King Saud University

College of Medicine

2nd Year,

Reproduction Block

PHARMACOLOGY 433

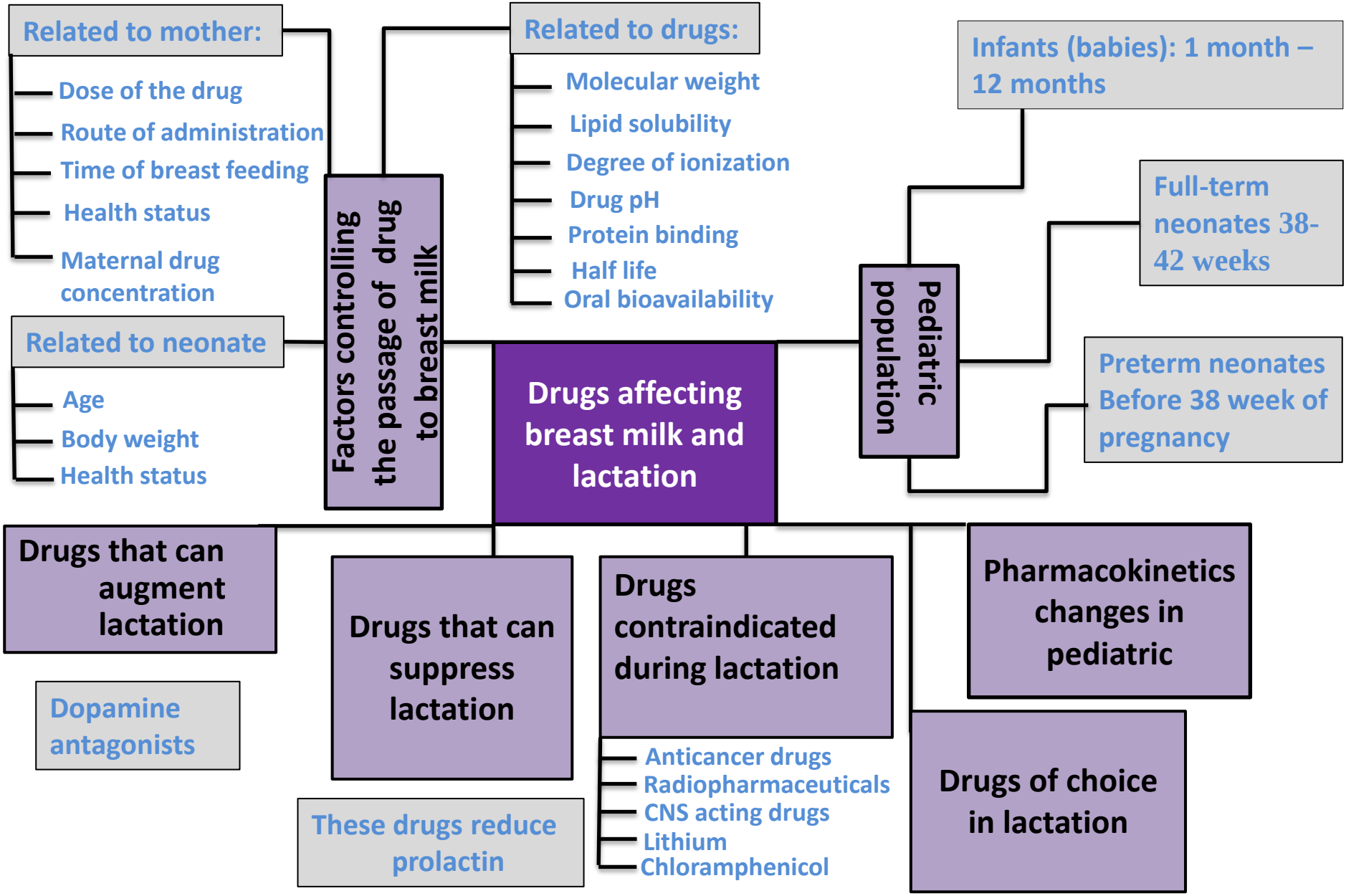
MED 433 Teams

L8 - Drugs affecting breast milk and lactation

Objectives

- Recognize the main pharmacological characters that control the passage of drugs from milk to baby.
- Identify the adverse effects of major pharmacological categories on babies.
- Know drugs that can inhibit lactation and should be avoided in breast feeding.
- Know drugs that may enhance lactation.
- Describe the best and safest medication to be given to breast feeding women if she is suffered from different diseases as epilepsy, infection, diabetes, heart failure, hypertension.

Mind Map


Related to mother:
Dose of the drug
Route of administration
Time of breast feeding
Health status
Maternal drug concentration
Related to neonate
Age
Body weight
Health status
Factors controlling the passage of drug to breast milk
Related to drugs:
Molecular weight
Lipid solubility
Degree of ionization
Drug pH
Protein binding
Half life
Oral bioavailability
Drugs affecting breast milk and lactation
Pediatric population
Infants (babies): 1 month – 12 months
Full-term neonates 38-42 weeks
Preterm neonates Before 38 week of pregnancy
Drugs that can augment lactation
Dopamine antagonists
Drugs that can suppress lactation
These drugs reduce prolactin
Drugs contraindicated during lactation
Anticancer drugs
Radiopharmaceuticals
CNS acting drugs
Lithium
Chloramphenicol
Pharmacokinetics changes in pediatric
Drugs of choice in lactation

Introduction

(Breast feeding) Lactation	**is very important because breast milk is the healthiest form of milk for babies.** **Provide the baby with immunoglobulins (IgA, IgM) that are essential for protection against gastroenteritis**
Pediatric population	**Newborn:** less than one month old **Preterm neonates:** born before 38 weeks of pregnancy **Full-term neonates:** 38-42 weeks of gestational age **Infants (babies):** 1 month – 12 months of age **Children:** 1 -12 years of age **Toddler (young child):** 1-5 years **Older child:** 6-12 years **Adolescent:** 13-18 years
Pharmacokinetics changes in pediatrics	**1-Higher gastric pH (due to reduce of HCL production)** **2-Higher concentrations of free drug** **3-Higher body water** **4-Lower rate of metabolism** **5 -Renal clearance is less efficient**

Factors controlling passage of drugs into breast milk

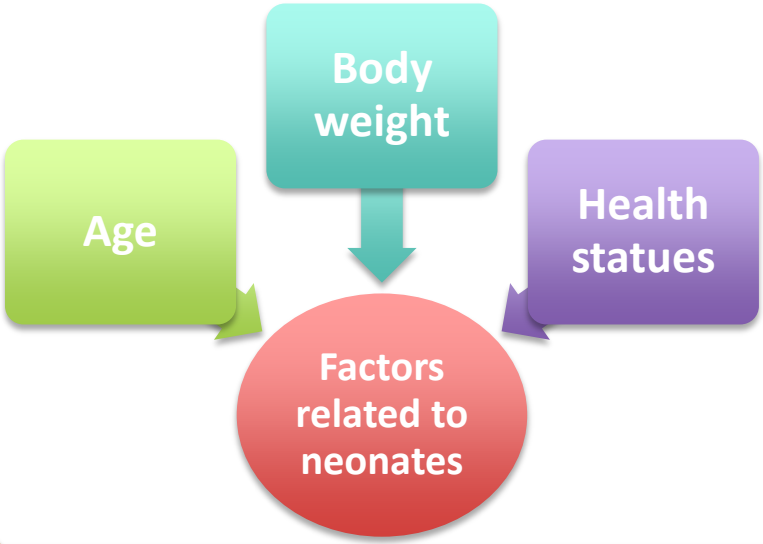
Molecular weight (MW)	-Low **MW** Drugs Pass Easily Into Milk **EX: alcohol.** **-High MW** DRUGS are safe **EX:Insulin, Heparin** .
Lipid solubility	lipid soluble drugs pass more freely in the breast milk
Degree of ionization	Ionized form of drugs **(water Soluble drug)** are less likely transfer into breast milk **EX: Heparin is safe because ,it is high ionized drug**
pH	-pH of milk is slightly more acidic than maternal blood **-Alkaline** Drugs Pass Easily Into Milk **-Acidic** drugs are less likely transfer into breast milk (**the milk is always acidic** if the drug is acidic too there will be no ionization and the drug will go back into the blood BUT if the drug is alkaline there will be ionization and it will be excreted into milk) *ionization only happens between acid and alkaline it never happens between acid\acid or alkaline\alkaline*
protein binding	Only unbound form gets into maternal milk **EX:** warfarin is safe **because ,it is highly** bound **drug**
Half life	Avoid the use of drugs with long half lives **EX:** Oxazepam vs **(diazepam** has long half life**)**
Volume of distribution	large volume of distribution (Vd) drugs are less likely transfer into breast milk Because large amount of the drug present in the tissue

slide | doctor's note | important | explanation

Factors related to mother

Dose of the drug	Any change in dose of women'drug will affect on Therapeutic plan So, we can't change dose we control administration And Time of feeding
Route of administration	**Route of administration affect the concentration of the drug in maternal blood** Maternal use of **topical preparations** **(creams, nasal sprays or inhalers** *** topical preparations is better than systemic preparations** **Because topical drugs have less concentration in blood** **Less pass into milk**
Time of breastfeeding	take medication just after nursing and 3-4 hours before the next feeding to allow time for drug to be cleared from the mother's blood – drug concentration in milk will be **low**).

1-Premature babies have much more limited capacity for metabolism and excretion
Due to immaturity of liver enzymes. And decrease Renal blood flow – decrease GFR
2- Monoclonal antibodies, pass very poorly into milk after the first 1st week postpartum



The amount of a drug to which the baby is exposed as a result of breast feeding depends on

- The amount of milk consumed
- The amount of drug absorbed from GI
- The ability of the baby to eliminate the drug

Age & Health status of the baby;

Special cautions are required in

- Premature infants
- Low birth weight
- Infants with G6PD deficiency(prone to hemolysis) sulfa medications Should be avoided
- Infants with impaired ability to metabolize /excrete drugs e.g. hyperbilirubinemia.

Drugs contraindicated during lactation	Drugs that can suppress lactation =↓volume of Milk by reduce prolactin	Drugs that can augment lactation
1. Anticancer drugs • Doxorubicin • cyclophosphamide • methotrexate **2. Radiopharmaceuticals** e.g. radioactive iodine in case of hyperthyroidism **3. CNS acting drugs** amphetamine, heroin, cocaine **4. Lithium** anti manic Drug **5. Chloramphenicol** also known as chlornitromycin	**Levodopa** (dopamine precursor) **2. Bromocriptine** (dopamine agonist). **3. Estrogen, combined oral contraceptives that contain high-dose of estrogen and a progestin.** should be used mini pills or progestrins only **4. Androgens** **5. Thiazide diuretics**	**1. Dopamine antagonists : they stimulate prolactin secretion galactorrhea e.g.** **Metoclopramide** (antiemetic) **Domperidone** (antiemetic) **Haloperidol** (antipsychotic) **Methyl dopa** (antihypertensive drug) **Theophylline** (used in asthma)

slide | doctor's note | important | explanation

Antibiotics

No adverse effect

1. **Penicillins**

Ampicillin

Amoxacillin

2. **Cephalosporins**
3. **Erythromycin**

Should be avoided

1. **Chloramphenicol**

- **"Gray baby" syndrome**
- This phenomenon occurs in newborn infants because they do not yet have fully functional liver enzymes
- (i.e. UDP-glucuronyl transferase), so chloramphenicol remains unmetabolized in the body. This causes several adverse effects, including hypotension and cyanosis.
- **Possibility of bone marrow suppression**

2. **Sulphonamides**

- **hyperbilirubinemia -neonatal jaundice**
  Should be avoided in premature infants or infants with G6PD deficiency

3. **Quinolones**

- **Risk of arthropathies**

4. **Tetracyclines**

Absorption by the baby is probably prevented by chelation with milk calcium.

Avoid due to possible risk of teeth discoloration.

slide | doctor's note | important | explanation

Sedative/hypnotics

Should be avoided

1. **Barbiturates (phenobarbitone)** Lethargy, sedation, poor suck reflexes
2. **Benzodiazepines (diazepam)** Lethargy, sedation in infants

- **Clinical monitoring is recommended for both.**
- **single doses are unlikely to be harmful**

regular use of high doses should be avoided

Antidiabetics

safe	compatible	should be avoided
Insulin	Oral antidiabetics	Metformin *due to lactic acidosis

Oral contraceptive

safe	should be avoided
• Non hormonal method should be used • Progestin only pills or minipill are preferred for birth control.	• estrogens containing pills Estrogens ↓ milk quantity

Antithyroid drugs

safe	should be avoided
• Propylthiouracil	• Carbimazole • Methimazole

slide | doctor's note | important | explanation

Anticounvulsant

Safe

- Carbamazepine
- Phenytoin

* Amounts entering breast milk are not sufficient to produce adverse effects

* Infants must be monitored

Anticoagulation

Safe

- Heparin
- Warfarin
- Warfarin can be used, very small quantities found in breast milk
- monitor the infant's prothrombin time during treatment.

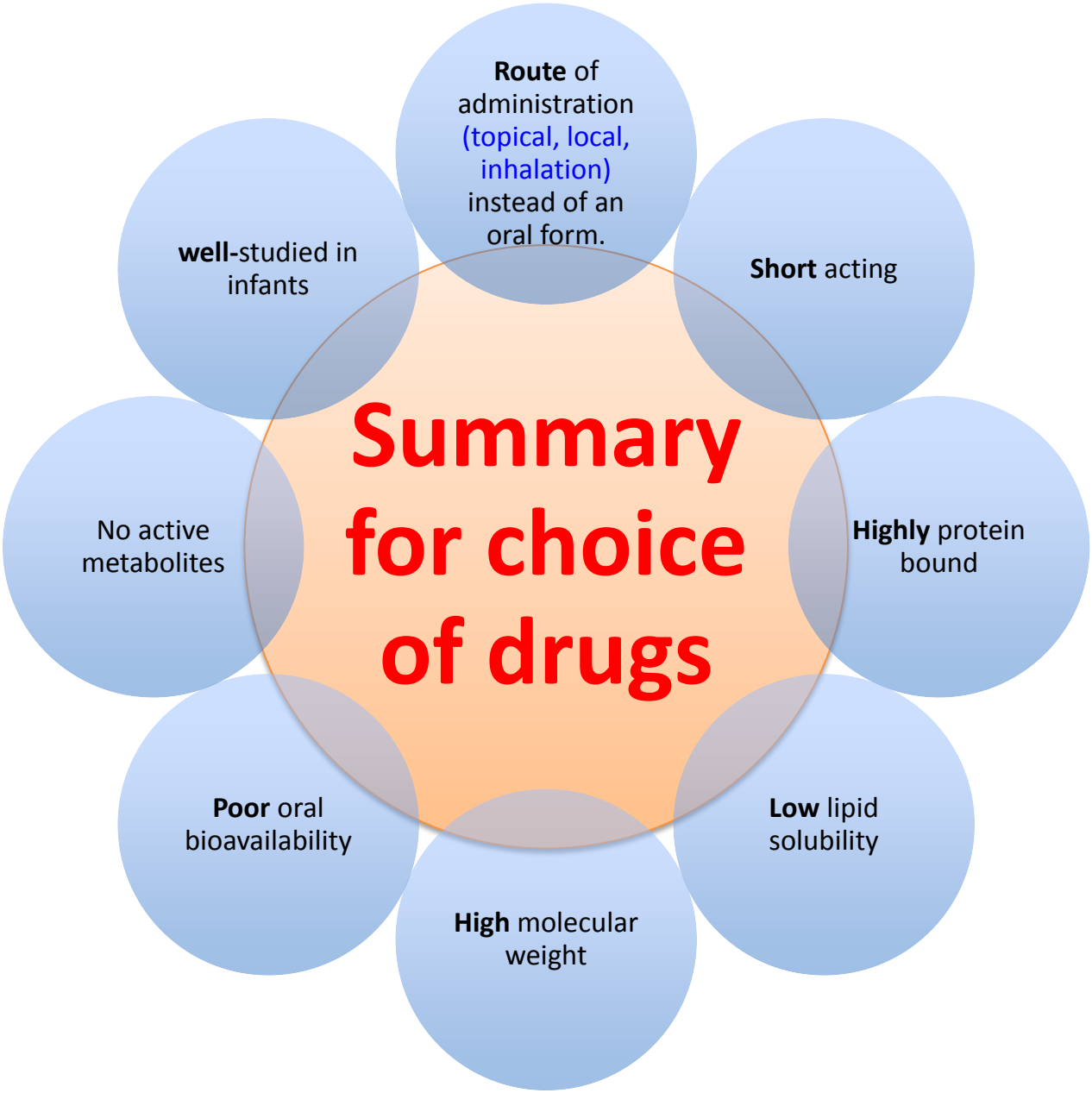
others

Should be avoided

1. Iodine (radioactive) => Hypothyroidism permanent in infant
2. Cytotoxic drugs
3. Lithium => large amount can be detected in milk
4. CVS drugs (atenolol) => Risk of bradycardia and hypoglycemia in infants

So important !!

Drugs of choice in **lactation**	
Antibiotics	Cephalosporins, penicillins **Avoid chloramphenicol, sulphonamides and tetracyclines**
Antidiabetics	Insulin – oral antidiabetics **Avoid metformin**
Anticoagulants	**Heparin** - warfarin
Analgesics	Acetaminophen
Antithyroid drugs	Propylthiouracil is preferable over others
Anticonvulsants	Carbamazepine - phenytoin
Oral contraceptives	Progestin only pills or minipills are preferred for birth control.
Antiasthmatics	**Inhaled** corticosteroids - prednisone



slide | doctor's note | important | explanation

SUMMARY

Factors controlling passage of drugs into breast milk

Factors related to drugs :	Factors related to mother:	Factors related to neonates:	
1. Molecular weight 2. Lipid solubility 3. Degree of ionization 4. Drug pH 5. Protein binding 6. Half life 7. Oral bioavailability	1. Dose of the drug 2. Route of administration 3. Time of breast feeding 4. Health status 5. Maternal drug concentration	1-Age 2-Health status	- <u>Special cautions are required in</u> -Premature infants Low birth weight - Infants with G6PD deficiency - Infants with impaired ability to metabolize /excrete drugs e.g.hyperbilirubinemia.
		3-Body weight	

Drugs contraindicated during lactation	Drugs that can suppress lactation(These drugs reduce prolactin)	Drugs that can augment lactation (Dopamine antagonists)
1-Anticancer drugs: Doxorubicin, cyclophosphamide, methotrexate	1-Levodopa (dopamine precursor)	they stimulate prolactin secretion galactorrhea e.g. 1-Metoclopramide (antiemetic) 2-Domperidone (antiemetic) 3-Haloperidol (antipsychotic) 4-Methyl dopa (antihypertensive drug) 5-Theophylline (used in asthma)
2-Radiopharmaceuticals e.g. radioactive iodine	2-Bromocriptine (dopamine agonist).	
3-CNS acting drugs amphetamine, heroin, cocaine	3-Estrogen, combined oral contraceptives that contain high-dose of estrogen and a progestin.	
4-Lithium		
5-Chloramphenicol	4-Androgens	
	5-Thiazide diuretics	

Quiz yourself

Q1:A premature baby with G6PD deficiency presented with jaundice and hemolysis, which drug of the following his mother is taken:

A-Chloramphenicol
B-Co-trimoxazole
C-Cephalosporins

Q2: A breast feeding women diagnosed with deep vein thrombosis which drug will be the safest for her condition:

A-Heparin
B-Warfarin
C-Dabigatran

Q3:What are the factors of the anticoagulant drug in Q2 that make it safe in lactating women:

A-Polarity
B-High molecular weight
C-A+B

Q4:Drug 1 PH is 7 and drug 2 PH is 8, which drug will be excreted in milk?

A- 1
B- 2
C- NON

Q5:A lactating women who does not want to be pregnant, which OCP will be suitable for her:

A-Estrogen pills
B-Estrogen+Progestin pills
C-Progestin pills

Q6:Diabetic women with DM type2 came to the doctor to ask about her medication plan during lactation period, which one is the safest:

A-Insulin+Metformin
B-Insuline only
C-Glucophage

Q7:Which state is correct regarding Hypnotic drugs during lactation period:

A-Single doses are not harmful
B-Long term use can cause abuse to mother and fetus
C-A+B

Q8:Which drug of the following drugs can stimulate prolactin secretion:

A-Dopamine antagonists
B-Dopamine agonist

Answers: 1-B 2-A 3-C 4-B 5-C 6-B 7-C 8-A

Done by

PHARMACOLOGY 433

Raneem Alotaibi	Ahmed Aldakhil
Awatif alenazi	Fahad Alotaibi
Nawal Asiry	
Noha Almndeel	
Noura alrayes	

Contact us for any questions or comments :

@pharma_433

Pharma_433@yahoo.com