SUCCINYLCHOLINE CHLORIDE- succinylcholine chloride injection
Nexus Pharmaceuticals Inc

Succinylcholine Chloride Injection, USP

An ultra-short-acting depolarizing skeletal muscle relaxant.

WARNING: VENTRICULAR DYSRHYTHMIAS, CARDIAC ARREST, AND DEATH FROM HYPERKALEMIC RHABDOMYOLYSIS

There have been rare reports of acute rhabdomyolysis with hyperkalemia followed by ventricular dysrhythmias, cardiac arrest and death after the administration of succinylcholine to apparently healthy pediatric patients who were subsequently found to have undiagnosed skeletal muscle myopathy, most frequently Duchenne's muscular dystrophy.

This syndrome often presents as peaked T-waves and sudden cardiac arrest within minutes after the administration of the drug in healthy appearing pediatric patients (usually, but not exclusively, males, and most frequently 8 years of age or younger). There have also been reports in adolescents.

Therefore, when a healthy appearing infant or child develops cardiac arrest soon after administration of succinylcholine, not felt to be due to inadequate ventilation, oxygenation or anesthetic overdose, immediate treatment for hyperkalemia should be instituted. This should include administration of intravenous calcium, bicarbonate, and glucose with insulin, with hyperventilation. Due to the abrupt onset of this syndrome, routine resuscitative measures are likely to be unsuccessful. However, extraordinary and prolonged resuscitative efforts have resulted in successful resuscitation in some reported cases. In addition, in the presence of signs of malignant hyperthermia, appropriate treatment should be instituted concurrently.

Since there may be no signs or symptoms to alert the practitioner to which patients are at risk, it is recommended that the use of succinylcholine in pediatric patients should be reserved for emergency intubation or instances where immediate securing of the airway is necessary, e.g., laryngospasm, difficult airway, full stomach, or for intramuscular use when a suitable vein is inaccessible (see **PRECAUTIONS: Pediatric Use** and **DOSAGE AND ADMINISTRATION**).

This drug should be used only by individuals familiar with its actions, characteristics and hazards.

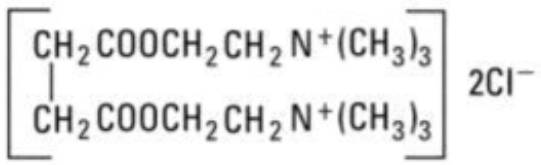
DESCRIPTION

Succinylcholine Chloride Injection, USP is a sterile, nonpyrogenic solution to be used as an ultra-short-acting, depolarizing, skeletal muscle relaxant. See **HOW SUPPLIED** for a summary of content and characteristics of the solution. The solution is for intramuscular (IM) or intravenous (IV) use.

Succinylcholine Chloride is chemically designated as Ethanaminium, 2,2'-[(1,4-dioxo-1,4-

butanediyl) bis(oxy)] bis [N, N, N-trimethyl-, dichloride, its molecular formula is $C_{14}H_{30}Cl_2N_2O_4$, and its molecular weight is 361.31.

It has the following structural formula:



Succinylcholine is a diquaternary base consisting of the dichloride salt of the dicholine ester of succinic acid. Succinylcholine Chloride, USP is a white, odorless, crystalline powder. It is freely soluble in water, slightly soluble in alcohol, and practically insoluble in ether. The drug is incompatible with alkaline solutions but relatively stable in acid solutions. Solutions of the drug lose potency unless refrigerated.

Solution intended for multiple-dose administration contains methylparaben 0.18% and propylparaben 0.02%, as preservatives. Product not requiring dilution (multiple-dose fliptop vial) contains sodium chloride to render isotonic. May contain sodium hydroxide and/or hydrochloric acid for pH adjustment. pH is 3.6 (3.0 to 4.5). See table in ***HOW SUPPLIED*** for characteristics.

Sodium Chloride, USP, chemically designated NaCl, is a white crystalline compound freely soluble in water.

CLINICAL PHARMACOLOGY

Succinylcholine is a depolarizing skeletal muscle relaxant. As does acetylcholine, it combines with the cholinergic receptors of the motor end plate to produce depolarization. This depolarization may be observed as fasciculations. Subsequent neuromuscular transmission is inhibited so long as adequate concentration of succinylcholine remains at the receptor site. Onset of flaccid paralysis is rapid (less than one minute after intravenous administration), and with single administration lasts approximately 4 to 6 minutes.

Succinylcholine is rapidly hydrolyzed by plasma cholinesterase to succinylmonocholine (which possesses clinically insignificant depolarizing muscle relaxant properties) and then more slowly to succinic acid and choline (see **PRECAUTIONS**). About 10% of the drug is excreted unchanged in the urine. Succinylcholine levels were reported to be below the detection limit of 2 mcg/mL after 2.5 minutes of an IV bolus dose of 1 or 2 mg/kg in fourteen (14) anesthetized patients. The paralysis following administration of succinylcholine is progressive, with differing sensitivities of different muscles. This initially involves consecutively the levator muscles of the face, muscles of the glottis and finally the intercostals and the diaphragm and all other skeletal muscles.

Succinylcholine has no direct action on the uterus or other smooth muscle structures. Because it is highly ionized and has low fat solubility, it does not readily cross the placenta.

Tachyphylaxis occurs with repeated administration (see **PRECAUTIONS**).

Depending on the dose and duration of succinylcholine administration, the characteristic depolarizing neuromuscular block (Phase I block) may change to a block with characteristics superficially resembling a non-depolarizing block (Phase II block). This may be associated with prolonged respiratory muscle paralysis or weakness in patients who manifest the transition to Phase II block. When this diagnosis is confirmed by peripheral nerve stimulation, it may sometimes be reversed with anticholinesterase drugs such as neostigmine (see **PRECAUTIONS**). Anticholinesterase drugs may not always be effective. If given before succinylcholine is metabolized by cholinesterase, anticholinesterase drugs may prolong rather than shorten paralysis.

Succinylcholine has no direct effect on the myocardium. Succinylcholine stimulates both autonomic ganglia and muscarinic receptors which may cause changes in cardiac rhythm, including cardiac arrest.

Changes in rhythm, including cardiac arrest, may also result from vagal stimulation, which may occur during surgical procedures, or from hyperkalemia, particularly in pediatric patients (see **PRECAUTIONS: Pediatric Use**). These effects are enhanced by halogenated anesthetics.

Succinylcholine causes an increase in intraocular pressure immediately after its injection and during the fasciculation phase, and slight increases which may persist after onset of complete paralysis (see **WARNINGS**).

Succinylcholine may cause slight increases in intracranial pressure immediately after its injection and during the fasciculation phase (see **PRECAUTIONS**).

As with other neuromuscular blocking agents, the potential for releasing histamine is present following succinylcholine administration. Signs and symptoms of histamine mediated release such as flushing, hypotension and bronchoconstriction are, however, uncommon in normal clinical usage.

Succinylcholine has no effect on consciousness, pain threshold or cerebration. It should be used only with adequate anesthesia (see **WARNINGS**).

INDICATIONS AND USAGE

Succinylcholine chloride is indicated as an adjunct to general anesthesia, to facilitate tracheal intubation, and to provide skeletal muscle relaxation during surgery or mechanical ventilation.

CONTRAINDICATIONS

Succinylcholine is contraindicated in persons with known or suspected genetic susceptibility to malignant hyperthermia [see **WARNINGS, CLINICAL PHARMACOLOGY**], skeletal muscle myopathies and known hypersensitivity to the drug. It is also contraindicated in patients after the acute phase of injury following major burns, multiple trauma, extensive denervation of skeletal muscle, or upper motor neuron injury, because succinylcholine administered to such individuals may result in severe hyperkalemia which may result in cardiac arrest (see **WARNINGS**). The risk of hyperkalemia in these patients increases over time and usually peaks at 7 to 10 days after the injury. The risk is dependent on the extent and location of the injury. The precise time of onset and the duration of the risk period are not known.

WARNINGS

Succinylcholine should be used only by those skilled in the management of artificial respiration and only when facilities are instantly available for tracheal intubation and for providing adequate ventilation of the patient, including the administration of oxygen under positive pressure and the elimination of carbon dioxide. The clinician must be prepared to assist or control respiration.

To avoid distress to the patient, succinylcholine should not be administered before unconsciousness has been induced. In emergency situations, however, it may be necessary to administer succinylcholine before unconsciousness is induced.

Succinylcholine is metabolized by plasma cholinesterase and should be used with caution, if at all, in patients known to be or suspected of being homozygous for the atypical plasma cholinesterase gene.

Anaphylaxis

Severe anaphylactic reactions to neuromuscular blocking agents, including succinylcholine, have been reported. These reactions have, in some cases, been life-threatening and fatal. Due to the potential severity of these reactions, the necessary precautions, such as the immediate availability of appropriate emergency treatment, should be taken. Precautions should also be taken in those individuals who have had previous anaphylactic reactions to other neuromuscular blocking agents since cross-reactivity between neuromuscular blocking agents, both depolarizing and non-depolarizing, has been reported in this class of drugs.

Risk of Death due to Medication Errors

Administration of Succinylcholine Chloride Injection results in paralysis, which may lead to respiratory arrest and death; this progression may be more likely to occur in a patient for whom it is not intended. Confirm proper selection of intended product and avoid confusion with other injectable solutions that are present in critical care and other clinical settings. If another healthcare provider is administering the product, ensure that the intended dose is clearly labeled and communicated.

Hyperkalemia

(see **BOX WARNING**) Succinylcholine should be administered with **GREAT CAUTION** to patients suffering from electrolyte abnormalities and those who may have massive digitalis toxicity, because in these circumstances, succinylcholine may induce serious cardiac arrhythmias or cardiac arrest due to hyperkalemia.

GREAT CAUTION should be observed if succinylcholine is administered to patients during the acute phase of injury following major burns, multiple trauma, extensive denervation of skeletal muscle, or upper motor neuron injury (see **CONTRAINDICATIONS**). The risk of hyperkalemia in these patients increases over time and usually peaks at 7 to 10 days after the injury. The risk is dependent on the extent and location of the injury. The precise time of onset and the duration of the risk period are undetermined. Patients with chronic abdominal infection, subarachnoid hemorrhage, or conditions causing degeneration of central and peripheral nervous systems should receive succinylcholine with **GREAT CAUTION** because of the potential for developing

severe hyperkalemia.

Malignant Hyperthermia

In susceptible individuals, succinylcholine may trigger malignant hyperthermia, a skeletal muscle hypermetabolic state leading to high oxygen demand. Fatal outcomes of malignant hyperthermia have been reported.

The risk of developing malignant hyperthermia increases with the concomitant administration of succinylcholine and volatile anesthetic agents. QUELICIN can induce malignant hyperthermia in patients with known or suspected susceptibility based on genetic factors or family history, including those with certain inherited ryanodine receptor (RYR1) or dihydropyridine receptor (CACNA1S) variants. [see **CONTRAINDICATIONS, CLINICAL PHARMACOLOGY**].

Signs consistent with malignant hyperthermia may include hyperthermia, hypoxia, hypercapnia, muscle rigidity (e.g., jaw muscle spasm), tachycardia (e.g., particularly that unresponsive to deepening anesthesia or analgesic medication administration), tachypnea, cyanosis, arrhythmias, hypovolemia, and hemodynamic instability. Skin mottling, coagulopathies, and renal failure may occur later in the course of the hypermetabolic process.

Successful treatment of malignant hyperthermia depends on early recognition of the clinical signs. If malignant hyperthermia is suspected, discontinue all triggering agents (i.e., volatile anesthetic agents and succinylcholine), administer intravenous dantrolene sodium, and initiate supportive therapies. Consult prescribing information for intravenous dantrolene sodium for additional information on patient management. Supportive therapies include administration of supplemental oxygen and respiratory support based on clinical need, maintenance of hemodynamic stability and adequate urinary output, management of fluid and electrolyte balance, correction of acid base derangements, and institution of measures to control rising temperature.

Other

In both adults and pediatric patients, the incidence of bradycardia, which may progress to asystole, is higher following a second dose of succinylcholine. The incidence and severity of bradycardia is higher in pediatric patients than adults. Whereas bradycardia is common in pediatric patients after an initial dose of 1.5 mg/kg, bradycardia is seen in adults only after repeated exposure. Pretreatment with anticholinergic agents (e.g., atropine) may reduce the occurrence of bradyarrhythmias.

Succinylcholine causes an increase in intraocular pressure. It should not be used in instances in which an increase in intraocular pressure is undesirable (e.g., narrow angle glaucoma, penetrating eye injury) unless the potential benefit of its use outweighs the potential risk.

Succinylcholine is acidic (pH = 3.5) and should not be mixed with alkaline solutions having a pH greater than 8.5 (e.g., barbiturate solutions).

PRECAUTIONS: (SEE BOX WARNING)

General

When succinylcholine is given over a prolonged period of time, the characteristic depolarization block of the myoneural junction (Phase I block) may change to a block with characteristics superficially resembling a non-depolarizing block (Phase II block). Prolonged respiratory muscle paralysis or weakness may be observed in patients manifesting this transition to Phase II block. The transition from Phase I to Phase II block has been reported in 7 of 7 patients studied under halothane anesthesia after an accumulated dose of 2 to 4 mg/kg succinylcholine (administered in repeated, divided doses). The onset of Phase II block coincided with the onset of tachyphylaxis and prolongation of spontaneous recovery. In another study, using balanced anesthesia (N_2O/O_2/narcotic-thiopental) and succinylcholine infusion, the transition was less abrupt, with great individual variability in the dose of succinylcholine required to produce Phase II block. Of 32 patients studied, 24 developed Phase II block. Tachyphylaxis was not associated with the transition to Phase II block, and 50% of the patients who developed Phase II block experienced prolonged recovery.

When Phase II block is suspected in cases of prolonged neuromuscular blockade, positive diagnosis should be made by peripheral nerve stimulation, prior to administration of any anticholinesterase drug. Reversal of Phase II block is a medical decision which must be made upon the basis of the individual, clinical pharmacology and the experience and judgment of the physician. The presence of Phase II block is indicated by fade of responses to successive stimuli (preferably "train of four"). The use of an anticholinesterase drug to reverse Phase II block should be accompanied by appropriate doses of an anticholinergic drug to prevent disturbances of cardiac rhythm. After adequate reversal of Phase II block with an anticholinesterase agent, the patient should be continually observed for at least 1 hour for signs of return of muscle relaxation. Reversal should not be attempted unless: (1) a peripheral nerve stimulator is used to determine the presence of Phase II block (since anticholinesterase agents will potentiate succinylcholine-induced Phase I block), and (2) spontaneous recovery of muscle twitch has been observed for at least 20 minutes and has reached a plateau with further recovery proceeding slowly; this delay is to ensure complete hydrolysis of succinylcholine by plasma cholinesterase prior to administration of the anticholinesterase agent. Should the type of block be misdiagnosed, depolarization of the type initially induced by succinylcholine (i.e., Phase I block) will be prolonged by an anticholinesterase agent.

Succinylcholine should be employed with caution in patients with fractures or muscle spasm because the initial muscle fasciculations may cause additional trauma.

Succinylcholine may cause a transient increase in intracranial pressure; however, adequate anesthetic induction prior to administration of succinylcholine will minimize this effect.

Succinylcholine may increase intragastric pressure, which could result in regurgitation and possible aspiration of stomach contents.

Neuromuscular blockade may be prolonged in patients with hypokalemia or hypocalcemia.

Since allergic cross-reactivity has been reported in this class, request information from your patients about previous anaphylactic reactions to other neuromuscular blocking agents. In addition, inform your patients that severe anaphylactic reactions to neuromuscular blocking agents, including succinylcholine have been reported.

Reduced Plasma Cholinesterase Activity

Succinylcholine should be used carefully in patients with reduced plasma cholinesterase (pseudocholinesterase) activity. The likelihood of prolonged neuromuscular block following administration of succinylcholine must be considered in such patients (see ***DOSAGE AND ADMINISTRATION***).

Plasma cholinesterase activity may be diminished in the presence of genetic abnormalities of plasma cholinesterase (e.g., patients heterozygous or homozygous for atypical plasma cholinesterase gene), pregnancy, severe liver or kidney disease, malignant tumors, infections, burns, anemia, decompensated heart disease, peptic ulcer, or myxedema. Plasma cholinesterase activity may also be diminished by chronic administration of oral contraceptives, glucocorticoids, or certain monoamine oxidase inhibitors and by irreversible inhibitors of plasma cholinesterase (e.g., organophosphate insecticides, echothiophate, and certain antineoplastic drugs).

Patients homozygous for atypical plasma cholinesterase gene (1 in 2500 patients) are extremely sensitive to the neuromuscular blocking effect of succinylcholine. In these patients, a 5 to 10 mg test dose of succinylcholine may be administered to evaluate sensitivity to succinylcholine, or neuromuscular blockade may be produced by the cautious administration of a 1 mg/mL solution of succinylcholine by slow intravenous infusion. Apnea or prolonged muscle paralysis should be treated with controlled respiration.

Drug Interactions

Drugs which may enhance the neuromuscular blocking action of succinylcholine include: promazine, oxytocin, aprotinin, certain non-penicillin antibiotics, quinidine, β-adrenergic blockers, procainamide, lidocaine, trimethaphan, lithium carbonate, magnesium salts, quinine, chloroquine, diethyl ether, isoflurane, desflurane, metoclopramide and terbutaline. The neuromuscular blocking effect of succinylcholine may be enhanced by drugs that reduce plasma cholinesterase activity (e.g., chronically administered oral contraceptives, glucocorticoids, or certain monoamine oxidase inhibitors) or by drugs that irreversibly inhibit plasma cholinesterase (see **PRECAUTIONS**).

If other neuromuscular blocking agents are to be used during the same procedure, the possibility of a synergistic or antagonistic effect should be considered.

Carcinogenesis, Mutagenesis, Impairment of Fertility

There have been no long-term studies performed in animals to evaluate carcinogenic potential of succinylcholine. Genetic toxicology studies have not been completed to evaluate the genotoxic potential of succinylcholine. There are no studies to evaluate the potential impact of succinylcholine on fertility.

Pregnancy

Risk Summary

It is also not known whether succinylcholine can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. Animal reproduction studies have not been conducted with succinylcholine chloride. Succinylcholine should be given to a pregnant woman only if clearly needed.

The estimated background risk of major birth defects and miscarriage for the indicated population is unknown. All pregnancies have a background risk of birth defect, loss, or other adverse outcomes. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2 to 4% and 15 to 20%, respectively.

Clinical Considerations

Plasma cholinesterase levels are decreased by approximately 24% during pregnancy and for several days postpartum. Therefore, a higher proportion of patients may be expected to show increased sensitivity (prolonged apnea) to succinylcholine when pregnant than when nonpregnant.

Labor and Delivery

Succinylcholine is commonly used to provide muscle relaxation during delivery by caesarean section. While small amounts of succinylcholine are known to cross the placental barrier, under normal conditions the quantity of drug that enters fetal circulation after a single dose of 1 mg/kg to the mother should not endanger the fetus. However, since the amount of drug that crosses the placental barrier is dependent on the concentration gradient between the maternal and fetal circulations, residual neuromuscular blockade (apnea and flaccidity) may occur in the newborn after repeated high doses to, or in the presence of atypical plasma cholinesterase in, the mother.

Nursing Mothers

It is not known whether succinylcholine is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised following succinylcholine administration to a nursing woman.

Pediatric Use

Safety and effectiveness of succinylcholine chloride have been established in pediatric patient age groups, neonate to adolescent. There are rare reports of ventricular dysrhythmias and cardiac arrest secondary to acute rhabdomyolysis with hyperkalemia in apparently healthy pediatric patients who receive succinylcholine (see **BOX WARNING**). Many of these pediatric patients were subsequently found to have a skeletal muscle myopathy such as Duchenne's muscular dystrophy whose clinical signs were not obvious. The syndrome often presents as sudden cardiac arrest within minutes after the administration of succinylcholine. These pediatric patients are usually, but not exclusively, males, and most frequently 8 years of age or younger. There have also been reports in adolescents. There may be no signs or symptoms to alert the practitioner to which patients are at risk. A careful history and physical may identify developmental delays suggestive of a myopathy. A preoperative creatine kinase could identify some but not all patients at risk. Due to the abrupt onset of this syndrome, routine resuscitative measures are likely to be unsuccessful. Careful monitoring of the electrocardiogram may alert the practitioner to peaked T-waves (an early sign). Administration of intravenous calcium, bicarbonate, and glucose with insulin, with hyperventilation have resulted in successful resuscitation in some of the reported cases. Extraordinary and prolonged resuscitative efforts have been effective in some cases. In addition, in the presence of signs of malignant hyperthermia, appropriate treatment should be initiated concurrently (see **WARNINGS**). Since it is difficult to identify which

patients are at risk, it is recommended that the use of succinylcholine in pediatric patients should be reserved for emergency intubation or instances where immediate securing of the airway is necessary, e.g., laryngospasm, difficult airway, full stomach, or for intramuscular use when a suitable vein is inaccessible.

As in adults, the incidence of bradycardia in pediatric patients is higher following the second dose of succinylcholine. The incidence and severity of bradycardia is higher in pediatric patients than adults. Pre-treatment with anticholinergic agents, e.g., atropine, may reduce the occurrence of bradyarrhythmias.

Geriatric Use

Clinical studies of Succinylcholine Chloride Injection did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in responses between the elderly and younger patients.

In general, dose selection for an elderly patient should be cautious, usually starting at the low end of the dosing range, reflecting the greater frequency of decreased hepatic, renal, or cardiac function, and of concomitant disease or other drug therapy.

ADVERSE REACTIONS

Adverse reactions to succinylcholine consist primarily of an extension of its pharmacological actions. Succinylcholine causes profound muscle relaxation resulting in respiratory depression to the point of apnea; this effect may be prolonged. Hypersensitivity reactions, including anaphylaxis, may occur in rare instances. The following additional adverse reactions have been reported: cardiac arrest, malignant hyperthermia, arrhythmias, bradycardia, tachycardia, hypertension, hypotension, hyperkalemia, prolonged respiratory depression or apnea, increased intraocular pressure, muscle fasciculation, jaw rigidity, postoperative muscle pain, rhabdomyolysis with possible myoglobinuric acute renal failure, excessive salivation, and rash.

There have been post-marketing reports of severe allergic reactions (anaphylactic and anaphylactoid reactions) associated with use of neuromuscular blocking agents, including succinylcholine. These reactions, in some cases, have been life threatening and fatal. Because these reactions were reported voluntarily from a population of uncertain size, it is not possible to reliably estimate their frequency (see **WARNINGS** and **PRECAUTIONS**).

OVERDOSAGE

Overdosage with succinylcholine may result in neuromuscular block beyond the time needed for surgery and anesthesia. This may be manifested by skeletal muscle weakness, decreased respiratory reserve, low tidal volume, or apnea. The primary treatment is maintenance of a patent airway and respiratory support until recovery of normal respiration is assured. Depending on the dose and duration of succinylcholine administration, the characteristic depolarizing neuromuscular block (Phase I) may change to a block with characteristics superficially resembling a non-depolarizing block (Phase II) (see **PRECAUTIONS**).

DOSAGE AND ADMINISTRATION

The dosage of succinylcholine should be individualized and should always be determined by the clinician after careful assessment of the patient (see **WARNINGS**).

Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration whenever solution and container permit. Solutions which are not clear and colorless should not be used.

Succinylcholine is for intravenous or intramuscular use only.

Succinylcholine must be titrated to effect by or under supervision of experienced clinicians who are familiar with its actions and with appropriate neuromuscular monitoring techniques.

Succinylcholine should be administered only by those skilled in the management of artificial respiration and only when facilities are instantly available for tracheal intubation and for providing adequate ventilation of the patient, including the administration of oxygen under positive pressure and the elimination of CO2. The clinician must be prepared to assist or control respiration.

To avoid distress to the patient, do not administer Succinylcholine before unconsciousness has been induced (see **WARNINGS**).

The occurrence of bradyarrhythmias with administration of Succinylcholine may be reduced by pretreatment with anticholinergics (e.g., atropine) (see **WARNINGS**).

Monitor neuromuscular function with a peripheral nerve stimulator when using Succinylcholine by infusion (see **PRECAUTIONS**).

Succinylcholine supplied in single-dose vials must be diluted before use. Succinylcholine supplied in multiple-dose vials does not require dilution before use (see ***DOSAGE AND ADMINISTRATION***)

Risk of Medication Errors

Accidental administration of neuromuscular blocking agents may be fatal. Store Succinylcholine Chloride Injection with the cap and ferrule intact and in a manner that minimizes the possibility of selecting the wrong product.

Adults

For Short Surgical Procedures

The average dose required to produce neuromuscular blockade and to facilitate tracheal intubation is 0.6 mg/kg Succinylcholine Chloride Injection given intravenously. The optimum dose will vary among individuals and may be from 0.3 to 1.1 mg/kg for adults. Following administration of doses in this range, neuromuscular blockade develops in about 1 minute; maximum blockade may persist for about 2 minutes, after which recovery takes place within 4 to 6 minutes. However, very large doses may result in more prolonged blockade. A 5 to 10 mg test dose may be used to determine the sensitivity of the patient and the individual recovery time (see **PRECAUTIONS**).

For Long Surgical Procedures

The dose of succinylcholine administered by infusion depends upon the duration of the surgical procedure and the need for muscle relaxation. The average rate for an adult ranges between 2.5 and 4.3 mg per minute.

Solutions containing from 1 to 2 mg per mL succinylcholine have commonly been used for continuous infusion. The more dilute solution (1 mg per mL) is probably preferable from the standpoint of ease of control of the rate of administration of the drug and, hence, of relaxation. This intravenous solution containing 1 mg per mL may be administered at a rate of 0.5 mg (0.5 mL) to 10 mg (10 mL) per minute to obtain the required amount of relaxation. The amount required per minute will depend upon the individual response as well as the degree of relaxation required. Avoid overburdening the circulation with a large volume of fluid. It is recommended that neuromuscular function be carefully monitored with a peripheral nerve stimulator when using succinylcholine by infusion in order to avoid overdose, detect development of Phase II block, follow its rate of recovery, and assess the effects of reversing agents (see PRECAUTIONS).

Intermittent intravenous injections of succinylcholine may also be used to provide muscle relaxation for long procedures. An intravenous injection of 0.3 to 1.1 mg/kg may be given initially, followed, at appropriate intervals, by further injections of 0.04 to 0.07 mg/kg to maintain the degree of relaxation required.

Pediatrics

For emergency tracheal intubation or in instances where immediate securing of the airway is necessary, the intravenous dose of succinylcholine is 2 mg/kg for infants and small pediatric patients; for older pediatric patients and adolescents the dose is 1 mg/kg (see **BOX WARNING** and **PRECAUTIONS: Pediatric Use**). It is currently known that the effective dose of succinylcholine in pediatric patients may be higher than that predicted by body weight dosing alone. For example, the usual adult IV dose of 0.6 mg/kg is comparable to a dose of 2-3 mg/kg in neonates and infants to 6 months and 1-2 mg/kg in infants up to 2 years of age. This is thought to be due to the relatively large volume of distribution in the pediatric patient versus the adult patient.

Rarely, IV bolus administration of succinylcholine in infants and pediatric patients may result in malignant ventricular arrythmias and cardiac arrest secondary to acute rhabdomyolysis with hyperkalemia. In such situations, an underlying myopathy should be suspected.

Intravenous bolus administration of succinylcholine in infants or pediatric patients may result in profound bradycardia or, rarely, asystole. As in adults, the incidence of bradycardia in pediatric patients is higher following a second dose of succinylcholine. Whereas bradycardia is common in pediatric patients after an initial dose of 1.5 mg/kg, bradycardia is seen in adults only after repeated exposure.

The occurrence of bradyarrhythmias may be reduced by pretreatment with atropine (see **PRECAUTIONS: Pediatric Use).**

Intramuscular Use

If necessary, succinylcholine may be given intramuscularly to infants, older pediatric patients or adults when a suitable vein is inaccessible. A dose of up to 3 to 4 mg/kg may be given, but not more than 150 mg total dose should be administered by this route. The onset of effect of succinylcholine given intramuscularly is usually observed in about

2 to 3 minutes.

Compatibility and Admixtures

Succinylcholine is acidic (pH 3.5) and should not be mixed with alkaline solutions having a pH greater than 8.5 (e.g., barbiturate solutions). Admixtures containing 1 to 2 mg/mL may be prepared by adding 1 g Succinylcholine Chloride Injection to 1,000 or 500 mL sterile solution, such as 5% Dextrose Injection, USP or 0.9% Sodium Chloride Injection, USP. Admixtures of Succinylcholine Chloride Injection must be used within 24 hours after preparation. Aseptic techniques should be used to prepare the diluted product. Admixtures of Succinylcholine Chloride Injection should be prepared for single patient use only. The unused portion of diluted Succinylcholine Chloride Injection should be discarded.

To prevent needle-stick injuries, needles should not be recapped, purposely bent, or broken by hand.

HOW SUPPLIED

Succinylcholine Chloride Injection, USP is supplied as a clear, colorless solution in the following concentration and package:

NDC No.	Container	Size (mL)	mg/mL	mg (Total)	mOsmol/mL (calc.)
Multiple Dose 14789-104-05	Fliptop Vial	10	20	200 mg	0.338

Refrigeration of the undiluted agent will assure full potency until expiration date. All units carry a date of expiration.

The container closure is not made with natural rubber latex.

Store in refrigerator 2° to 8°C (36° to 46°F). The multi-dose vials are stable for up to 14 days at room temperature without significant loss of potency.

Manufactured in Germany for:
Nexus Pharmaceuticals, Inc.
Lincolnshire, IL 60069 USA

NEXUS
PHARMACEUTICALS

SCCPI01DER03

Revised 04/2023

Principal Display Panel - 20 mg Carton Label

Succinylcholine
Chloride Injection, USP

200 mg/10 mL (20 mg/mL)

WARNING: Paralyzing Agent.

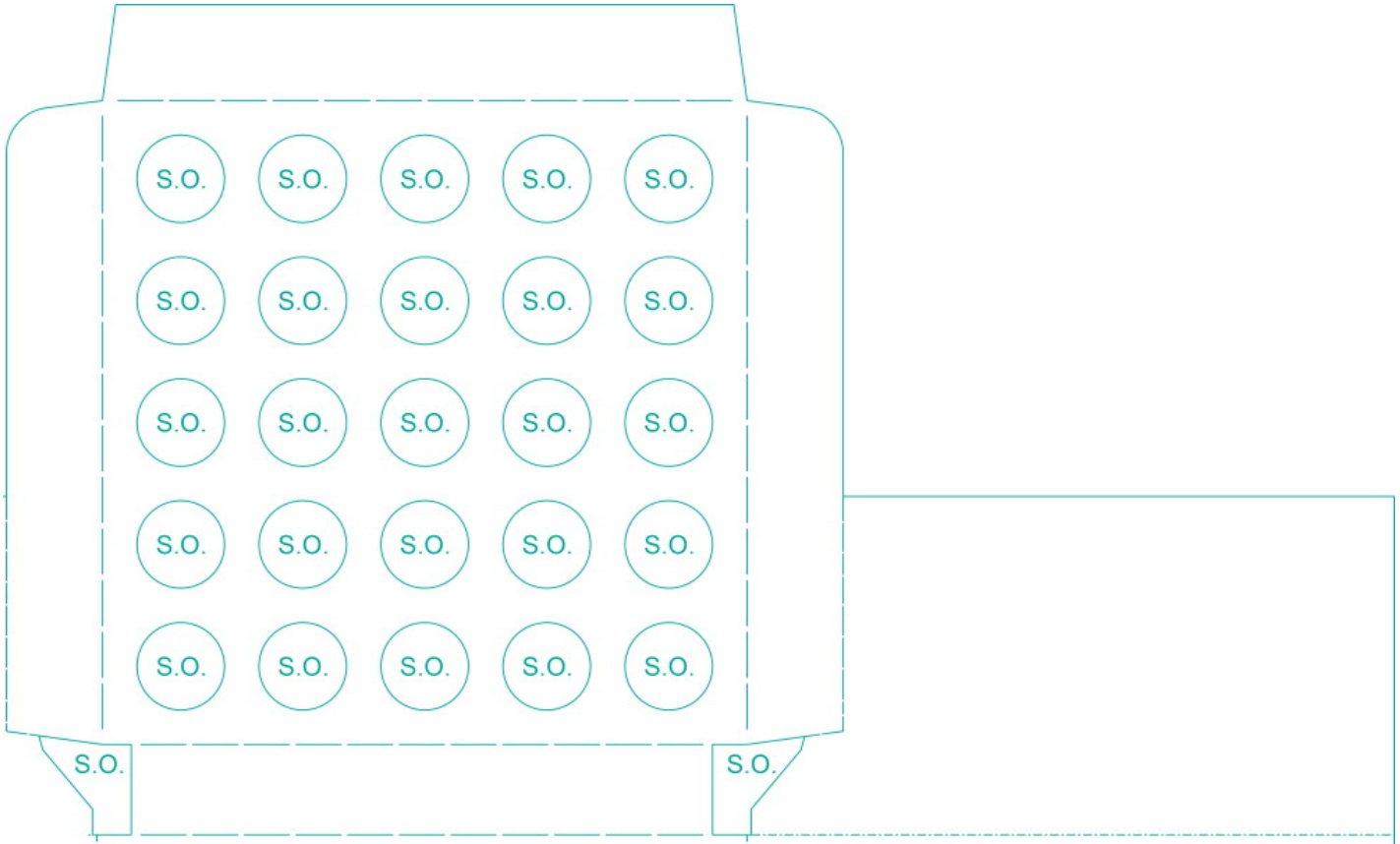
NDC 14789-104-05

25 x **10 mL** Multiple-Dose Vials

Rx Only

Store in refrigerator
2° to 8°C (36 to 46°F).

NEXUS
PHARMACEUTICALS



Succinylcholine Chloride Injection, USP

200 mg/10 mL (20 mg/mL)

WARNING: Paralyzing Agent.

NDC 14789-104-05

25 x **10 mL** Multiple-dose Vials

Rx Only

Store in refrigerator 2° to 8°C (36 to 46°F).

NEXUS PHARMACEUTICALS

USE ASEPTIC TECHNIQUE

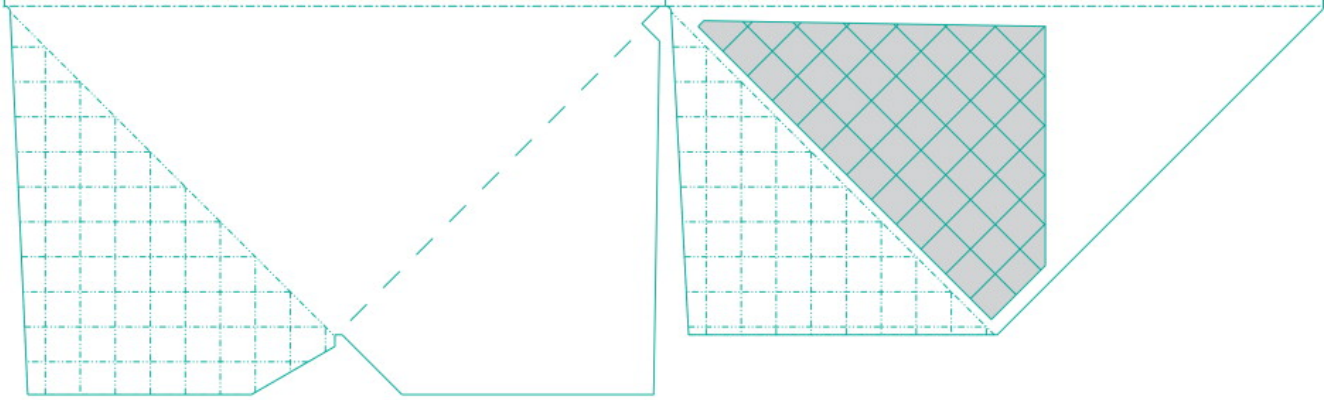
Remove cover from Fliptop vial and cleanse stopper with antiseptic.

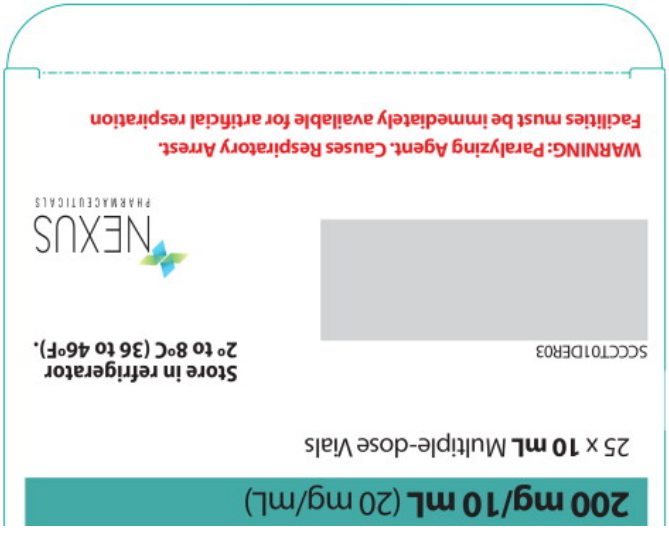
WARNING: Paralyzing Agent. Causes Respiratory Arrest. Facilities must be immediately available for artificial respiration.

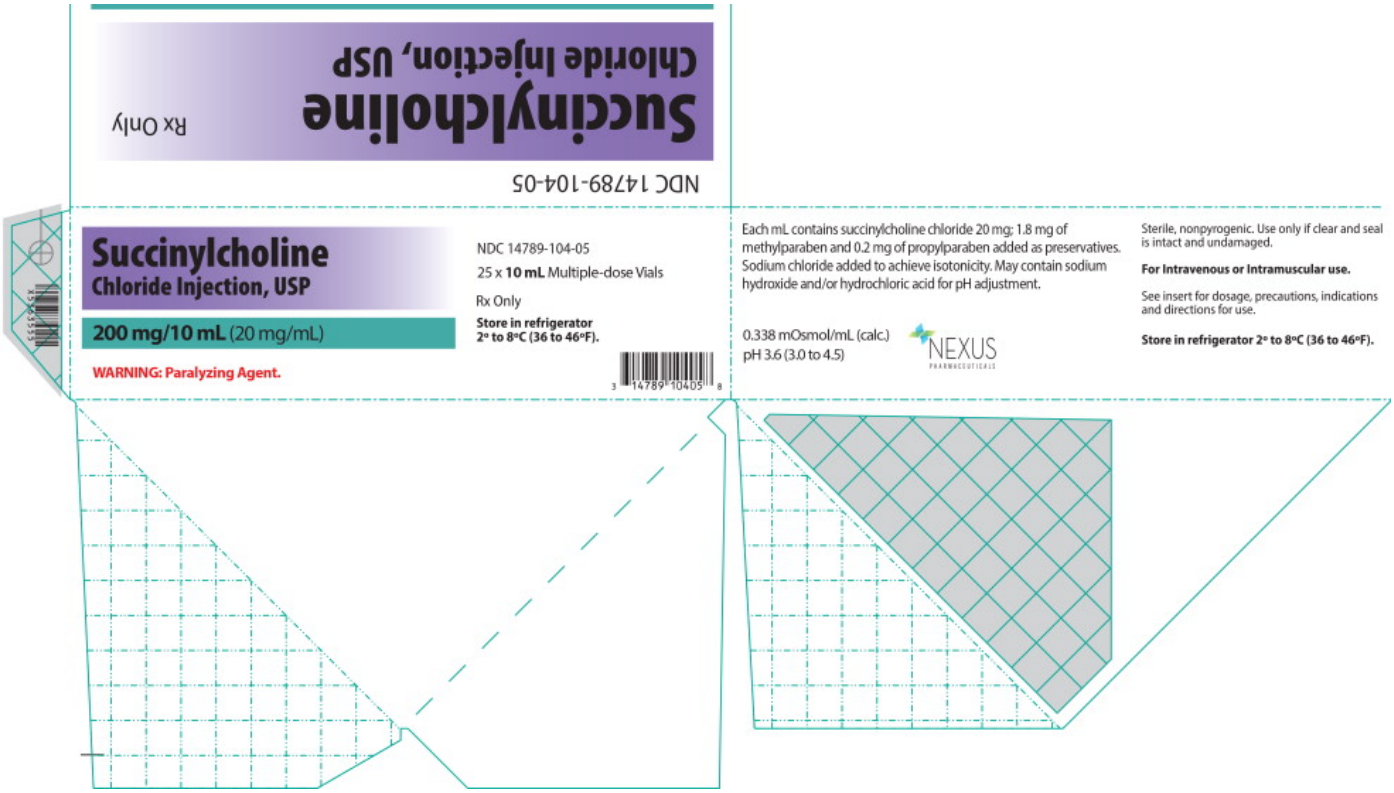
Store in refrigerator 2° to 8°C (36 to 46°F).

The container closure is not made with natural rubber latex.

Made in Germany
Distributed by:
Nexus Pharmaceuticals, Inc.
Lincolnshire, IL 60069







Principal Display Panel - 20 mg Vial Label

NDC 14789-104-07

10 mL Multiple-Dose Vial

Succinylcholine
Chloride Injection, USP

200 mg/10 mL (20 mg/mL)

WARNING: Paralyzing Agent

NEXUS
PHARMACEUTICALS

Manufactured in Germany for:
Nexus Pharmaceuticals, Inc.
Lincolnshire, IL 60069

Rx Only

For Intravenous or Intramuscular use.

Also contains 0.18% methylparaben and 0.02% propylparaben added as preservatives. Sterile, nonpyrogenic.

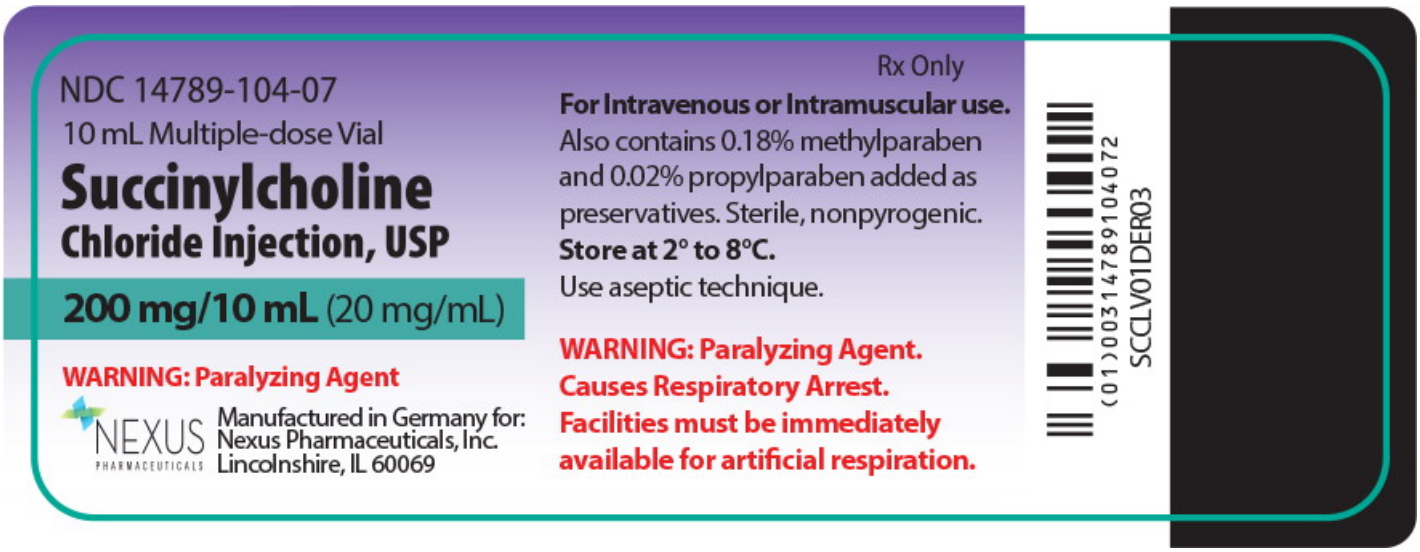
Store at 2° to 8°C.

Use aseptic technique.

WARNING: Paralyzing Agent.

Causes Respiratory Arrest.

Facilities must be immediately available for artificial respiration.



SUCCINYLCHOLINE CHLORIDE

succinylcholine chloride injection

Product Information			
Product Type	HUMAN PRESCRIPTION DRUG	**Item Code (Source)**	NDC:14789-104
Route of Administration	INTRAVENOUS, INTRAMUSCULAR		

Active Ingredient/Active Moiety		
Ingredient Name	**Basis of Strength**	**Strength**
Succinylcholine Chloride (UNII: I9L0DDD30I) (Succinylcholine - UNII:J2R869A8YF)	Succinylcholine Chloride	20 mg in 1 mL

Inactive Ingredients	
Ingredient Name	**Strength**
Methylparaben (UNII: A2I8C7HI9T)	1.8 mg in 1 mL
Propylparaben (UNII: Z8IX2SC1OH)	0.2 mg in 1 mL
Sodium Chloride (UNII: 451W47IQ8X)	
Sodium Hydroxide (UNII: 55X04QC32I)	
Hydrochloric Acid (UNII: QTT17582CB)	

Packaging				
#	**Item Code**	**Package Description**	**Marketing Start Date**	**Marketing End Date**
1	NDC:14789-104-05	25 in 1 TRAY	01/11/2021	

1	NDC:14789-104-07	10 mL in 1 VIAL, MULTI-DOSE; Type 0: Not a Combination Product		

Marketing Information

Marketing Category	Application Number or Monograph Citation	Marketing Start Date	Marketing End Date
ANDA	ANDA213552	01/11/2021	

Labeler - Nexus Pharmaceuticals Inc (620714787)

Establishment

Name	Address	ID/FEI	Business Operations
Nexus Pharmaceuticals Inc		620714787	ANALYSIS(14789-104)

Revised: 5/2023 Nexus Pharmaceuticals Inc