

## **Local Anaesthetics – Substances with Multiple Application in Medicine**

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### **Abstract**

Local anaesthetics are substances which, by local action groups on the runners, cause loss of reversible a painful sensation, delimited corresponding to the application. They allow small surgery, short in duration and the endoscopic maneuvers. May be useful in soothe teething pain of short duration and in the locking of the nervous disorders in medical care. Local anesthesia is a process useful for the carrying out of surgery and of endoscopic maneuvers, to soothe teething pain in certain conditions, for depriving the temporary structures peripheral nervous control. Reversible locking of the transmission nociceptive, the set of the vegetative and with a local anesthetic at the level of the innervations peripheral nerve, roots and runners, a trunk nervous, around the components of a ganglion or coolant is cefalorahidian practice anesthesia loco-regional. Local anaesthetics summary and semi-summary have multiple applications in dentistry, consulting, surgery and obstetrics, constituting "weapons" very useful in the fight against the pain.

**Keywords:** Local anaesthetics, dentistry, consulting, surgery and obstetrics

## Introduction

Local anesthesia is a useful method for performing surgical procedures and endoscopic maneuvers, in order to relieve pain in certain conditions, for the temporary deprivation of peripheral structures from nervous control. Reversible locking of the nociceptive, motor and vegetative transmission with a local anesthetic at the level of peripheral nerve endings, nerve roots, of a nerve trunk, around the components of a ganglion or in the cerebrospinal fluid constitutes the practice of loco-regional anesthesia. Local anaesthetics are substances which, through local action on nerve formations, lead to the reversible loss of the pain sensation, defined corresponding with the application area [1]. The first known local anesthetic was cocaine. It is found in the leaves of a shrub scientifically called *Erythroxylon coca*, and more commonly coca shrub. The shrub grows wild in the Andes Mountains of South America, but also in Ceylon and Jamaica. The natives use it by chewing the leaves, to remove the sensation of hunger, thirst and fatigue. An American author noted that natives measure the distance between villages in coca leaves [2]. Later, in 1948, xiline or lidocaine was introduced with a faster and more intense action than procaine and, also with a notable efficacy in the treatment of cardiac arrhythmias [1, 2]. Xiline was followed, in 1952, by chlorprocaine, which has, however a higher level of neurotoxicity, in 1957 by mepivacaine, acting somewhat longer than xiline and bupivacaine, introduced in 1963 [1,2]. The latter local anesthetic determines a longer action period and it is indicated to be used to remove the pain of childbirth or postoperative pains. Administered through continuous infusion, it may cause effective analgesia for several days. Unfortunately, its administration must be carefully monitored because it has side effects on the heart. For the anesthesia of the skin and of the mucous membranes were later synthesized other local anaesthetics. As it can be seen, cocaine, the first anesthetic discovered, lost ground to the newer anaesthetics, which is also because this preparation snorted through the nose causes a feeling of drunkenness and an increase of physical and mental energy, phenomena sought after avidly by addicts. The chronic use of cocaine with this purpose determines however phenomena of somatic damage, the chronic consumer having an earthy yellow color, with a total lack of appetite, physically and mentally exhausted, phenomena that can lead to death. Clinically, cocaine is now used less often, only for the surface anesthesia of the mucous membrane of the eyes and of the nasopharynx. However, the other local anaesthetics have multiple uses in dentistry, ENT surgery and obstetrics, very useful "weapons" in the fight against pain. However, most local anaesthetics are injected near the action area and they must be able to penetrate the membrane of the nerve. In general, the membranes of the nerves are composed of lipids. The increase of solubility of lipids of a series of compounds has as a result the facilitation of membrane penetration. In *in vitro* experiments involving very simple systems with isolated nerves, the potency of the compounds is directly proportional to the distribution coefficient. The *in vivo* system is more complicated and often, in a homologous series, the increase of partition coefficients leads to the increase of

potency to a maximum, afterwards the activity decreases, at the same time the toxicity increases [1, 3].

Local anaesthetics of synthesis and semi-synthesis have multiple uses in dentistry, ENT, surgery and obstetrics, constituting very useful "weapons" against pain.

**In this paper the local anaesthetics are systematized depending on their structure. Assessments are made regarding the effects based on the correlations generated through the analysis of the structures from spectroscopy data [3, 4].**

### Research Methods

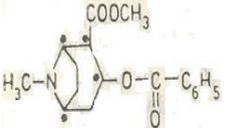
In this study the information regarding the natural and synthetic anaesthetics is systematized, with the presentation of the chemical structures, short characterizations and highlights of the beneficial and toxic effects.

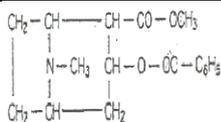
Through the spectrophotometric method in infrared were obtained spectra in infrared for the following local anaesthetics: Cocaine, Prilocaine, Lidocaine, Bupivacaine, Benzocaine, Procaine. The FT IR 4200 Jasco spectrometer with Fourier transform, manufactured in Japan, Tokyo, was used. The characteristics of the device are: the wavelength 7800 to 350 $\text{cm}^{-1}$ ; with the precision of  $\pm 0.01 \text{ cm}^{-1}$  and the maximum resolution of 0,5  $\text{cm}^{-1}$ [4]. Spectra in infrared were carried out for the following substances: Cocaine, Benzocaine, Procaine, Lidocaine, Bupivacaine, Prilocaine.

### Results and Discussions

**A systematization of local anaesthetics can be made after the chemical structure and the obtaining method/ In Table 1 and 2 are presented examples of local anaesthetics [3]**

**Table 1. Natural local anaesthetics [1,3, 5,6]**

Local anaesthetics and structure	Effect on the human body
<p>Cocaine</p>  <p>The chemical structure of cocaine is shown as a tropane alkaloid. It features a bicyclic tropane ring system with a methyl group on the nitrogen atom, a methyl ester group (-COOCH<sub>3</sub>) at the 2-position, and an ethyl ester group (-O-C(=O)-C<sub>2</sub>H<sub>5</sub>) at the 3-position.</p>	<p>Cocaine is an alkaloid isolated from <i>Erythroxylon coca</i> leaves, Family Erythroxylaceae, in 1855, by Gaedcke, who assumed that it is an alkaloid related to caffeine. In 1860 Niemann obtained it by extraction from the leaves, along with other compounds with a similar chemical structure: benzoylecgonine, cynnamil cocaine. The fruits have been used by locals since ancient times, for their effects (elation and removing the sensation of fatigue, hunger and thirst). Cocaine is obtained also synthetically. The cocaine can cause very serious acute poisoning (some with a fatal outcome), especially as therapeutic accidents (overdose,</p>

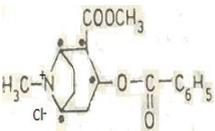
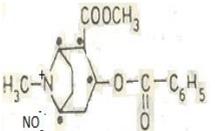


confusion, or consecutive to the hypersensitivity of the subject), rarely because of suicide and chronic poisoning - cocainomania. Base cocaine is rarely used, as oil solutions 2%, used in ophthalmology. Its salts are frequently used: cocaine hydrochloride and nitrate. Cocaine does not penetrate intact skin, but it is quickly absorbed by the mucous membranes, as highlighted by the response given to addicts when cocaine is sniffed. The use of cocaine is limited, exclusively externally, as a surface analgesic, especially in the field of ENT. The maximum dose of local application must not exceed 30 mg for one use and 60 mg for 24 hours.

**Pharmacokinetics.** It is easily absorbed at the level of mucous membranes. It is biotransformed intensely by hydrolysis in the blood, liver and gastrointestinal tract (when administered this way) forming benzoylecgonine (and methanol) and subsequently benzoic acid and ecgonine. It is eliminated through the kidneys.

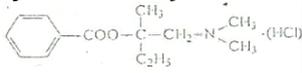
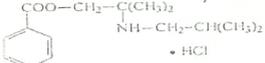
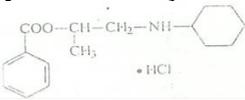
**Toxicodynamics.** Cocaine is toxic to the CNS, producing stimulating effects followed by depression, by depressing the vital centers of the bulb. Produces hyperthermia. At the level of the vegetative nervous system, it has a sympathomimetic action, the main effects are vasoconstriction and mydriasis. By repeated administration the tolerance increases, familiarity easily being set up, with a strong psychological dependence, the abstinence syndrome is insignificant in these events. The lethal dose (for unusual subjects) is smaller by mucous membrane or parenteral administration than orally. It is admitted that lethal doses for adults are 0.2 to 0.3 g s.c. and 1 g orally.

**Treatment.** In acute poisoning by ingestion gastric lavage is done with a solution of KMnO<sub>4</sub> 1‰, followed by the administration of a purgative. Symptomatic treatment refers to combating convulsions and respiratory and cardio-circulatory assistance.

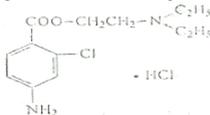
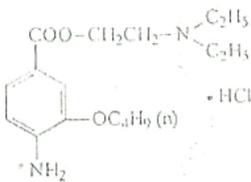
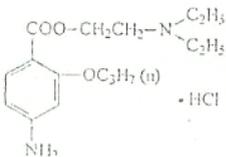
<p>Cocaine hydrochloride</p>  <p>The chemical structure shows a tropane ring system with a methyl group on the nitrogen atom, a chlorine atom, and a methyl ester group (-COOCH<sub>3</sub>). The tropane ring is connected to an ethyl ester group (-O-C(=O)-C<sub>2</sub>H<sub>5</sub>).</p>	<p>It is presented in the form of crystals or white crystalline powder, soluble in water (1: 0.5), alcohol (1: 3.5), chloroform (1:15), and glycerin. It has a sympathomimetic action by blocking presynaptic reuptake of noradrenaline by receptors. Local anesthetic action is strong but limited by its toxicity; it is also vasoconstrictive locally, small doses causing psychomotor stimulation. It acts on the central nervous system, as a stimulant in the first phase, and then causes depression. Produces cocaineomania. Inside the organism, cocaine breaks down quickly, it is eliminated partially through urine as ecgonine and benzoic acid. Its toxicity prevented its use with other purposes apart from local anesthesia and even this use is limited because of fear of producing systemic effects and addiction.</p>
<p>Cocaine nitrate</p>  <p>The chemical structure is identical to cocaine hydrochloride, but the chlorine atom on the tropane ring is replaced by a nitrate group (-NO<sub>3</sub>).</p>	<p>It is rarely used. It has the same uses as cocaine hydrochloride. Due to the fact that the use of cocaine therapeutically is limited, presenting a number of disadvantages including euphoria and pronounced toxicity (cacoinomania); synthesis was used to obtain compounds with similar structure and activity. Research has shown that most compounds in this class can fit into a general formula, which represents only part of the cocaine molecule responsible for local anesthesia.</p>

Each structural component (aryl and aminoalkyl) contributes to the stability of the molecule in lipids and it can be modified to form derivatives with an increased coefficient of distribution. The substitution of the aryl radical with alkyl, alkoxy and alkylamino leads to homologous series in which the partition coefficients increase with the number of methylene groups (-CH<sub>2</sub>-). A review of these series showed that the local anesthetic activity reached the peak for the homologues C<sub>4</sub>, C<sub>5</sub> or C<sub>6</sub> according to the specific nature of the series under consideration. Similarly, changes in the amino alkyl group of the molecule lead to an increase of the activity and toxicity, with the increase of the number of carbon atoms. The N-alkyl branching is often accompanied by an increase of the action. Tertiary amino group may be diethylamino, piperidino or pyrrolidino, resulting in compounds that have the same degree of effectiveness. Most local anaesthetics have PKa values between 8 to 9.5. The result is that some of the compounds with higher pKa values are ionized at a rate of 100 / pH physiologically, and thus have difficulty in achieving biophase. Substances that have a lower pHa are not sufficiently ionized and are less effective, even if they reach biophase.

**Table 2.** Local anaesthetics of synthesis and semi-synthesis [1,2,3,5,6]

Local anaesthetics and structure	Effect on the human body
<b>AMINO ALCOHOLS ESTERS BENZOIC ACID DERIVATIVES (BENZOATE)</b>	
<p><b><i>Amylocaine</i></b> (DCI), <i>Amileina, Stovaina,</i> <i>Benzoate 1-Ethyl-1-</i> <i>methyl-2-</i> <i>(dimethylamino)-ethyl;</i> <i>1-Dimetilamoni-2-</i> <i>methyl-2- benzoyl</i> <i>oxibutan</i> <i>(hydrochloride).</i></p> 	<p>It is a local anesthetic as active as cocaine, but less toxic. Is also has cardiac analeptics properties; also, it does not produce arterial hypertension. It is administered internally in doses of 0.01-0.1 g per day in potions and externally, in the form of solutions 5-20%, 4% eye drops, 1-2% ointments and 0.02-0.04 g suppositories. It can be administered parenterally (s.c.).</p>
<p><b><i>Isobutene</i></b> (DCI), Benzoate 2 (isobutylamine)-2- methyl-1-propanol (hydrochloride).</p> 	<p>White crystalline powder, easily soluble in water, alcohol and chloroform. From the structural point of view, Isobutene differs from Meprylcaine in that it has an N-isobutyl group in the place of the N-propyl group. As Meprylcaine, the action period is short. It is used in dentistry in the form of a solution of 2%.</p>
<p><b><i>Hexylcaine</i></b> (DCI) Cyclaina, benzoate 1- (cyclohexyl- amino) -2-propanol (hydrochloride).</p> 	<p>It is used as a local anesthetic (1-5%), with the same intensity as Cocaine and Butacaine, and for the nerve blocking anesthesia a solution of 1-2% is used, its toxicity is comparable with that produced by Procaine and Tetracaine. It is also used in spinal anesthesia with a solution of 1-2.5%.</p>
<p><b><i>Piperocaine</i></b> (DCI), Metycaine, metilpiperidilpropil benzoate; 3 pipercolinopropyl benzoate; benzoate 3- (2'-methylpiperidino)</p>	<p>It is a crystalline substance soluble in water (1: 1.5) and alcohol (1: 4.5). Aqueous solutions are slightly acidic and stable to sterilization through autoclaving. It is a very good local anesthetic recommended as solutions of 2-4% in ophthalmology, in ENT with solutions of 2-10%, for infiltrations are recommended solutions of 0.5-1%, and for spinal anesthesia solutions of 1,5% are used without exceeding 1.65 mg / kg.</p>

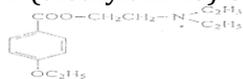
<p>propyl (HCl).</p> <chem>CCCC(=O)OCCCN(C)CC1CCCCC1.[Cl-]</chem>	
<p><b>Cyclometicaine</b> (DCI) Surfacaine, benzoate 3-(2-methylpiperidino) propyl-p-(cichlohrxiloxi) (sulphate).</p> <chem>CCCC(=O)Oc1ccc(Oc2ccccc2)cc1CCCN(C)CC1CCCCC1.[Cl-]</chem>	<p>Cyclometicaine sulphate is in the form of a white crystalline powder, slightly soluble in water, alcohol and chloroform. It is an effective local anesthetic on altered or diseased skin and on rectal mucosa. It is used topically on burns (sun) light skin injuries, on the rectal mucosa in the form of ointments, gels, creams or suppositories. Not recommended in ophthalmology.</p>
<p><b>DERIVATIVES OF P-AMINOBENZOIC ACID (P-AMINOBENZOATE)</b></p>	
<p><b>Benzocaine</b> (DCI), Anesthesine, Etophorm, p-Aminobenzoate ethyl.</p> <chem>CCOC(=O)c1ccc(N)cc1</chem>	<p>It is a local non-toxic anesthetic, readily absorbed through the altered skin and through mucous membranes. It acts only as long as it is in contact with the diseased skin or the mucous membranes. It is used externally in the form of ointments and creams at concentrations of up to 20%, 2% oil solutions and suppositories. Internally it is administered as a potions in doses of 0.3-0.6 g for ulcer pain, gastralgia.</p>
<p><b>Procaine</b> (DCI), Novocain, Allocaine, <b>Sy,caine</b>, 4-amino benzoic 2-dimethylamino acetate (hydrochloride).</p> <chem>CCN(C)CCOC(=O)c1ccc(N)cc1.[Cl-]</chem>	<p>Procaine is the salt of a strong acid with a weak base. The aromatic amino group causes the aqueous solution to be neutral, therefore it is well tolerated by tissues. The ester group may undergo hydrolytic cleavage in p-aminobenzoic acid and diethylaminoethanol. Procaine hydrochloride is not effective on intact skin or mucous membranes, but it acts promptly through infiltration. Its action may be extended by concomitant administration with a vasoconstrictor (adrenaline) that slows its release into the blood where it is rapidly inactivated by hydrolysis Procaine. It is used as a local anesthetic for a relatively short duration, used more in infiltration anesthesia, truncal, epidural and spinal anesthetic being weak. Administered by injection (i.v.), Procaine has an analgesic effect, causing vasodilatation and smooth muscle relaxation, depresses the heart and prevents certain ectopic arrhythmias, reduces the</p>

	<p>reflectivity of vegetation. Low doses over time, prevent aging, being a trophic sealant.</p>
<p><b>Chloroprocaine</b> (DCI), Nesacaine, 2-Chloro-4-aminobenzoate of diethylaminoethyl (hydrochloride).</p> 	<p>Chloroprocaine differs structurally from procaine by the fact that it has an atom of chlorine in the position 2 of the aromatic nucleus which, attracting electrons, destabilizes the ester group. Consequently, chloroprocaine is hydrolyzed in plasma four times quicker than procaine; the local anesthetic action is more rapidly installed and is more intense than that of procaine, but the toxicity is higher.</p>
<p><b>Oxybuprocaine</b> (DCI), Novesine, Butoxyprocaine, Benoxinal, 3-Butoxy-4-aminobenzoate of 2-(diethylamino)-ethyl (hydrochloride)</p> 	<p>White, crystalline powder with a salty taste, very soluble in water and chloroform, soluble in alcohol, stable in air, light and heat. It appears that the 3-butoxy radical stabilizes the molecule, so it is hydrolyzed more slowly than Procaine, the degree of hydrolysis depending on the pH of the solution (pH≈4). Oxybuprocaine is a rapidly acting surface anesthetic. By blocking reversible transmission of stimuli via sensory nerve, it is more effective than cocaine, does not cause mydriasis and accommodation disorders, being better tolerated than cocaine or tetracaine. It is indicated for surface anesthesia of the cornea, in the extraction of deep foreign bodies, in diagnostic examinations and eye surgery. It is administered as a 0.4% solution (5 drops in 5 minutes). The application of oxybuprocaine drops must be strictly limited to preparing ophthalmic surgery or diagnostic examinations. Used in small quantities, oxybuprocaine is well tolerated; sometimes causing a burning sensation, transient hyperemia, even corneal epithelial lesions. It does not cause local irritation, vasoconstriction, specific pupil dilation or sensitivity to light.</p>
<p><b>Propoxycaine</b> (DCI), Blockain, 2-proxy 4-aminobenzoate of 2-(dimethylamino)-ethyl (chlorhydrate)</p> 	<p>White crystalline substance, readily soluble in water, soluble in alcohol. 2% aqueous solutions have pH 5.4. The propoxy- group apparently destabilizes the ester group in the same way as the chlorine in the 2-position of the chloroprocaine's structure. This is in contrast to the apparent stabilizing effect of the butoxy group located in the 3-position on the aromatic ring. (Oxybuprocaine). The inductive and steric effects of a 2-alkoxy substituent which favors hydrolysis, apparently exerts greater influence than the positive mezomer</p>

	<p>stabilizing effect (resonance). These effects are minimal when the -alkoxy substituent is in position 3. Propoxycaine causes a more rapid onset of the local anesthetic effect and a longer duration of action, being more active than Procaine. The lipophilic nature justifies these advantages. It is administered injectable for nerve block and infiltration anesthetic, in the form of a 0.5% solutions, without the addition of a vasoconstrictor.</p>
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### P-ALCOXYBENZOIC ACID DERIVATIVES (P-ALCOXYBENZOATES)

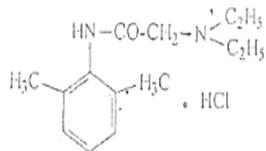
**Paretoxycaine** (DCI), Intracaine, Maxycaine, p-Ethoxybenzoate of 2-(diethylamino)-ethyl



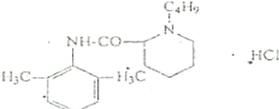
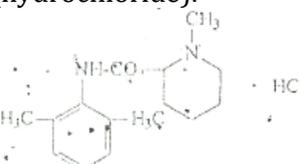
The presence of the -alkoxy group instead of the -amino group makes Paretoxycaine produce less significant side effects than the esters of the p-aminobenzoic acid. It is used as a local anesthetic in ENT.

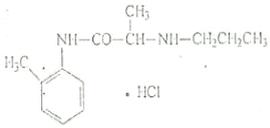
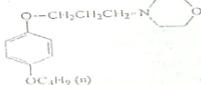
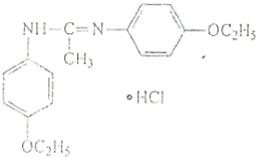
### AMIDES

**Lidocaine** (DCI), Xiline, Xylocaine, a-(Diethylamino)-2, 6-dimethylacetanilide, a-(Diethylamino)-N-(2,6 dimethylphenyl)-acetamide (hydrochloride).



Löfgren (1940) has researched and selected Lidocaine as the main representative of the series. Based on the iodine derivative (a- diethylaminomethylindol) with low anesthetic properties, he obtained a local anesthetic with the chemical structure similar to that of lidocaine. It has the form of a white or slightly yellow crystalline powder, insoluble in water, very soluble in alcohol and oils. Lidocaine hydrochloride is a white crystalline powder, odorless, very soluble in water and alcohol. Lidocaine (xiline) is resistant to hydrolysis because, in addition to the relative stability of the amide bond, the two methyl groups at position 2 and 6 cause the steric hindrance to the attack the carbonyl group; this explains the prolonged action. Lidocaine acts on all the nerve fibers, as it contains in its molecule a hydrophilic end represented by an amino group and a hydrophobic end represented by an aromatic radical, joined by a short chain, typically ester or amide. In tissues due to the slightly alkaline pH and buffer system, the liposoluble base is released, which is able to penetrate through the membrane of nerve fibers, where the amide undergoes a quaternizing effect. Lidocaine is used in all types of local anesthesia, it is three times

	<p>more active than procaine and has longer action. As antiarrhythmic, it is used in ventricular arrhythmia in acute myocardial infarction, cardiac surgery or therapy with digitalis, being administered i.v., typically under EKG control, from the initial dose of 100 mg, to the reach of the effective plasma concentration, continuing with 1.5-3 mg / minute.</p>
<p><b>Bupivacaine</b> (DCI), Sensorcaine, Marcaine, Carbostesia, (<math>\pm</math>)-N-(2,6-Dimethylphenyl)-1-butyl-2-piperidincarboxamide (hydrochloride).</p> 	<p>Bupivacaine is a local analgesic characterized by a long duration of action, and a relatively high installation latency. The pharmacodynamic properties are similar to lidocaine. The effect occurs slowly, in 15 minutes, and lasts 4-8 hours, due to its marked liposolubility and to its ability to bind to membrane proteins. Bupivacaine is used in local or regional anesthesia for surgery (truncal, plexicală, caudal, epidural anesthesia) and is administered parenterally; doses should not exceed 2.5 mg / kg body weight.</p>
<p><b>Mepivacaine</b> (DCI), Carbocaine, Mepivastein, Opticain, Scandonest, (<math>\pm</math>) N-(2,6-Dimethylphenyl)-1-methyl-2-piperidine-carboxamide (hydrochloride); 1-Methyl-2,6'-<b>pipelocoxylidide</b> (hydrochloride).</p> 	<p>As with the other anilides and lidocaine, mepivacaine is highly resistant to hydrolysis, and its solutions are subjected to sterilization in autoclave, without decomposition. Mepivacaine is used as racemic because it was established that the two optical isomers have the same activity and toxicity; they are comparable to those of lidocaine. Its duration of action is considerably longer than that of lidocaine, even in the absence of a vasoconstrictor. It is recommended especially when epinephrine and its counterparts are contraindicated. Mepivacaine is a local anesthetic of synthesis whose action is due to the decrease in membrane permeability of sodium ions. It is administered parenterally 1 to 2 ml of a 3% solution.</p>
<p><b>Prilocaine</b> (DCI), Citanest, N-(2-Methylphenyl)-2-(propilamina)-propanamide (chlorhydrate); 2-(Propilamino)-o-propionotoluidide</p>	<p>White crystalline powder, odorless, bitter, slightly soluble in water and alcohol. Prilocaine has stability, effectiveness, toxicity and duration of action similar to that of other anilides. Its duration of action is between that of lidocaine and that of mepivacaine. Side effects are similar to those produced by other anilides, noting that prilocaine produces methemoglobinemia. This is due to the fact that as a result of its metabolism is obtained a-toluidine- (2-methylaniline), which is</p>

<p>(hydrochloride)</p> 	<p>broken down into toxic products (phenylhydroxylamine nitrobenzene) that cause methemoglobinemia. Prilocaine hydrochloride solutions are used without addition of vasoconstrictors.</p>
<p><b>ETHERS</b></p>	
<p><b>Pramoxin</b> (DCI), Pramocaine, Tronothan e, 4-[3-(p- Butoxyphenoxy)- propyl]-morpholine (hydrochloride)</p> 	<p>White crystalline powder with aromatic smell, slightly soluble in water and alcohol, the pH of THE 1% solution is 4.5. It is a topical local anesthetic, with a low index of sensitivity, with few side effects. It is used for relieving pain and itching caused by insect stings lesions, superficial injuries and hemorrhoids.</p>
<p><b>OTHER STRUCTURES</b></p>	
<p><b>Fencaine</b> (DCI), Holocaine, N, N'-bis-(4- Ethoxyphenyl)- acetamide monohydrate (hydrochloride)</p> 	<p>White crystalline powder, odorless, bitter-tasting, stable in air, easily soluble in water (1:50), easily soluble in alcohol. The aqueous solutions may be sterilized by boiling, but are unstable to the action of alkaline hydroxides. The local anesthetic properties of fencaine were highlighted in 1897, preceding the discovery of izogamine. Fencaine hydrochloride is a slightly irritating, causing a slight discomfort before the onset of anesthesia. It is more toxic than cocaine, and therefore cannot be used for parenteral administration; it is used as a 1% ophthalmic solution 1 to 2% ointment.</p>

The spectrums obtained for the analyzed substances (Cocaine, Benzocaine, Procaine, Lidocaine, Bupivacaine, Prilocaine) are presented in the following figures. *IR spectrums of the analyzed compounds are presented by describing the transmittance depending on the wavelength.*

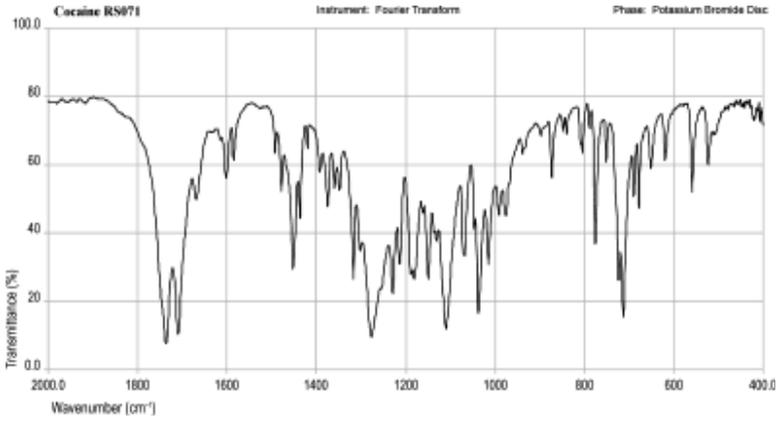


Fig. 1 IR spectrum of cocaine

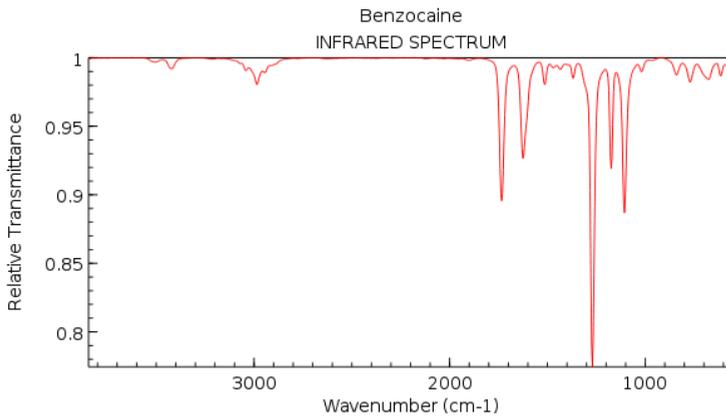


Fig. 2 IR spectrum of Benzocaine

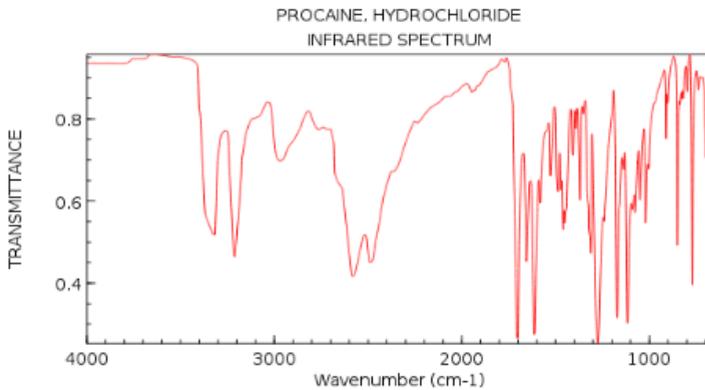


Fig. 3 IR spectrum of procaine

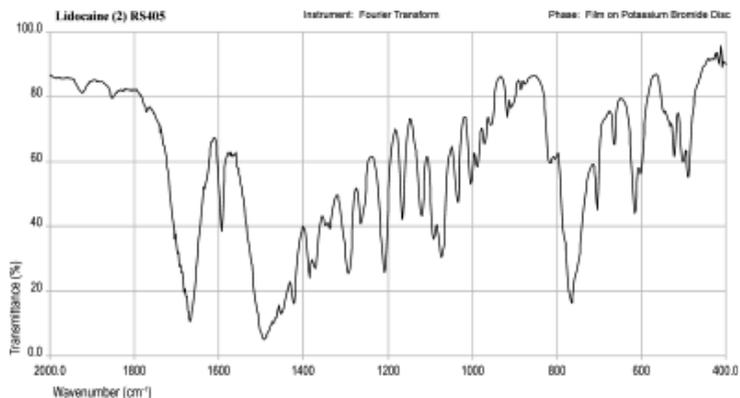


Fig. 4 IR spectrum of lidocainei

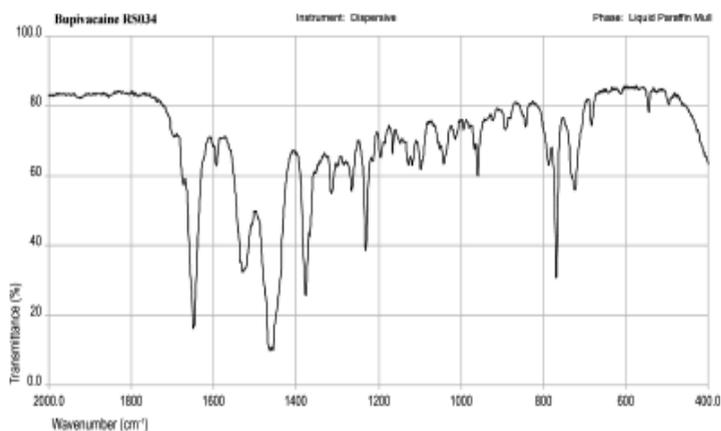


Fig. 5 IR spectrum of bupivacaine

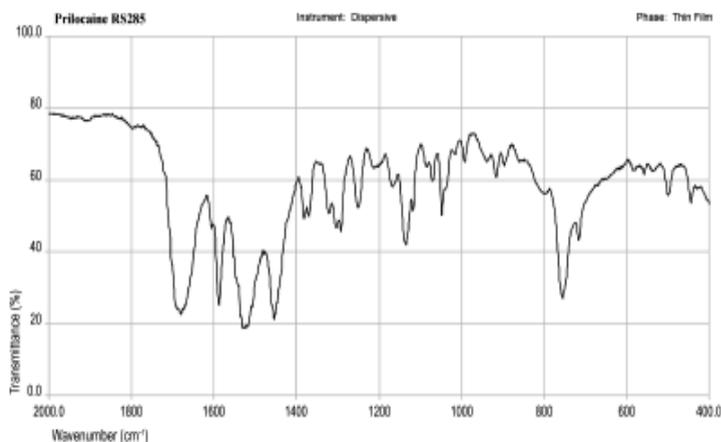


Fig. 6. IR spectrum of prilocaine

## Conclusions

Local anaesthetics may have 3 types of systemic effects, namely: central-nervous, vegetative and cardiovascular. Being absorbed at the site of applications, they cause central excitement phenomena, followed by depression. These effects may lead to serious toxic symptoms. The slowing of absorption by associating vasoconstrictors allows to prolong local action and attenuates resorption effects:

- a) at the level of the central nervous system, excitation and depression events may take place, sometimes a state of confusions (similar to intoxication), after which may follow coma and finally the paralysis of respiratory centers.
- b) at the level of the vegetative nervous system they produce a vasodilator, hypotensive effect, also having a certain antispasmodic action at the level of the smooth muscles.
- c) at the level of the cardiovascular system they cause myocardial depression by inhibiting excitability. In overdose, myocardial depression may be severe. But this effect is therapeutically exploited in cardiac arrhythmia.

Local synthesis and semi-synthesis local anaesthetics have multiple uses in dentistry, ENT, surgery and obstetrics, representing very useful “weapons” in the fight against pain.

The obtained specters may bring a contribution to the setup of an atlas of specters to be used in the control of medicines.

## Acknowledgement

This paper is supported by the Sectoral Operational Programme Human Resources Development (SOP HRD), financed from the European Social Fund and by the Romanian Government under the contract number POSDRU/187/1.5/S/156040/

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