

**Local Anesthetics**  
**Self-Study Objectives and Questions for Pharm 210, Fall Term 2009**  
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**Terms**

amide (class of local anesthetic)	ester (class of local anesthetic)
infiltration (administration route)	local anesthetic/local anesthesia

**Drugs**

lidocaine	prototype of amide class and overall local anesthetic prototype
procaine	prototype of ester class
benzocaine	
cocaine	

**Objectives**

After reviewing your notes from class, and reading the corresponding chapter in Lehne, you should be able to state, describe, or recognize the:

1. main purposes for which local anesthetics (LAs) are given in the clinical setting.
2. the basics of what infiltration (of a LA), nerve block, caudal, and intrathecal administration involves
3. general cellular/pharmacologic mechanism(s) by which LAs cause their intended and unwanted effects on excitable cells (i.e., how and where they “work,” and the dose-dependency of those effects).
4. two main chemical classes of LAs, and the chemical class to which a particular local anesthetic (LA) belongs simply by looking at the drug’s generic name (whether it is or isn’t one of the prototypes).
5. main similarities and differences between LAs in the two main classes in terms of mechanism of action, mechanisms by (or sites from) which they are eliminated from the body, and adverse effects (particularly with respect to allergic reactions).
6. signs and symptoms of systemic LA toxicity, how to recognize them, and how to manage them; and the main cause(s) of death from lethal overdoses of a local anesthetic.
7. reasons and rationales for including a vasoconstrictor (e.g., epinephrine) in a parenteral formulation of local anesthetic. You should also know how or whether the presence of vasoconstrictor affects the time-course (onset, duration) and intensity of LA action, the risks and severity of LA toxicity, and the risk and severity of potential allergic reactions to the anesthetic.

8. unique properties and uses of benzocaine, compared with (e.g.,) lidocaine
9. unique properties and uses of cocaine, compared with (e.g.,) lidocaine; the role of vasoconstrictors as supplements to cocaine; the central nervous system and related adverse and abuse-promoting effects of cocaine

### ***Questions to “think about”***

1. Why is it incorrect to assume that LAs affect only pain, or only sensory nerve function?
2. You are taking a medication history on a patient, asking about drug allergies. They say they're allergic to NOVOCaine, because a doctor or dentist said “I'm giving you some NOVOCaine.” What things do you need to consider, what other questions do you need to ask or answer, before you believe they are truly allergic to NOVOCaine?
3. You're working in the emergency department of a local hospital. A 20 year old patient, with several skin lacerations that require suturing, comes in. He/she will be given a local anesthetic to alleviate the pain of the tissue repair. Why is it not a good idea, at all, to tell the patient he/she will be getting a “shot of NOVOCaine”?
4. Comment on the following: “Epinephrine obviously is a vasoconstrictor, clearly a drug that can raise blood pressure. Therefore, LAs that contain epinephrine are contraindicated for patients with hypertension (high blood pressure).”

To simplify things, assume we are talking about this in the context of a hypertensive patient who has multiple but relatively minor lacerations on the arms and upper body that require suturing, and infiltration of a LA is indicated.

5. Comment on the following: “Local anesthetics may cause anaphylaxis in a small number of patients. Epinephrine is the drug of choice for treating anaphylaxis. Therefore, including epinephrine in a LA to which the patient is highly allergic will prevent the development of an anaphylactic reaction.

### ***Case Study***

Paula Kane, a 32 years old otherwise healthy woman, suffered traumatic amputations of four fingers and part of the thumb on one hand as the result of an at-home accident with a riding lawn mower. She also has multiple deep lacerations of the hand itself. She is taken to surgery to clean and repair the wounds. It is obviously necessary to anesthetize the area. Bupivacaine is selected as the drug, and it will be administered by nerve block at a proper injection site.

1. When taking Ms. Kane's health history preoperatively, she states to you that she received Novocain during a visit to the dentist (for a tooth extraction one year ago) and had a "very bad reaction" to it. She described the reaction as causing hives, severe wheezing, severe tightness in her chest and throat, and light-headedness. What are your interpretations of this information?
2. What adverse effects would be of concern using any LA for Ms. Kane? Which, if any, of her reported adverse effects might be lessened or prevented altogether if the LA contained epinephrine?
3. Would it have been appropriate to infiltrate all Ms. Kane's finger and thumb wounds with a LA containing epinephrine to "boost" the anesthetic's actions?

Five days later Ms. Kane's finger stumps show signs of advanced tissue death (necrosis) from inadequate blood flow (ischemia), and there is also evidence of infection. A plastic surgeon determines that her fingers cannot be salvaged. Because Ms. Kane would be left with no fingers or thumb, she would be faced with little meaningful function of her hand (even if it remained viable), and have a poor cosmetic result. The surgeon recommends amputation of her hand and a portion of her forearm for subsequent fitting of a prosthesis. Ms. Kane consents in writing and returns to the operating room for the surgery.

4. Would it be appropriate to use an ester this time, provided it contains epinephrine? (As you should know by now, epinephrine is "the drug of choice" for managing anaphylactic reactions.)
5. Ms. Kane asks you why she had to have a LOCAL ANESTHETIC, instead of getting a "gas" to be put to sleep (general anesthesia) during the surgery. What is your response?
6. When a local anesthetic is administered, which sensation is lost first? Which is usually last to recover? Why?
7. While Ms. Kane is recovering from her surgery, would it be appropriate to manage her pain with a local anesthetic (e.g., over the next several weeks)?