iohexol	None	97
Iopanoic acid	None	260
Isoniazid	None; acetyl (hepatotoxic) metabolite secreted but no hepatotoxicity reported in infants	214, 261
Interferon- α	—	262
Ivermectin	None	263, 264
K ₁ (vitamin)	None	265, 266
Kanamycin	None	214
Ketoconazole	None	267
Ketorolac	—	268
Labetalol	None	269, 270
Levonorgestrel	—	271–274
Levothyroxine	None	275
Lidocaine	None	276
Loperamide	—	277
Loratadine	None	278
Magnesium sulfate	None	279
Medroxyprogesterone	None	201, 280
Mefenamic acid	None	281
Meperidine	None	61, 282
Methadone	None	283–287
Methimazole (active metabolite of carbimazole)	None	288, 289
Methohexital	None	61
Methyldopa	None	290
Methypylon	Drowsiness	291
Metoprolol†	None	120
Metrizamide	None	292
Metrizoate	None	97
Mexiletine	None	293, 294
Minoxidil	None	295
Morphine	None; infant may have measurable blood concentration	282, 296–298
Moxalactam	None	299
Nadolol†	None	300
Nalidixic acid	Hemolysis in infant with glucose-6-phosphate dehydrogenase (G-6-PD) deficiency	301
Naproxen	—	302
Nefopam	None	303
Nifedipine	—	304
Nitrofurantoin	Hemolysis in infant with G-6-PD deficiency	305
Norethynodrel	None	306
Norsteroids	None	307
Noscapine	None	308
Ofloxacin	None	198
Oxprenolol	None	309, 310
Phenylbutazone	None	311
Phenytoin	Methemoglobinemia (1 case)	138, 176, 312
Piroxicam	None	313
Prednisolone	None	314, 315
Prednisone	None	316

TABLE 6. Continued

Drug	Reported Sign or Symptom in Infant or Effect on Lactation	Reference No.
Procainamide	None	317
Progesterone	None	318
Propoxyphene	None	319
Propranolol	None	320–322
Propylthiouracil	None	323
Pseudoephedrine†	None	324
Pyridostigmine	None	325
Pyrimethamine	None	326
Quinidine	None	191, 327
Quinine	None	296
Riboflavin	None	159
Rifampin	None	214
Scopolamine	—	156
Secobarbital	None	328
Senna	None	329
Sotalol	—	237, 330
Spironolactone	None	331
Streptomycin	None	214
Sulbactam	None	332
Sulfapyridine	Caution in infant with jaundice or G-6-PD deficiency and ill, stressed, or premature infant; appears in infant's milk	333, 334
Sulfisoxazole	Caution in infant with jaundice or G-6-PD deficiency and ill, stressed, or premature infant; appears in infant's milk	335
Sumatriptan	None	336
Suprofen	None	337
Terbutaline	None	338
Terfenadine	None	235
Tetracycline	None; negligible absorption by infant	339, 340
Theophylline	Irritability	169, 341
Thiopental	None	139, 342
Thiouracil	None mentioned; drug not used in United States	343
Ticarcillin	None	344
Timolol	None	310
Tolbutamide	Possible jaundice	345
Tolmetin	None	346
Trimethoprim/sulfamethoxazole	None	347, 348
Triprolidine	None	324
Valproic acid	None	176, 349, 350
Verapamil	None	351
Warfarin	None	352
Zolpidem	None	353

* Drugs listed have been reported in the literature as having the effects listed or no effect. The word “none” means that no observable change was seen in the nursing infant while the mother was ingesting the compound. Dashes indicate no mention of clinical effect on the infant. It is emphasized that many of the literature citations concern single case reports or small series of infants.

† Drug is concentrated in human milk.

TABLE 7. Food and Environmental Agents: Effects on Breastfeeding

Agent	Reported Sign or Symptom in Infant or Effect on Lactation	Reference No.
Aflatoxin	None	354–356
Aspartame	Caution if mother or infant has phenylketonuria	357
Bromide (photographic laboratory)	Potential absorption and bromide transfer into milk; see Table 6	358
Cadmium	None reported	359
Chlordane	None reported	360
Chocolate (theobromine)	Irritability or increased bowel activity if excess amounts (≥ 16 oz/d) consumed by mother	169, 361
DDT, benzene hexachlorides, dieldrin, aldrin, heptachlorepoxyde	None	362–370
Fava beans	Hemolysis in patient with G-6-PD deficiency	371
Fluorides	None	372, 373
Hexachlorobenzene	Skin rash, diarrhea, vomiting, dark urine, neurotoxicity, death	374, 375
Hexachlorophene	None; possible contamination of milk from nipple washing	376
Lead	Possible neurotoxicity	377–380
Mercury, methylmercury	May affect neurodevelopment	381–383
Methylmethacrylate	None	384
Monosodium glutamate	None	385
Polychlorinated biphenyls and polybrominated biphenyls	Lack of endurance, hypotonia, sullen, expressionless facies	386–390
Silicone	Esophageal dysmotility	17–22
Tetrachloroethylene cleaning fluid (perchloroethylene)	Obstructive jaundice, dark urine	391
Vegetarian diet	Signs of B ₁₂ deficiency	392

ACKNOWLEDGMENT

The Committee on Drugs would like to thank Linda Watson for her work in reference identification, document retrieval, and manuscript preparation.

REFERENCES

1. American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human breast milk. *Pediatrics*. 1983;72:375-383
2. American Academy of Pediatrics, Committee on Drugs. Transfer of drugs and other chemicals into human milk. *Pediatrics*. 1989;84:924-936
3. American Academy of Pediatrics, Committee on Drugs. Transfer of drugs and other chemicals into human milk. *Pediatrics*. 1994;93:137-150
4. Bisdorf W. Alcohol and nicotine poisoning in nursing infants. *JAMA*. 1937;109:178
5. Ferguson BB, Wilson DJ, Schaffner W. Determination of nicotine concentrations in human milk. *Am J Dis Child*. 1976;130:837-839
6. Luck W, Nau H. Nicotine and cotinine concentrations in the milk of smoking mothers: influence of cigarette consumption and diurnal variation. *Eur J Pediatr*. 1987;146:21-26
7. Luck W, Nau H. Nicotine and cotinine concentrations in serum and milk of nursing mothers. *Br J Clin Pharmacol*. 1984;18:9-15
8. Luck W, Nau H. Nicotine and cotinine concentrations in serum and urine of infants exposed via passive smoking or milk from smoking mothers. *J Pediatr*. 1985;107:816-820
9. Labrecque M, Marcoux S, Weber JP, Fabia J, Ferron L. Feeding and urine cotinine values in babies whose mothers smoke. *Pediatrics*. 1989;83:93-97
10. Schwartz-Bickenbach D, Schulte-Hobein B, Abt S, Plum C, Nau H. Smoking and passive smoking during pregnancy and early infancy: effects on birth weight, lactation period, and cotinine concentrations in mother's milk and infant's urine. *Toxicol Lett*. 1987;35:73-81
11. Schulte-Hobein B, Schwartz-Bickenbach D, Abt S, Plum C, Nau H. Cigarette smoke exposure and development of infants throughout the first year of life: influence of passive smoking and nursing on cotinine levels in breast milk and infant's urine. *Acta Paediatr*. 1992;81:550-557
12. Hopkinson JM, Schanler RJ, Fraley JK, Garza C. Milk production by mothers of premature infants: influence of cigarette smoking. *Pediatrics*. 1992;90:934-938
13. Little RE, Lambert MD III, Worthington-Roberts B, Ervin CH. Maternal smoking during lactation: relation to infant size at one year of age. *Am J Epidemiol*. 1994;140:544-554
14. Boshuizen HC, Verkerk PH, Reerink JD, Hermgreen WP, Zaadstra BM, Verloove-Vanhorick SP. Maternal smoking during lactation: relation to growth during the first year of life in a Dutch birth cohort. *Am J Epidemiol*. 1998;147:117-126
15. Steldinger R, Luck W, Nau H. Half lives of nicotine in milk of smoking mothers: implications for nursing. *J Perinat Med*. 1988;16:261-262
16. Woodward A, Douglas RM, Graham NM, Miles H. Acute respiratory illness in Adelaide children: breast feeding modifies the effect of passive smoking. *J Epidemiol Community Health*. 1990;44:224-230
17. Levine JJ, Ilowite NT. Sclerodermalike esophageal disease in children breast-fed by mothers with silicone breast implants. *JAMA*. 1994;271:213-216
18. Levine JJ, Trachtman H, Gold DM, Pettei MJ. Esophageal dysmotility in children breast-fed by mothers with silicone breast implants: long-term follow-up and response to treatment. *Dig Dis Sci*. 1996;41:1600-1603
19. LeVier RR, Harrison MC, Cook RR, Lane TH. What is silicone? *Plast Reconstr Surg*. 1993;92:163-167
20. Berlin CM Jr. Silicone breast implants and breast-feeding. *Pediatrics*. 1994;94:547-549
21. Kjoller K, McLaughlin JK, Friis S, et al. Health outcomes in offspring of mothers with breast implants. *Pediatrics*. 1998;102:1112-1115
22. Semple JL, Lugowski SJ, Baines CJ, Smith DC, McHugh A. Breast milk contamination and silicone implants: preliminary results using silicon as a proxy measurement for silicone. *Plast Reconstr Surg*. 1998;102:528-533
23. *Physicians' Desk Reference*. Montvale, NJ: Medical Economics Company; 2001
24. US Pharmacopeia. *USP DI 2001: Information for the Health Care Professional, Volume I*. Hutchinson TA, ed. Englewood, CO: Micromedex; 2001
25. US Pharmacopeia. *USP Dictionary of USAN and International Drug Names*. Rockville, MD: US Pharmacopeia; 2000
26. Wiernik PH, Duncan JH. Cyclophosphamide in human milk. *Lancet*. 1971;1:912
27. Amato D, Niblett JS. Neutropenia from cyclophosphamide in breast milk. *Med J Aust*. 1977;1:383-384
28. Flechner SM, Katz AR, Rogers AJ, Van Buren C, Kahan BD. The presence of cyclosporine in body tissue and fluids during pregnancy. *Am J Kidney Dis*. 1985;5:60-63
29. Nyberg G, Haljamae, Frisenette-Fich C, Wennergren M, Kjellmer I. Breast-feeding during treatment with cyclosporine. *Transplantation*. 1998;65:253-255
30. Egan PC, Costanza ME, Dodion P, Egorin MJ, Bachur NR. Doxorubicin and cisplatin excretion into human milk. *Cancer Treat Rep*. 1985;69:1387-1389
31. Johns DG, Rutherford LD, Leighton PC, Vogel CL. Secretion of methotrexate into human milk. *Am J Obstet Gynecol*. 1972;112:978-980
32. Steiner E, Villen T, Hallberg M, Rane A. Amphetamine secretion in breast milk. *Eur J Clin Pharmacol*. 1984;27:123-124
33. Chasoff JJ, Lewis DE, Squires L. Cocaine intoxication in a breast-fed infant. *Pediatrics*. 1987;80:836-838
34. Cobrinik RW, Hood RT Jr, Chusid E. The effect of maternal narcotic addiction on the newborn infant: review of literature and report of 22 cases. *Pediatrics*. 1959;24:288-304
35. Perez-Reyes M, Wall ME. Presence of delta-9-tetrahydrocannabinol in human milk. *N Engl J Med*. 1982;307:819-820
36. Kaufman KR, Petrucha RA, Pitts FN Jr, Weekes ME. PCP in amniotic fluid and breast milk: case report. *J Clin Psychiatry*. 1983;44:269-270
37. McArdle HJ, Danks DM. Secretion of copper 64 into breast milk following intravenous injection in a human subject. *J Trace Elem Exp Med*. 1991;4:81-84
38. Tobin RE, Schneider PB. Uptake of 67Ga in the lactating breast and its persistence in milk: case report. *J Nucl Med*. 1976;17:1055-1056
39. Butt D, Szaz KF. Indium-111 radioactivity in breast milk. *Br J Radiol*. 1986;59:80
40. Hedrick WR, Di Simone RN, Keen RL. Radiation dosimetry from breast milk excretion of radioiodine and pertechnetate. *J Nucl Med*. 1986;27:1569-1571
41. Rose MR, Prescott MC, Herman KJ. Excretion of iodine-123-hippuran, technetium-99 m-red blood cells, and technetium-99 m-macroaggregated albumin into breast milk. *J Nucl Med*. 1990;31:978-984
42. Palmer KE. Excretion of 125I in breast milk following administration of labelled fibrinogen. *Br J Radiol*. 1979;52:672-673
43. Honour AJ, Myant NB, Rowlands EN. Secretion of radioiodine in digestive juices and milk in man. *Clin Sci*. 1952;11:447-462
44. Karjalainen P, Penttila IM, Pystynen P. The amount and form of radioactivity in human milk after lung scanning, renography and placental localization by 131 I labelled tracers. *Acta Obstet Gynecol Scand*. 1971;50:357-361
45. Bland EP, Docker MF, Crawford JS, Farr RF. Radioactive iodine uptake by thyroid of breast-fed infants after maternal blood-volume measurements. *Lancet*. 1969;2:1039-1041
46. Nurnberger CE, Lipscomb A. Transmission of radioiodine (¹³¹I) to infants through human maternal milk. *JAMA*. 1952;150:1398-1400
47. Robinson PS, Barker P, Campbell A, Henson P, Surveyor I, Young PR. Iodine-131 in breast milk following therapy for thyroid carcinoma. *J Nucl Med*. 1994;35:1797-1801
48. Rubow S, Klopper J, Wasserman H, Baard B, van Niekerk M. The excretion of radiopharmaceuticals in human breast milk: additional data and dosimetry. *Eur J Nucl Med*. 1994;21:144-153
49. Pommerenke WT, Hahn PF. Secretion of radio-active sodium in human milk. *Proc Soc Exp Biol Med*. 1943;52:223-224
50. O'Connell ME, Sutton H. Excretion of radioactivity in breast milk following 99Tcm-Sn polyphosphate. *Br J Radiol*. 1976;49:377-379
51. Berke RA, Hoops EC, Kereiakes JC, Saenger EL. Radiation dose to breast-feeding. *J Nucl Med*. 1973;14:51-52
52. Vagenakis AG, Abreau CM, Braverman LE. Duration of radioactivity in the milk of a nursing mother following 99 mTc administration. *J Nucl Med*. 1971;12:188
53. Wyburn JR. Human breast milk excretion of radionuclides following administration of radiopharmaceuticals. *J Nucl Med*. 1973;14:115-117
54. Pittard WB III, Merkatz R, Fletcher BD. Radioactive excretion in human milk following administration of technetium Tc 99 m macroaggregated albumin. *Pediatrics*. 1982;70:231-234
55. Maisels MJ, Gilcher RO. Excretion of technetium in human milk. *Pediatrics*. 1983;71:841-842
56. American Academy of Pediatrics, Committee on Drugs. Psychotropic drugs in pregnancy and lactation. *Pediatrics*. 1982;69:241-244
57. Oo CY, Kuhn RJ, Desai N, Wright CE, McNamara PJ. Pharmacokinetic

- ics in lactating women: prediction of alprazolam transfer into milk. *Br J Clin Pharmacol.* 1995;40:231–236
58. Patrick MJ, Tilstone WJH, Reavey P. Diazepam and breast-feeding. *Lancet.* 1972;1:542–543
 59. Cole AP, Hailey DM. Diazepam and active metabolite in breast milk and their transfer to the neonate. *Arch Dis Child.* 1975;50:741–742
 60. Duscil LJ, Good SM, Hall RW, Ilett KF. Excretion of diazepam and its metabolites in human milk during withdrawal from combination high dose diazepam and oxazepam. *Br J Clin Pharmacol.* 1990;29:123–126
 61. Borgatta L, Jenny RW, Gruss L, Ong C, Barad D. Clinical significance of methohexital, meperidine, and diazepam in breast milk. *J Clin Pharmacol.* 1997;37:186–192
 62. Dencker SJ, Johansson G, Milsom I. Quantification of naturally occurring benzodiazepine-like substances in human breast milk. *Psychopharmacology (Berl).* 1992;107:69–72
 63. Summerfield RJ, Nielson MS. Excretion of lorazepam into breast milk. *Br J Anaesth.* 1985;57:1042–1043
 64. Matheson I, Lunde PK, Bredesen JE. Midazolam and nitrazepam in the maternity ward: milk concentrations and clinical effects. *Br J Clin Pharmacol.* 1990;30:787–793
 65. Olesen OV, Bartels U, Poulsen JH. Perphenazine in breast milk and serum. *Am J Psychiatry.* 1990;147:1378–1379
 66. Brodie RR, Chasseaud LF, Taylor T. Concentrations of N-desmethylpropylmethylprazepam in whole-blood, plasma, and milk after administration of prazepam to humans. *Biopharm Drug Dispos.* 1981;2:59–68
 67. Hilbert JM, Gural RP, Symchowicz S, Zampaglione N. Excretion of quazepam into human breast milk. *J Clin Pharmacol.* 1984;24:457–462
 68. Lebedevs TH, Wojnar-Horton RE, Yapp P, et al. Excretion of temazepam in breast milk. *Br J Clin Pharmacol.* 1992;33:204–206
 69. Bader TF, Newman K. Amitriptyline in human breast milk and the nursing infant's serum. *Am J Psychiatry.* 1980;137:855–856
 70. Erickson SH, Smith GH, Heidrich F. Tricyclics and breast feeding. *Am J Psychiatry.* 1979;136:1483–1484
 71. Gelenberg AJ. Single case study. Amoxapine, a new antidepressant, appears in human milk. *J Nerv Ment Dis.* 1979;167:635–636
 72. Briggs GG, Samson JH, Ambrose PJ, Schroeder DH. Excretion of bupropion in breast milk. *Ann Pharmacother.* 1993;27:431–433
 73. Schimmell MS, Katz EZ, Shaag Y, Pastuszak A, Koren G. Toxic neonatal effects following maternal clomipramine therapy. *Clin Toxicol.* 1991;29:479–484
 74. Sovner R, Orsulak PJ. Excretion of imipramine and desipramine in human breast milk. *Am J Psychiatry.* 1979;136:451–452
 75. Stancer HC, Reed KL. Desipramine and 2-hydroxydesipramine in human breast milk and the nursery infant's serum. *Am J Psychiatry.* 1986;143:1597–1600
 76. Rees JA, Glass RC, Sporne GA. Serum and breast-milk concentrations of dothiepin [letter]. *Practitioner.* 1976;217:686
 77. Ilett KF, Lebedevs TH, Wojnar-Horton RE, et al. The excretion of dothiepin and its primary metabolites in breast milk. *Br J Clin Pharmacol.* 1992;33:635–639
 78. Kemp J, Ilett KF, Booth J, Hackett LP. Excretion of doxepin and N-desmethyldoxepin in human milk. *Br J Clin Pharmacol.* 1985;20:497–499
 79. Burch KJ, Wells BG. Fluoxetine/norfluoxetine concentrations in human milk. *Pediatrics.* 1992;89:676–677
 80. Lester BM, Cucca J, Andreozi L, Flanagan P, Oh W. Possible association between fluoxetine hydrochloride and colic in an infant. *J Am Acad Child Adolesc Psychiatry.* 1993;32:1253–1255
 81. Burch KJ, Wells BG. Fluoxetine/norfluoxetine concentrations in human milk. *Pediatrics.* 1992;89:676–677
 82. Taddio A, Ito S, Koren G. Excretion of fluoxetine and its metabolite, norfluoxetine, in human breast milk. *J Clin Pharmacol.* 1996;36:42–47
 83. Brent NB, Wisner KL. Fluoxetine and carbamazepine concentrations in a nursing mother/infant pair. *Clin Pediatr (Phila).* 1998;37:41–44
 84. Isenberg KE. Excretion of fluoxetine in human breast milk. *J Clin Psychiatry.* 1990;51:169
 85. Nulman I, Koren G. The safety of fluoxetine during pregnancy and lactation. *Teratology.* 1996;53:304–308
 86. Yoshida K, Smith B, Craggs M, Kumar RC. Fluoxetine in breast-milk and developmental outcome of breast-fed infants. *Br J Psychiatry.* 1998;172:175–178
 87. Chambers CD, Anderson PO, Thomas RG, et al. Weight gain in infants breastfed by mothers who take fluoxetine. *Pediatrics.* 1999;104(5). Available at: <http://www.pediatrics.org/cgi/content/full/104/5/e61>. Accessed December 20, 2000
 88. Wright S, Dawling S, Ashford JJ. Excretion of fluvoxamine in breast milk. *Br J Clin Pharmacol.* 1991;31:209
 89. Wisner KL, Perel JM. Serum nortriptyline levels in nursing mothers and their infants. *Am J Psychiatry.* 1991;148:1234–1236
 90. Wisner KL, Perel JM. Nortriptyline treatment of breast-feeding women. *Am J Psychiatry.* 1996;153:295
 91. Stowe ZN, Cohen LS, Hostetter A, Ritchie JC, Owens MJ, Nemeroff CB. Paroxetine in human breast milk and nursing infants. *Am J Psychiatry.* 2000;157:185–189
 92. Epperson CN, Anderson GM, McDougale CJ. Sertraline and breast-feeding. *N Engl J Med.* 1997;336:1189–1190
 93. Stowe ZN, Owens MJ, Landry JC, et al. Sertraline and desmethylsertraline in human breast milk and nursing infants. *Am J Psychiatry.* 1997;154:1255–1260
 94. Verbeek RK, Ross SG, McKenna EA. Excretion of trazodone in breast milk. *Br J Clin Pharmacol.* 1986;22:367–370
 95. Polishuk WZ, Kulcsar SA. Effects of chlorpromazine on pituitary function. *J Clin Endocrinol Metab.* 1956;16:292
 96. Wiles DH, Orr MW, Kolakowska T. Chlorpromazine levels in plasma and milk of nursing mothers. *Br J Clin Pharmacol.* 1978;5:272–273
 97. Nielsen ST, Matheson I, Rasmussen JN, Skinnemoen K, Andrew E, Hafsaah G. Excretion of iohexol and metrizoate in human breast milk. *Acta Radiol.* 1987;28:523–526
 98. Ohkubo T, Shimoyama R, Sugawara K. Determination of chlorpromazine in human breast milk and serum by high-performance liquid chromatography. *J Chromatogr.* 1993;614:328–332
 99. Matheson I, Evang A, Overo KF, Syversen G. Presence of chlorprothixene and its metabolites in breast milk. *Eur J Clin Pharmacol.* 1984;27:611–613
 100. Barnas C, Bergant A, Hummer M, Saria A, Fleischhacker WW. Clozapine concentrations in maternal and fetal plasma, amniotic fluid, and breast milk. *Am J Psychiatry.* 1994;151:945
 101. Stewart RB, Karas B, Springer PK. Haloperidol excretion in human milk. *Am J Psychiatry.* 1980;137:849–850
 102. Whalley LJ, Blain PG, Prime JK. Haloperidol secreted in breast milk. *Br Med J (Clin Res Ed).* 1981;282:1746–1747
 103. Ohkubo T, Shimoyama R, Sugawara K. Measurement of haloperidol in human breast milk by high-performance liquid chromatography. *J Pharm Sci.* 1992;81:947–949
 104. Yoshida K, Smith B, Craggs M, Kumar RC. Neuroleptic drugs in breast milk: a study of pharmacokinetics and of possible adverse effects in breast-fed infants. *Psychol Med.* 1998;28:81–91
 105. Ananth J. Side effects in the neonate from psychotropic agents excreted through breast-feeding. *Am J Psychiatry.* 1978;135:801–805
 106. Plomp TA, Vulmsa T, de Vijlder JJ. Use of amiodarone during pregnancy. *Eur J Obstet Gynecol Reprod Biol.* 1992;43:201–207
 107. Havelka J, Hejzlar M, Popov V, Viktorinova D, Prochazka J. Excretion of chloramphenicol in human milk. *Chemotherapy.* 1968;13:204–211
 108. Smadel JE, Woodward TE, Ley HL Jr, et al. Chloramphenicol (Chloromycetin) in the treatment of tsutsugamushi disease (scrub typhus). *J Clin Invest.* 1949;28:1196
 109. Venkatesan K, Mathur A, Girdhar A, Girdhar BK. Excretion of clofazimine in human milk in leprosy patients. *Lepr Rev.* 1997;68:242–246
 110. Tomson T, Ohman I, Vitols S. Lamotrigine in pregnancy and lactation: a case report. *Epilepsia.* 1997;38:1039–1041
 111. Gupta AP, Gupta PK. Metoclopramide as a lactagogue. *Clin Pediatr (Phila).* 1985;24:269–272
 112. Kauppila A, Arvela P, Koivisto M, Kivinen S, Ylikorkkala O, Pelkonen O. Metoclopramide and breast feeding: transfer into milk and the newborn. *Eur J Clin Pharmacol.* 1983;25:819–823
 113. Erickson SH, Oppenheim GL, Smith GH. Metronidazole in breast milk. *Obstet Gynecol.* 1981;57:48–50
 114. Heisterberg L, Branebjerg PE. Blood and milk concentrations of metronidazole in mothers and infants. *J Perinat Med.* 1983;11:114–120
 115. Evaldson GR, Lindgren S, Nord CE, Rane AT. Tinidazole milk excretion and pharmacokinetics in lactating women. *Br J Clin Pharmacol.* 1985;19:503–507
 116. Boutroy MJ, Bianchetti G, Dubruc C, Vert P, Morselli PL. To nurse when receiving acebutolol: is it dangerous for the neonate? *Eur J Clin Pharmacol.* 1986;30:737–739
 117. Nelis GF. Diarrhoea due to 5-aminosalicylic acid in breast milk. *Lancet.* 1989;1:383
 118. Jenss H, Weber P, Hartmann F. 5-Aminosalicylic acid its metabolite in breast milk during lactation [letter]. *Am J Gastroenterol.* 1990;85:331
 119. Klotz U, Harings-Kaim A. Negligible excretion of 5-aminosalicylic acid in breast milk. *Lancet.* 1993;342:618–619
 120. Liedholm H, Melander A, Bitzen PO, et al. Accumulation of atenolol and metoprolol in human breast milk. *Eur J Clin Pharmacol.* 1981;20:229–231
 121. Schimmel MS, Eidelman AI, Wilschanski MA, Shaw D Jr, Ogilvie RJ,

- Koren G. Toxic effects of atenolol consumed during breast feeding. *J Pediatr*. 1989;114:476–478
122. Thorley KJ, McAinsh J. Levels of the beta-blockers atenolol and propranolol in the breast milk of women treated for hypertension in pregnancy. *Biopharm Drug Dispos*. 1983;4:299–301
 123. Kulas J, Lunell NO, Rosing U, Steen B, Rane A. Atenolol and metoprolol. A comparison of their excretion into human breast milk. *Acta Obstet Gynecol Scand Suppl*. 1984;118:65–69
 124. White WB, Andreoli JW, Wong SH, Cohn RD. Atenolol in human plasma and breast milk. *Obstet Gynecol*. 1984;63:425–445
 125. Kulski JK, Hartmann PE, Martin JD, Smith M. Effects of bromocriptine mesylate on the composition of the mammary secretion in non-breast-feeding women. *Obstet Gynecol*. 1978;52:38–42
 126. Katz M, Kroll D, Pak J, Osimoni A, Hirsch M. Puerperal hypertension, stroke, and seizures after suppression of lactation with bromocriptine. *Obstet Gynecol*. 1985;66:822–824
 127. Clark JH, Wilson WG. A 16-day-old breast-fed infant with metabolic acidosis caused by salicylate. *Clin Pediatr (Phila)*. 1981;20:53–54
 128. Levy G. Salicylate pharmacokinetics in the human neonate. In: Marselli PL, ed. *Basic and Therapeutic Aspects of Perinatal Pharmacology*. New York, NY: Raven Press; 1975:319
 129. Jamali F, Keshavarz E. Salicylate excretion in breast milk. *Int J Pharm*. 1981;8:285–290
 130. Kok TH, Taitz LS, Bennett MJ, Holt DW. Drowsiness due to clemastine transmitted in breast milk. *Lancet*. 1982;1:914–915
 131. Fomina PI. Untersuchungen über den Übergang des aktiven agens des Mutterkorns in die Milch stillender Mütter. *Arch Gynecol*. 1934;157:275
 132. Schou M, Amdisen A. Lithium and pregnancy. 3. Lithium ingestion by children breast-fed by women on lithium treatment. *Br Med J*. 1973;2: 138
 133. Tunnessen WW Jr, Hertz CG. Toxic effects of lithium in newborn infants: a commentary. *J Pediatr*. 1972;81:804–807
 134. Sykes PA, Quarrie J, Alexander FW. Lithium carbonate and breast-feeding. *Br Med J*. 1976;2:1299
 135. Eckstein HB, Jack B. Breast-feeding and anticoagulant therapy. *Lancet*. 1970;1:672–673
 136. Nau H, Rating D, Hauser J, Jäger E, Koch S, Helge H. Placental transfer and pharmacokinetics of primidone and its metabolites phenobarbital, PEMA and hydroxyphenobarbital in neonates and infants of epileptic mothers. *Eur J Clin Pharmacol*. 1980;18:31–42
 137. Kuhn W, Koch S, Helge H, Nau H. Primidone and phenobarbital during lactation period in epileptic women: total and free drug serum levels in the nursed infants and their effects on neonatal behavior. *Dev Pharmacol Ther*. 1988;11:147–154
 138. Finch E, Lorber J. Methaemoglobinaemia in newborn probably due to phenytoin excreted in human milk. *J Obstet Gynaecol Br Emp*. 1954;61: 833–834
 139. Tyson RM, Shrader EA, Perlman HH. Drugs transmitted through breast milk. II. Barbiturates. *J Pediatr*. 1938;13:86–90
 140. Knott C, Reynolds F, Clayden G. Infantile spasms on weaning from breast milk containing anticonvulsants. *Lancet*. 1987;2:272–273
 141. Branski D, Kerem E, Gross-Kieselstein E, Hurvitz H, Litt R, Abrahamov A. Bloody diarrhea—a possible complication of sulfasalazine transferred through human breast milk. *J Pediatr Gastroenterol Nutr*. 1986;5:316–317
 142. Berlin CM Jr, Yaffe SJ, Ragni M. Disposition of acetaminophen in milk, saliva, and plasma of lactating women. *Pediatr Pharmacol (New York)*. 1980;1:135–141
 143. Bitzen PO, Gustafsson B, Jostell KG, Melander A, Wahlin-Boll E. Excretion of paracetamol in human breast milk. *Eur J Clin Pharmacol*. 1981;20:123–125
 144. Findlay JW, DeAngelis RL, Kearney MF, Welch RM, Findlay JM. Analgesic drugs in breast milk and plasma. *Clin Pharmacol Ther*. 1981; 29:625–633
 145. Soderman P, Hartvig P, Fagerlund C. Acetazolamide excretion into human breast milk. *Br J Clin Pharmacol*. 1984;17:599–600
 146. Rollman O, Pihl-Lundin I. Acitretin excretion into human breast milk. *Acta Derm Venereol*. 1990;70:487–490
 147. Lau RJ, Emery MG, Galinsky RE. Unexpected accumulation of acyclovir in breast milk with estimation of infant exposure. *Obstet Gynecol*. 1987;69:468–471
 148. Meyer LJ, de Miranda P, Sheth N, Spruance S. Acyclovir in human breast milk. *Am J Obstet Gynecol*. 1988;158:586–588
 149. Binkiewicz A, Robinson MJ, Senior B. Pseudo-Cushing syndrome caused by alcohol in breast milk. *J Pediatr*. 1978;93:965–967
 150. Cobo E. Effect of different doses of ethanol on the milk-ejecting reflex in lactating women. *Am J Obstet Gynecol*. 1973;115:817–821
 151. Kesaniemi YA. Ethanol and acetaldehyde in the milk and peripheral blood of lactating women after ethanol administration. *J Obstet Gynaecol Br Commonw*. 1974;81:84–86
 152. Little RE, Anderson KW, Ervin CH, Worthington-Roberts B, Clarren SK. Maternal alcohol use during breast-feeding and infant mental and motor development at one year. *N Engl J Med*. 1989;321:425–430
 153. Kamilli I, Gresser U. Allopurinol and oxypurinol in human breast milk. *Clin Investig*. 1993;71:161–164
 154. Kafetzis DA, Sifas CA, Georgakopoulos PA, Papadatos CJ. Passage of cephalosporins and amoxicillin into the breast milk. *Acta Paediatr Scand*. 1981;70:285–288
 155. Berman JD, Melby PC, Neva FA. Concentration of Pentostam in human breast milk. *Trans R Soc Trop Med Hyg*. 1989;83:784–785
 156. Sapeika N. Excretion of drugs in human milk: review. *J Obstet Gynaecol Br Emp*. 1947;54:426–431
 157. Bald R, Bernbeck-Bethausen EM, Spahn H, Mutschler E. Excretion of azpropazone in human breast milk. *Eur J Clin Pharmacol*. 1990;39: 271–273
 158. Fleiss PM, Richwald GA, Gordon J, Stern M, Frantz M, Devlin RG. Aztreonam in human serum and breast milk. *Br J Clin Pharmacol*. 1985;19:509–511
 159. Nail PA, Thomas MR, Eakin R. The effect of thiamin and riboflavin supplementation on the level of those vitamins in human breast milk and urine. *Am J Clin Nutr*. 1980;33:198–204
 160. Roepke JL, Kirksey A. Vitamin B6 nutriture during pregnancy lactation. I. Vitamin B6 intake, levels of the vitamin in biological fluids, condition of the infant at birth. *Am J Clin Nutr*. 1979;32:2249–2256
 161. West KD, Kirksey A. Influence of vitamin B6 intake on the content of the vitamin in human milk. *Am J Clin Nutr*. 1976;29:961–969
 162. Greentree LB. Dangers of vitamin B6 in nursing mothers. *N Engl J Med*. 1979;300:141–142
 163. Samson RR, McClelland DB. Vitamin B12 in human colostrum and milk. Quantitation of the vitamin and its binder and the uptake of bound vitamin B12 by intestinal bacteria. *Acta Paediatr Scand*. 1980;69: 93–99
 164. Eriksson G, Swahn CG. Concentrations of baclofen in serum and breast milk from a lactating woman. *Scand J Clin Lab Invest*. 1981;41:185–187
 165. Healy M. Suppressing lactation with oral diuretics. *Lancet*. 1961;1:1353
 166. Brambel CE, Hunter RE. Effect of dicumarol on the nursing infant. *Am J Obstet Gynecol*. 1950;59:1153
 167. Tyson RM, Shrader EA, Perlman HH. Drugs transmitted through breast milk. III. Bromides. *J Pediatr*. 1938;13:91–93
 168. Pittman KA, Smyth RD, Losada M, Zigelboim I, Maduska AL, Sunshine A. Human perinatal distribution of butorphanol. *Am J Obstet Gynecol*. 1980;138:797–800
 169. Berlin CM Jr. Excretion of the methylxanthines in human milk. *Semin Perinatol*. 1981;5:389–394
 170. Tyralla EE, Dodson WE. Caffeine secretion into breast milk. *Arch Dis Child*. 1979;54:787–800
 171. Hildebrandt R, Gundert-Remy U. Lack of pharmacological active saliva levels of caffeine in breast-fed infants. *Pediatr Pharmacol (New York)*. 1983;3:237–244
 172. Berlin CM Jr, Denson HM, Daniel CH, Ward RM. Disposition of dietary caffeine in milk, saliva, and plasma of lactating women. *Pediatrics*. 1984;73:59–63
 173. Ryu JE. Caffeine in human milk and in serum of breast-fed infants. *Dev Pharmacol Ther*. 1985;8:329–337
 174. Ryu JE. Effect of maternal caffeine consumption on heart rate and sleep time of breast-fed infants. *Dev Pharmacol Ther*. 1985;8:355–363
 175. Devlin RG, Fleiss PM. Captopril in human blood and breast milk. *J Clin Pharmacol*. 1981;21:110–113
 176. Nau H, Kuhn W, Egger JH, Rating D, Helge H. Anticonvulsants during pregnancy and lactation. Transplacental, maternal and neonatal pharmacokinetics. *Clin Pharmacokinet*. 1982;7:508–543
 177. Pynnonen S, Kanto J, Sillanpää M, Erkkola R. Carbamazepine: placental transport, tissue concentrations in foetus and newborn, and level in milk. *Acta Pharmacol Toxicol (Copenh)*. 1977;41:244–253
 178. Silcox J, Schulz P, Horbay GL, Wassenaar W. Transfer of carbetocin into human breast milk. *Obstet Gynecol*. 1993;82:456–459
 179. Cooper DS. Antithyroid drugs: to breast-feed or not to breast-feed. *Am J Obstet Gynecol*. 1987;157:234–235
 180. Lamberg BA, Ikonen E, Osterlund K, et al. Antithyroid treatment of maternal hyperthyroidism during lactation. *Clin Endocrinol (Oxf)*. 1984; 21:81–87
 181. Tyson RM, Shrader EA, Perlman HH. Drugs transmitted through breast milk. I. Laxatives. *J Pediatr*. 1937;11:824–832
 182. Yoshioka H, Cho K, Takimoto M, Maruyama S, Shimizu T. Transfer of cefazolin into human milk. *J Pediatr*. 1979;94:151–152
 183. Dresse A, Lambotte R, Dubois M, Delapierre D, Kramp R. Transmam-

- mary passage of cefoxitin: additional results. *J Clin Pharmacol*. 1983;23:438–440
184. Shyu WC, Shah VR, Campbell DA, et al. Excretion of cefprozil into human breast milk. *Antimicrob Agents Chemother*. 1992;36:938–941
 185. Blanco JD, Jorgensen JH, Castaneda YS, Crawford SA. Cefazidime levels in human breast milk. *Antimicrob Agents Chemother*. 1983;23:479–480
 186. Bourget P, Quinquis-Desmaris V, Fernandez H. Ceftriaxone distribution and protein binding between maternal blood and milk postpartum. *Ann Pharmacother*. 1993;27:294–297
 187. Lacey JH. Dichloralphenazone and breast milk. *Br Med J*. 1971;4:684
 188. Reed CB. A study of the conditions that require the removal of the child from the breast. *Surg Gynecol Obstet*. 1908;6:514
 189. Soares R, Paulini E, Pereira JP. Da concentracao e eliminacao da cloroquina atraves da circulacao placentaria e do leite materno, de pacientes sob regime do sal loroquinado. *Rev Bras Malarial Doencas Trop*. 1957;9:19
 190. Ogunbona FA, Onyeji CO, Bolaji OO, Torimiro SE. Excretion of chloroquine and desethylchloroquine in human milk. *Br J Clin Pharmacol*. 1987;23:473–476
 191. Edstein MD, Veenendaal JR, Newman K, Hyslop R. Excretion of chloroquine, dapsone and pyrimethamine in human milk. *Br J Clin Pharmacol*. 1986;22:733–735
 192. Werthmann MW Jr, Krees SV. Excretion of chlorothiazide in human breast milk. *J Pediatr*. 1972;81:781–783
 193. Miller EM, Cohn RD, Burghart PH. Hydrochlorothiazide disposition in a mother and her breast-fed infant. *J Pediatr*. 1982;101:789–791
 194. Mulley BA, Parr GD, Pau WK, Rye RM, Mould JJ, Siddle NC. Placental transfer of chlorthalidone and its elimination in maternal milk. *Eur J Clin Pharmacol*. 1978;13:129–131
 195. Somogyi A, Gugler R. Cimetidine excretion into breast milk. *Br J Clin Pharmacol*. 1979;7:627–629
 196. Oo CY, Kuhn RJ, Desai N, McNamara PJ. Active transport of cimetidine into human milk. *Clin Pharmacol Ther*. 1995;58:548–555
 197. Gardner DK, Gabbe SG, Harter C. Simultaneous concentrations of ciprofloxacin in breast milk and in serum in mother and breast-fed infant. *Clin Pharm*. 1992;11:352–354
 198. Giamarellou H, Kolokythas E, Petrikkos G, Gazis J, Aravantinos D, Sfrikakis P. Pharmacokinetics of three newer quinolones in pregnant and lactating women. *Am J Med*. 1989;87(suppl):495–515
 199. Hofmeyr GJ, Sonnendecker EW. Secretion of the gastrokinetic agent cisapride in human milk. *Eur J Clin Pharmacol*. 1986;30:735–736
 200. Smith JA, Morgan JR, Rachlis AR, Papsin FR. Clindamycin in human breast milk [letter]. *Can Med Assoc J*. 1975;112:806
 201. Zacharias S, Aguilera E, Assenzo JR, Zanartu J. Effects of hormonal and nonhormonal contraceptives on lactation and incidence of pregnancy. *Contraception*. 1986;33:203–213
 202. Meny RG, Naumburg EG, Alger LS, Brill-Miller JL, Brown S. Codeine and the breastfed neonate. *J Hum Lact*. 1993;9:237–240
 203. Milunsky JM. Breast-feeding during colchicine therapy for familial Mediterranean fever [letter]. *J Pediatr*. 1991;119:164
 204. Ben-Chetrit E, Scherrmann J-M, Levy M. Colchicine in breast milk of patients with familial Mediterranean fever. *Arthritis Rheum*. 1996;39:1213–1217
 205. Guillonneau M, Aigrain EJ, Galliot M, Binet MH, Darbois Y. Colchicine is excreted at high concentrations in human breast milk. *Eur J Obstet Gynecol Reprod Biol*. 1995;61:177–178
 206. Nilsson S, Mellbin T, Hofvander Y, Sundelin C, Valentin J, Nygren KG. Long-term follow-up of children breast-fed by mothers using oral contraceptives. *Contraception*. 1986;34:443–457
 207. Nilsson S, Nygren KG. Transfer of contraceptive steroids to human milk. *Res Reprod*. 1979;11:1–2
 208. American Academy of Pediatrics, Committee on Drugs. Breast-feeding and contraception. *Pediatrics*. 1981;68:138–140
 209. Barsivala VM, Virkar KD. The effect of oral contraceptives on concentration of various components of human milk. *Contraception*. 1973;7:307–312
 210. Borglin NE, Sandholm LE. Effect of oral contraceptives on lactation. *Fertil Steril*. 1971;22:39–41
 211. Curtis EM. Oral-contraceptive feminization of a normal male infant: report of a case. *Obstet Gynecol*. 1964;23:295–296
 212. Kora SJ. Effect of oral contraceptives on lactation. *Fertil Steril*. 1969;20:419–423
 213. Toaff R, Ashkenazi H, Schwartz A, Herzberg M. Effects of oestrogen and progesterone on the composition of human milk. *J Reprod Fertil*. 1969;19:475–482
 214. Snider DE Jr, Powell KE. Should women taking antituberculosis drugs breast-feed? *Arch Intern Med*. 1984;144:589–590
 215. Cancela L, Le Boulch N, Miravet L. Relationship between the vitamin D content of maternal milk and the vitamin D status of nursing women and breast-fed infants. *J Endocrinol*. 1986;110:43–50
 216. Rothberg AD, Pettifor JM, Cohen DF, Sonnendecker EW, Ross FP. Maternal-infant vitamin D relationships during breast-feeding. *J Pediatr*. 1982;101:500–503
 217. Greer FR, Hollis BW, Napoli JL. High concentrations of vitamin D2 in human milk associated with pharmacologic doses of vitamin D2. *J Pediatr*. 1984;105:61–64
 218. Greenhalf JO, Leonard HS. Laxatives in the treatment of constipation in pregnant and breast-feeding mothers. *Practitioner*. 1973;210:259–263
 219. Dreisbach JA. Sulphone levels in breast milk of mothers on sulphone therapy. *Lepr Rev*. 1952;23:101–106
 220. Mortimer EA Jr. Drug toxicity from breast milk [letter]? *Pediatrics*. 1977;60:780–781
 221. FitzJohn TP, Williams DG, Laker MF, Owen JP. Intravenous urography during lactation. *Br J Radiol*. 1982;55:603–605
 222. Loughnan PM. Digoxin excretion in human breast milk. *J Pediatr*. 1978;92:1019–1020
 223. Levy M, Granit L, Laufer N. Excretion of drugs in human milk. *N Engl J Med*. 1977;297:789
 224. Okada M, Inoue H, Nakamura Y, Kishimoto M, Suzuki T. Excretion of diltiazem in human milk [letter]. *N Engl J Med*. 1985;312:992–993
 225. Zylber-Katz E, Linder N, Granit L, Levy M. Excretion of dipyrone metabolites in human breast milk. *Eur J Clin Pharmacol*. 1986;30:359–361
 226. MacKintosh D, Buchanan N. Excretion of disopyramide in human breast milk [letter]. *Br J Clin Pharmacol*. 1985;19:856–857
 227. Hoppu K, Neuvonen PJ, Korte T. Disopyramide and breast feeding [letter]. *Br J Clin Pharmacol*. 1986;21:553
 228. Hofmeyr GJ, van Idlekinge B. Domperidone and lactation [letter]. *Lancet*. 1983;1:647
 229. Jorboe CH, Cook LN, Malesic I, Fleischaker J. Dyphylline elimination kinetics in lactating women: blood to milk transfer. *J Clin Pharmacol*. 1981;21:405–410
 230. Redman CW, Kelly JG, Cooper WD. The excretion of enalapril and enalaprilat in human breast milk. *Eur J Clin Pharmacol*. 1990;38:99
 231. Matsuda S. Transfer of antibiotics into maternal milk. *Biol Res Pregnancy Perinatol*. 1984;5:57–60
 232. Nilsson S, Nygren KG, Johansson ED. Transfer of estradiol to human milk. *Am J Obstet Gynecol*. 1978;132:653–657
 233. Koup JR, Rose JQ, Cohen ME. Ethosuximide pharmacokinetics in a pregnant patient and her newborn. *Epilepsia*. 1978;19:535–539
 234. Steer PL, Biddle CJ, Marley WS, Lantz RK, Sulik PL. Concentration of fentanyl in colostrum after an analgesic dose. *Can J Anaesth*. 1992;39:231–235
 235. Lucas BD Jr, Purdy CY, Scarim SK, Benjamin S, Abel SR, Hilleman DE. Terfenadine pharmacokinetics in breast milk in lactating women. *Clin Pharmacol Ther*. 1995;57:398–402
 236. McQuinn RL, Pisani A, Wafa S, et al. Flecaidine excretion in human breast milk. *Clin Pharmacol Ther*. 1990;48:262–267
 237. Wagner X, Jouglard J, Moulin M, Miller AM, Petitjean J, Pisapia A. Coadministration of flecaidine acetate and sotalol during pregnancy: lack of teratogenic effects, passage across the placenta, and excretion in human breast milk. *Am Heart J*. 1990;119:700–702
 238. Dan M, Weidekamm E, Sagiv R, Portmann R, Zakut H. Penetration of fleroxacin into breast milk and pharmacokinetics in lactating women. *Antimicrob Agents Chemother*. 1993;37:293–296
 239. Force RW. Fluconazole concentrations in breast milk. *Pediatr Infect Dis J*. 1995;14:235–236
 240. Buchanan RA, Eaton CJ, Koeff ST, Kinkel AW. The breast milk excretion of flufenamic acid. *Curr Ther Res Clin Exp*. 1969;11:533–538
 241. Mattern J, Mayer PR. Excretion of fluorescein into breast milk. *Am J Ophthalmol*. 1990;109:598–599
 242. Retief FP, Heyns AD, Oosthuizen M, Oelofse R, van Reenen OR. Aspects of folate metabolism in lactating women studied after ingestion of 14C-methylfolate. *Am J Med Sci*. 1979;277:281–288
 243. Rofsky NM, Weinreb JC, Litt AW. Quantitative analysis of gadopentetate dimeglumine excreted in breast milk. *J Magn Reson Imaging*. 1993;3:131–132
 244. Celiloglu M, Celiker S, Guven H, Tuncok Y, Demir N, Erten O. Gentamicin excretion and uptake from breast milk by nursing infants. *Obstet Gynecol*. 1994;84:263–265
 245. Bell RA, Dale IM. Gold secretion in maternal milk [letter]. *Arthritis Rheum*. 1976;19:1374
 246. Blau SP. Letter: metabolism of gold during lactation. *Arthritis Rheum*. 1973;16:777–778
 247. Gottlieb NL. Suggested errata. *Arthritis Rheum*. 1974;17:1057

248. Ostensen M, Skavdal K, Myklebust G, Tomassen Y, Aarbakke J. Excretion of gold into human breast milk. *Eur J Clin Pharmacol.* 1986;31:251-252
249. Bennett PN, Humphries SJ, Osborne JP, Clarke AK, Taylor A. Use of sodium aurothiomalate during lactation. *Br J Clin Pharmacol.* 1990;29:777-779
250. Cote CJ, Kenepf NB, Reed SB, Strobel GE. Trace concentrations of halothane in human breast milk. *Br J Anaesth.* 1976;48:541-543
251. Liedholm H, Wahlin-Boll E, Hanson A, Ingemarsson I, Melander A. Transplacental passage and breast milk concentrations of hydralazine. *Eur J Clin Pharmacol.* 1982;21:417-419
252. Ostensen M, Brown ND, Chiang PK, Aarbakke J. Hydroxychloroquine in human breast milk. *Eur J Clin Pharmacol.* 1985;28:357
253. Nation RL, Hackett LP, Duscil LJ, Ilett KF. Excretion of hydroxychloroquine in human milk. *Br J Clin Pharmacol.* 1984;17:368-369
254. Townsend RJ, Benedetti T, Erickson SH, Gillespie WR, Albert KS. A study to evaluate the passage of ibuprofen into breast-milk. *Drug Intell Clin Pharm.* 1982;16:482-483
255. Townsend RJ, Benedetti TJ, Erickson SH, et al. Excretion of ibuprofen into breast milk. *Am J Obstet Gynecol.* 1984;149:184-186
256. Eeg-Olofsson O, Malmros I, Elwin CE, Steen B. Convulsions in a breast-fed infant after maternal indomethacin [letter]. *Lancet.* 1978;2:215
257. Fairhead FW. Convulsions in a breast-fed infant after maternal indomethacin [letter]. *Lancet.* 1978;2:576
258. Lebedevs TH, Wojnar-Horton RE, Yapp P, et al. Excretion of indomethacin in breast milk. *Br J Clin Pharmacol.* 1991;32:751-754
259. Postellon DC, Aronow R. Iodine in mother's milk [letter]. *JAMA.* 1982;247:463
260. Holmdahl KH. Cholecystography during lactation. *Acta Radiol.* 1955;45:305-307
261. Berlin CM, Lee C. Isoniazid and acetylisoniazid disposition in human milk, saliva and plasma [abstr]. *Fed Proc.* 1979;38:426
262. Kumar AR, Hale TW, Mock RE. Transfer of interferon alfa into human breast milk. *J Hum Lact.* 2000;16:226-228
263. Ogbuokiri JE, Ozumba BC, Okonkwo PO. Ivermectin levels in human breast milk. *Eur J Clin Pharmacol.* 1993;45:389-390
264. Ogbuokiri JE, Ozumba BC, Okonkwo PO. Ivermectin levels in human breast milk. *Eur J Clin Pharmacol.* 1994;46:89-90
265. Dyggve HV, Dam H, Sondergaard E. Influence on the prothrombin time of breast-fed newborn babies of one single dose of vitamin K1 or synkavit given to the mother within 2 hours after birth. *Acta Obstet Gynecol Scand.* 1956;35:440-444
266. Von Kries R, Shearer M, McCarthy PT, Haug M, Harzer G, Goebel U. Vitamin K-1 content of maternal milk: Influence of the stage of lactation, lipid composition, and vitamin K-1 supplements given to the mother. *Pediatr Res.* 1987;22:513-517
267. Moretti ME, Ito S, Koren G. Disposition of maternal ketoconazole in breast milk. *Am J Obstet Gynecol.* 1995;173:1625-1626
268. Wischnik A, Manth SM, Lloyd J, Bullingham R, Thompson JS. The excretion of ketorolac tromethamine into breast milk after multiple oral dosing. *Eur J Clin Pharmacol.* 1989;36:521-524
269. Lunell HO, Kulas J, Rane A. Transfer of labetalol into amniotic fluid and breast milk in lactating women. *Eur J Clin Pharmacol.* 1985;28:597-599
270. Atkinson H, Begg EJ. Concentration of beta-blocking drugs in human milk [letter]. *J Pediatr.* 1990;116:156
271. Diaz S, Herreros C, Juez G, et al. Fertility regulation in nursing women: VII. Influence of Norplant levonorgestrel implants upon lactation and infant growth. *Contraception.* 1985;32:53-74
272. Shaaban MM, Odland V, Salem HT, et al. Levonorgestrel concentrations in maternal and infant serum during use of subdermal levonorgestrel contraceptive implants, Norplant by nursing mothers. *Contraception.* 1986;33:357-363
273. Shikary ZK, Betrabet SS, Patel ZM, et al. ICMR task force study on hormonal contraception. Transfer of levonorgestrel (LNG) administered through different drug delivery systems from the maternal circulation into the newborn infant's circulation via breast milk. *Contraception.* 1987;35:477-486
274. McCann MF, Moggia AV, Higgins JE, Potts M, Becker C. The effects of a progestin-only oral contraceptive (levonorgestrel 0.03 mg) on breast-feeding. *Contraception.* 1989;40:635-648
275. Mizuta H, Amino N, Ichihara K, et al. Thyroid hormones in human milk and their influence on thyroid function of breast-fed babies. *Pediatr Res.* 1983;17:468-471
276. Zeisler JA, Gaarder TD, De Mesquita SA. Lidocaine excretion in breast milk. *Drug Intell Clin Pharm.* 1986;20:691-693
277. Nikodem VC, Hofmeyr GJ. Secretion of the anti-diarrhoeal agent loperamide oxide in breast milk. *Eur J Clin Pharmacol.* 1992;42:695-696
278. Hilbert J, Radwanski E, Afrime MB, Perentesis G, Symchowicz S, Zampaglione N. Excretion of loratadine in human breast milk. *J Clin Pharmacol.* 1988;28:234-239
279. Cruikshank DP, Varner MW, Pitkin RM. Breast milk magnesium and calcium concentrations following magnesium sulfate treatment. *Am J Obstet Gynecol.* 1982;143:685
280. Hannon PR, Duggan AK, Serwint JR, Vogelhut JW, Witter F, DeAngelis C. The influence of medroxyprogesterone on the duration of breast-feeding in mothers in an urban community. *Arch Pediatr Adolesc Med.* 1997;151:490-496
281. Buchanan RA, Eaton CJ, Koeff ST, Kinkel AW. The breast milk excretion of mefenamic acid. *Curr Ther Res Clin Exp.* 1968;10:592-597
282. Wittels B, Scott DT, Sinatra RS. Exogenous opioids in human breast milk and acute neonatal neurobehavior: a preliminary study. *Anesthesiology.* 1990;73:864-869
283. Blinick G, Inturrisi CE, Jerez E, Wallach RC. Methadone assays in pregnant women and progeny. *Am J Obstet Gynecol.* 1975;121:617-621
284. Blinick G, Wallach RC, Jerez E, Ackerman BD. Drug addiction in pregnancy and the neonate. *Am J Obstet Gynecol.* 1976;125:135-142
285. Wojnar-Horton RE, Kristensen JH, Yapp P, Ilett KF, Duscil LJ, Hackett LP. Methadone distribution and excretion into breast milk of clients in a methadone maintenance programme. *Br J Clin Pharmacol.* 1997;44:543-547
286. Geraghty B, Graham EA, Logan B, Weiss EL. Methadone levels in breast milk. *J Hum Lact.* 1997;13:227-230
287. McCarthy JJ, Posey BL. Methadone levels in human milk. *J Hum Lact.* 2000;16:115-120
288. Cooper DS, Bode HH, Nath B, Saxe V, Maloof F, Ridgway EC. Methimazole pharmacology in man: studies using or newly developed radioimmunoassay for methimazole. *J Clin Endocrinol Metab.* 1984;58:473-479
289. Azizi F. Effect of methimazole treatment of maternal thyrotoxicosis on thyroid function in breast-feeding infants. *J Pediatr.* 1996;128:855-858
290. White WB, Andreoli JW, Cohn RD. Alpha-methyl dopa disposition in mothers with hypertension and in their breast-fed infants. *Clin Pharmacol Ther.* 1985;37:387-390
291. Shore MF. Drugs can be dangerous during pregnancy and lactations. *Can Pharm J.* 1970;103:358
292. Ilett KF, Hackett LP, Paterson JW, McCormick CC. Excretion of metrizamide in milk. *Br J Radiol.* 1981;54:537-538
293. Lownes HE, Ives TJ. Mexiletine use in pregnancy and lactation. *Am J Obstet Gynecol.* 1987;157:446-447
294. Lewis AM, Patel L, Johnston A, Turner P. Mexiletine in human blood and breast milk. *Postgrad Med J.* 1981;57:546-547
295. Valdivieso A, Valdes G, Spiro TE, Westerman RL. Minoxidil in breast milk [letter]. *Ann Intern Med.* 1985;102:135
296. Terwilliger WG, Hatcher RA. The elimination of morphine and quinine in human milk. *Surg Gynecol Obstet.* 1934;58:823-826
297. Robieux I, Koren G, Vandenbergh H, Schneiderman J. Morphine excretion in breast milk and resultant exposure of a nursing infant. *J Toxicol Clin Toxicol.* 1990;28:365-370
298. Oberlander TF, Robeson P, Ward V, et al. Prenatal and breast milk morphine exposure following maternal intrathecal morphine treatment. *J Hum Lact.* 2000;16:137-142
299. Miller RD, Keegan KA, Thrupp LD, Brann J. Human breast milk concentration of moxalactam. *Am J Obstet Gynecol.* 1984;148:348-349
300. Devlin RG, Duchin KL, Fleiss PM. Nadolol in human serum and breast milk. *Br J Clin Pharmacol.* 1981;12:393-396
301. Belton EM, Jones RV. Haemolytic anaemia due to nalidixic acid. *Lancet.* 1965;2:691
302. Jamali F, Stevens DR. Naproxen excretion in milk and its uptake by the infant. *Drug Intell Clin Pharm.* 1983;17:910-911
303. Liu DT, Savage JM, Donnell D. Nefopam excretion in human milk. *Br J Clin Pharmacol.* 1987;23:99-101
304. Ehrenkranz RA, Ackerman BA, Hulse JD. Nifedipine transfer into human milk. *J Pediatr.* 1989;114:478-480
305. Varsano I, Fischl J, Shochet SB. The excretion of orally ingested nitrofurantoin in human milk. *J Pediatr.* 1973;82:886-887
306. Laumas KR, Malkani PK, Bhatnagar S, Laumas V. Radioactivity in the breast milk of lactating women after oral administration of 3H-norethynodrel. *Am J Obstet Gynecol.* 1967;98:411-413
307. Pincus G, Bialy G, Layne DS, Paniagua M, Williams KI. Radioactivity in the milk of subjects receiving radioactive 19-norsteroids. *Nature.* 1966;212:924-925
308. Olsson B, Bolme P, Dahlstrom B, Marcus C. Excretion of noscapine in human breast milk. *Eur J Clin Pharmacol.* 1986;30:213-215

309. Sioufi A, Hillion D, Lumbroso P, et al. Oxprenolol placental transfer, plasma concentrations in newborns and passage into breast milk. *Br J Clin Pharmacol*. 1984;18:453–456
310. Fidler J, Smith V, De Swiet M. Excretion of oxprenolol and timolol in breast milk. *Br J Obstet Gynaecol*. 1983;90:961–965
311. Leuxner E, Pulver R. Verabreichung von irgapyrin bei schwangeren und wochnerinnen. *MMW Munch Med Wochenschr*. 1956;98:84–86
312. Mirkin B. Diphenylhydantoin: placental transport, fetal localization, neonatal metabolism, and possible teratogenic effects. *J Pediatr*. 1971;78:329–337
313. Ostensen M. Piroxicam in human breast milk. *Eur J Clin Pharmacol*. 1983;25:829–830
314. McKenzie SA, Selley JA, Agnew JE. Secretion of prednisolone into breast milk. *Arch Dis Child*. 1975;50:894–896
315. Greenberger PA, Odeh YK, Frederiksen MC, Atkinson AJ Jr. Pharmacokinetics of prednisolone transfer to breast milk. *Clin Pharmacol Ther*. 1993;53:324–328
316. Katz FH, Duncan BR. Entry of prednisone into human milk. *N Engl J Med*. 1975;293:1154
317. Pittard WB III, Glazier H. Procainamide excretion in human milk. *J Pediatr*. 1983;102:631–633
318. Diaz S, Jackanicz TM, Herreros C, et al. Fertility regulation in nursing women: VIII. Progesterone plasma levels and contraceptive efficacy of a progesterone-releasing vaginal ring. *Contraception*. 1985;32:603–622
319. Kunka RL, Venkataraman R, Stern RM, Ladik CF. Excretion of propoxyphene and norpropoxyphene in breast milk. *Clin Pharmacol Ther*. 1984;35:675–680
320. Levitan AA, Manion JC. Propranolol therapy during pregnancy and lactation. *Am J Cardiol*. 1973;32:247
321. Karlberg B, Lundberg D, Aberg H. Letter: excretion of propranolol in human breast milk. *Acta Pharmacol Toxicol (Copenh)*. 1974;34:222–224
322. Bauer JH, Pape B, Zajicek J, Groshong T. Propranolol in human plasma and breast milk. *Am J Cardiol*. 1979;43:860–862
323. Kampmann JP, Johansen K, Hansen JM, Helweg J. Propylthiouracil in human milk: revision of a dogma. *Lancet*. 1980;1:736–737
324. Findlay JW, Butz RF, Sailstad JM, Warren JT, Welch RM. Pseudoephedrine and triprolidine in plasma and breast milk of nursing mothers. *Br J Clin Pharmacol*. 1984;18:901–906
325. Hardell LI, Lindstrom B, Lonnerholm G, Osterman PO. Pyridostigmine in human breast milk. *Br J Clin Pharmacol*. 1982;14:565–567
326. Clyde DF, Shute GT, Press J. Transfer of pyrimethamine in human milk. *J Trop Med Hyg*. 1956;59:277
327. Hill LM, Malkasian GD Jr. The use of quinidine sulfate throughout pregnancy. *Obstet Gynecol*. 1979;54:366–368
328. Horning MG, Stillwell W, Nowlin J, Lertratanakoon K, Stillwell RN, Hill RM. Identification and quantification of drugs and drug metabolites in human breast milk using gas chromatography mass spectrometry computer methods. *Mod Probl Paediatr*. 1975;15:73–79
329. Werthmann MW JR, Krees SV. Quantitative excretion of Senokot in human breast milk. *Med Ann Dist Columbia*. 1973;42:4–5
330. Hackett LP, Wojnar-Horton RE, Duscil LJ, Ilett KF, Roberts MJ. Excretion of sotalol in breast milk. *Br J Clin Pharmacol*. 1990;29:277–278
331. Phelps DL, Karim Z. Spirolactone: relationship between concentrations of dethioacetylated metabolite in human serum milk. *J Pharm Sci*. 1977;66:1203
332. Foulds G, Miller RD, Knirsch AK, Thrupp LD. Sulbactam kinetics and excretion into breast milk in postpartum women. *Clin Pharmacol Ther*. 1985;38:692–696
333. Jarnerot G, Into-Malmberg MB. Sulphasalazine treatment during breast feeding. *Scand J Gastroenterol*. 1979;14:869–871
334. Berlin CM Jr, Yaffe SJ. Disposition of salicylazosulfapyridine (Azulfidine) and metabolites in human breast milk. *Dev Pharmacol Ther*. 1980;1:31–39
335. Kauffman RE, O'Brien C, Gilford P. Sulfisoxazole secretion into human milk. *J Pediatr*. 1980;97:839–841
336. Wojnar-Horton RE, Hackett LP, Yapp P, Duscil LJ, Paech M, Ilett KF. Distribution and excretion of sumatriptan in human milk. *Br J Clin Pharmacol*. 1996;41:217–221
337. Chaiken P, Chasin M, Kennedy B, Silverman BK. Suprofen concentrations in human breast milk. *J Clin Pharmacol*. 1983;23:385–390
338. Lindberberg C, Boreus LO, de Chateau P, Lindstrom B, Lonnerholm G, Nyberg L. Transfer of terbutaline into breast milk. *Eur J Respir Dis Suppl*. 1984;134:87–91
339. Tetracycline in breast milk. *Br Med J*. 1969;4:791
340. Posner AC, Prigot A, Konicoff NG. Further observations on the use of tetracycline hydrochloride in prophylaxis and treatment of obstetric infections. In: Welch H, Marti-Ibanez F, eds. *Antibiotics Annual 1954–1955*. New York, NY: Medical Encyclopedia Inc; 1955:594
341. Yurchak AM, Jusko WJ. Theophylline secretion into breast milk. *Pediatrics*. 1976;57:518–520
342. Andersen LW, Qvist T, Hertz J, Mogensen F. Concentrations of thio-pentone in mature breast milk and colostrum following an induction dose. *Acta Anaesthesiol Scand*. 1987;31:30–32
343. Williams RH, Kay GA, Jandorf BJ. Thiouracil: its absorption, distribution, and excretion. *J Clin Invest*. 1944;23:613–627
344. von Kobyletzki D, Dalhoff A, Lindemeyer H, Primavesi CA. Ticarcillin serum and tissue concentrations in gynecology and obstetrics. *Infection*. 1983;11:144–149
345. Moiel RH, Ryan JR. Tolbutamide orinase in human breast milk. *Clin Pediatr*. 1967;6:480
346. Sagrales R, Waller ES, Goehrs HR. Tolmetin in breast milk. *Drug Intell Clin Pharm*. 1985;19:55–56
347. Arnauld R. Etude du passage de la trimethoprim dans le lait maternel. *Ouest Med*. 1972;25:959
348. Miller RD, Salter AJ. The passage of trimethoprim/sulphamethoxazole into breast milk and its significance. Proceedings of the 8th International Congress of Chemotherapy, Athens. *Hellenic Soc Chemother*. 1974;1:687
349. Arnauld FW. Sodium valproate and pregnancy. *Arch Dis Child*. 1979;54:240
350. von Unruh GE, Froescher W, Hoffman F, Niesen M. Valproic acid in breast milk: how much is really there? *Ther Drug Monit*. 1984;6:272–276
351. Anderson P, Bondesson U, Mattiasson I, Johansson BW. Verapamil and norverapamil in plasma and breast milk during breast feeding. *Eur J Clin Pharmacol*. 1987;31:625–627
352. Orme ML, Lewis PJ, de Swiet M, et al. May mothers given warfarin breast-feed their infants? *Br Med J*. 1977;1:1564–1565
353. Pons G, Francoual C, Guillet P, et al. Zolpidem excretion in breast milk. *Eur J Clin Pharmacol*. 1989;37:245–248
354. Wild CP, Pionneau FA, Montesano R, Mutiro CF, Chetsanga CJ. Aflatoxin detected in human breast milk by immunoassay. *Int J Cancer*. 1987;40:328–333
355. Maxwell SM, Apeagyei F, de Vries HR, et al. Aflatoxins in breast milk, neonatal cord blood and sera of pregnant women. *J Toxicol Toxin Rev*. 1989;8:19–29
356. Zarba A, Wild CP, Hall AJ, et al. Aflatoxin M1 in human breast milk from The Gambia, west Africa, quantified by combined monoclonal antibody immunoaffinity chromatography HPLC. *Carcinogenesis*. 1992;13:891–894
357. Stegink LD, Filer LJ Jr, Baker GL. Plasma, erythrocyte human milk levels of free amino acids in lactating women administered aspartame or lactose. *J Nutr*. 1979;109:2173–2181
358. Mangurten HH, Kaye CI. Neonatal bromism secondary to maternal exposure in a photographic laboratory. *J Pediatr*. 1982;100:596–598
359. Radisch B, Luck W, Nau H. Cadmium concentrations in milk and blood of smoking mothers. *Toxicol Lett*. 1987;36:147–152
360. Miyazaki T, Akiyama K, Kaneko S, Horii S, Yamagishi T. Chlordane residues in human milk. *Bull Environ Contam Toxicol*. 1980;25:518–523
361. Resman BH, Blumenthal P, Jusko WJ. Breast milk distribution of theobromine from chocolate. *J Pediatr*. 1977;91:477–480
362. Wolff MS. Occupationally derived chemicals in breast milk. *Am J Ind Med*. 1983;4:259–281
363. Egan H, Goulding R, Roburn J, Tatton JO. Organo-chlorine pesticide residues in human fat and human milk. *Br Med J*. 1965;2:66–69
364. Quinby GE, Armstrong JF, Durham WF. DDT in human milk. *Nature*. 1965;207:726–728
365. Bakken AF, Seip M. Insecticides in human breast milk. *Acta Paediatr Scand*. 1976;65:535–539
366. Adamovic VM, Sokic B, Smiljanski MJ. Some observations concerning the ratio of the intake of organochlorine insecticides through food and amounts excreted in the milk of breast-feeding mothers. *Bull Environ Contam Toxicol*. 1978;20:280–285
367. Savage EP, Keefe TJ, Tessari JD, et al. National study of chlorinated hydrocarbon insecticide residues in human milk, USA. I. Geographic distribution of dieldrin, heptachlor, heptachlor epoxide, chlordane, oxychlordane, and mirex. *Am J Epidemiol*. 1981;113:413–422
368. Wilson DJ, Locker DJ, Ritzen CA, Watson JT, Schaffner W. DDT concentrations in human milk. *Am J Dis Child*. 1973;125:814–817
369. Bouwman H, Becker PJ, Cooppan RM, Reinecke AJ. Transfer of DDT used in malaria control to infants via breast milk. *Bull World Health Organ*. 1992;70:241–250
370. Stevens MF, Ebell GF, Psaila-Savona P. Organochlorine pesticides in Western Australian nursing mothers. *Med J Aust*. 1993;158:238–241
371. Emanuel B, Schoenfeld A. Favism in a nursing infant. *J Pediatr*. 1961;58:263–266

372. Simpson WJ, Tuba J. An investigation of fluoride concentration in the milk of nursing mothers. *J Oral Med.* 1968;23:104-106
373. Esala S, Vuori E, Helle A. Effect of maternal fluorine intake on breast milk fluorine content. *Br J Nutr.* 1982;48:201-204
374. Dreyfus-See G. Le passage dans le lait des aliments ou médicaments absorbés par denourrices. *Rev Med Interne.* 1934;51:198
375. Ando M, Hirano S, Itoh Y. Transfer of hexachlorobenzene (HCB) from mother to newborn baby through placenta and milk. *Arch Toxicol.* 1985;56:195-200
376. West RW, Wilson DJ, Schaffner W. Hexachlorophene concentrations in human milk. *Bull Environ Contam Toxicol.* 1975;13:167-169
377. Rabinowitz M, Leviton A, Needelman H. Lead in milk and infant blood: a dose-response model. *Arch Environ Health.* 1985;40:283-286
378. Sternowsky JH, Wessolowski R. Lead and cadmium in breast milk. Higher levels in urban vs rural mothers during the first 3 months of lactation. *Arch Toxicol.* 1985;57:41-45
379. Namihira D, Saldivar L, Pustilnik N, Carreon CJ, Salinas ME. Lead in human blood and milk from nursing women living near a smelter in Mexico City. *J Toxicol Environ Health.* 1993;38:225-232
380. Baum CR, Shannon MW. Lead in breast milk. *Pediatrics.* 1996;97:932
381. Koos BJ, Longo LD. Mercury toxicity in the pregnant woman, fetus, and newborn infant. A review. *Am J Obstet Gynecol.* 1976;126:390-409
382. Amin-Zaki L, Elhassani S, Majeed MA, Clarkson TW, Doherty RA, Greenwood MR. Studies of infants postnatally exposed to methylmercury. *J Pediatr.* 1974;85:81-84
383. Pitkin RM, Bahns JA, Filer LJ Jr, Reynolds WA. Mercury in human maternal and cord blood, placenta, and milk. *Proc Soc Exp Biol Med.* 1976;151:565-567
384. Hersh J, Bono JV, Padgett DE, Mancuso CA. Methyl methacrylate levels in the breast milk of a patient after total hip arthroplasty. *J Arthroplasty.* 1995;10:91-92
385. Stegink LD, Filer LJ Jr, Baker GL. Monosodium glutamate: effect on plasma and breast milk amino acid levels in lactating women. *Proc Soc Exp Biol Med.* 1972;140:836-841
386. Miller RW. Pollutants in breast milk: PCBs and cola-colored babies [editorial]. *J Pediatr.* 1977;90:510-511
387. Rogan WJ, Bagniewska A, Damstra T. Pollutants in breast milk. *N Engl J Med.* 1980;302:1450-1453
388. Wickizer TM, Brilliant LB, Copeland R, Tilden R. Polychlorinated biphenyl contamination of nursing mothers' milk in Michigan. *Am J Public Health.* 1981;71:132-137
389. Brilliant LB, Van Amburg G, Isbister J, Bloomer AW, Humphrey H, Price H. Breast-milk monitoring to measure Michigan's contamination with polybrominated biphenyls. *Lancet.* 1978;2:643-646
390. Wickizer TM, Brilliant LB. Testing for polychlorinated biphenyls in human milk. *Pediatrics.* 1981;68:411-415
391. Bagnell PC, Ellenberg HA. Obstructive jaundice due to a chlorinated hydrocarbon in breast milk. *Can Med Assoc J.* 1977;117:1047-1048
392. Higginbottom MC, Sweetman L, Nyhan WL. A syndrome of methylmalonic aciduria, homocystinuria, megaloblastic anemia neurologic abnormalities in a vitamin B12-deficient breast-fed infant of a strict vegetarian. *N Engl J Med.* 1978;299:317-323

The Transfer of Drugs and Other Chemicals Into Human Milk

Committee on Drugs

Pediatrics 2001;108;776

DOI: 10.1542/peds.108.3.776

Updated Information & Services

including high resolution figures, can be found at:
<http://pediatrics.aappublications.org/content/108/3/776>

References

This article cites 384 articles, 54 of which you can access for free at:
<http://pediatrics.aappublications.org/content/108/3/776#BIBL>

Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):

CME

<http://www.aappublications.org/cgi/collection/cme>

Pharmacology

http://www.aappublications.org/cgi/collection/pharmacology_sub

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:

<http://www.aappublications.org/site/misc/Permissions.xhtml>

Reprints

Information about ordering reprints can be found online:

<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

The Transfer of Drugs and Other Chemicals Into Human Milk

Committee on Drugs

Pediatrics 2001;108:776

DOI: 10.1542/peds.108.3.776

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/108/3/776>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2001 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

