TEN STEP TUESDAY

Medications, part 1

It's Ten Step Tuesday!

This week's post is the first in a series on medications adapted from the fabulous Bobbi Philipp, MD, FAP, FABM, Pediatrician and Professor of Pediatrics at Boston Medical Center

A common question we hear is, "Is it safe for me to take this medicine and breastfeed?"

Numerous properties determine if a medication is compatible with breastfeeding. First there are the properties that influence the transfer of the medication from the mother's blood stream across membranes in the breast tissue into the breast milk space. Then, once the drug is in the breast milk, other kinetic factors are involved like how well the medication is absorbed from the baby's gastrointestinal tract (for example in the stomach and as it passes through the liver).

This week we will look at these pharmacokinetic factors: 1) maternal plasma concentration; 2) molecular weight; 3) protein binding; and 4) lipid solubility. We will also talk about the effect of the half-life of a drug.

#1 Maternal plasma concentration

Thomas Hale, in his resource book, Medications and Mothers' Milk, writes, "In most instances, the most important determinant of drug penetration into milk is the mother's plasma level. Almost without exception, as the level of the medication in the mother's plasma rises, the concentration in milk increases as well. Drugs enter and exit milk as a function of mother's plasma level. As soon as the maternal plasma level of a medication begins to fall, equilibrium forces drive the medication out of the milk compartment back into the maternal plasma for elimination." (Hale, 2021)

#2 Molecular weight

A medication that is big in size, that is, has a high molecular weight, has limited movement into breast milk. "Big" is defined as greater than 800 Daltons.

- High molecular weight examples: insulin (6,000 Daltons), heparin (40,000 Daltons)
- Low molecular weight examples: alcohol (200 Daltons), caffeine (194 Daltons)

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#3 Protein Binding

As a general rule, most drugs are transported in the maternal circulation bound to the plasma protein, albumin. Albumin is a large molecular-weight protein. The unbound fraction of the drug is what can enter into the breast milk. Therefore, drugs that are highly protein bound (defined as >90%) don't easily transfer into breast milk.

- High protein binding examples: diazepam (99%), ibuprofen (99%), warfarin (99%), propranolol (90%)
- Low protein binding examples: lithium (0%)

#4 Lipid solubility

As a general rule, the more lipid (or fat) soluble a drug is, the higher the milk levels of that drug will be in the breast milk. Therefore, drugs with low lipid solubility are preferred. It can be hard to determine how lipid soluble a drug is. A good rule of thumb is that if a drug readily enters the brain (the central nervous system or CNS), then it is more likely to get into the breast milk.

- High lipid solubility examples: any drug that acts on the CNS, like antidepressants or anti-anxiety drugs

Half-life

"Medications with shorter half-lives as they are generally eliminated from the maternal plasma rapidly, thus exposing the milk compartment (and the infant) to reduced levels of medication." (Hale, 2021)

- Shorter half-life examples: alcohol (24 minutes), ibuprofen (120 minutes)
- Longer half-life examples: fluoxetine (Prozac) (2-3 days)

FACT — A general guideline is that it takes about 5 half-lives before a drug is completely eliminated from the system.

To sum up this first post, a medication will have a harder time transferring into breast milk if:

- The mother's plasma level is low
- The half-life is short (which causes the mother's plasma level to be lower quicker)
- The molecular weight is big, >800 Daltons
- The protein binding is high, >90%
- It has low lipid solubility

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