LESSON ASSIGNMENT

LESSON 3  Central Nervous System Drugs

LESSON ASSIGNMENT  Paragraphs 3-1 through 3-32

LESSON OBJECTIVES  Upon completion of this lesson, you should be able to discuss the actions, uses, untoward effects, administration, cautions, and contraindications for common sedative- hypnotics, antipsychotic tranquilizers, narcotic analgesics, nonaddictive analgesics, amphetamines, and naloxone.

SUGGESTION  After studying the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.
LESSON 3
CENTRAL NERVOUS SYSTEM DRUGS

Section I. THE CENTRAL NERVOUS SYSTEM

3-1. PARTS OF THE CENTRAL NERVOUS SYSTEM

The central nervous system (CNS) includes the brain and spinal cord. It is divided into the following levels based on anatomical position and function.

a. Cerebrum. The cerebrum consists of two hemispheres and contains the cerebral cortex, which is the site of consciousness, memory, sensation, some conditioned reflexes, and inhibition of certain reflexes. Nerve fibers extend to the lower portion of the brain and spinal cord. Transverse fibers connect the two hemispheres.

b. Midbrain (Mesencephalon). The midbrain carries pathways that connect the cerebrum and lower parts of the brain and the spinal cord. It also contains the thalamus and hypothalamus portion of the brain. Visual and audio reflexes are received here. Movement of the head and eyes in response to retinal stimuli originates here.

c. Pons. The pons is that part of the brain stem that is behind the midbrain and above the medulla oblongata. It carries various nerve pathways. The pons is connected with all portions of the brain.

d. Medulla Oblongata. The medulla is an oblongated portion at the base of the brain, which can be considered an upward continuation of the spinal cord. It contains the "vital centers"--the cardiac, vasomotor, and respiratory control centers--as well as controls for swallowing, vomiting, and coughing.

e. Cerebellum. The cerebellum, situated behind the brain stem (midbrain, pons, and medulla), is concerned with voluntary movements, although it plays no part in initiating them. Removal of the cerebellum would cause lack of muscular control, with shaky, jerky movements, and loss of equilibrium.

f. Spinal Cord. The spinal cord contains a central mass of gray matter surrounded by columns of white matter, which are bundles of nerve fibers. The cord serves as a reflex center and provides a series of ascending and descending pathways to and from the brain.

   (1) Ascending. The ascending pathways carry stimuli of conscious muscle sense, pain, heat, and cold.
(2) Descending. The descending pathways carry stimuli for voluntary and involuntary functions.

3-2. PHARMACOLOGIC CONSIDERATIONS OF THE CNS

The CNS is more sensitive to the action of drugs than any other system in the body. Drugs act on it either by stimulation or by depression. Stimulation may range from mild alertness to convulsions; depression may range from mild sedation to loss of consciousness. The parts of the CNS respond to the presence of drugs with specific action. When given in ordinary doses, drugs may affect only one specific portion of the CNS, but when they are given in larger doses, they may affect the entire system. The following are examples of this:

a. Caffeine given in small doses stimulates the psychic center; given in larger doses, it stimulates the respiratory center; and given in very large doses, it may induce convulsions.

b. Alcohol depresses the inhibitory centers in the cerebral cortex; large doses depress the medulla, causing a slowing of respiration, sometimes even to the point of death.

c. Anesthetics depress sensory and motor areas of the cortex and the reflex centers in the spinal cord. Given in large doses, they depress the respiratory center in the medulla.

d. Phenobarbital depresses sensory and motor areas of the cortex; large doses depress the respiratory center in the medulla.

e. Morphine gives relief from pain by acting primarily on sensory areas in the cerebral cortex. Given in large doses, it causes respiratory depression.

Section II. SEDATIVE-HYPNOTICS

3-3. EFFECTS OF SEDATIVE-HYPNOTICS

A hypnotic, also called a soporific or somnifacient, is an agent that induces sleep. A sedative is an agent that produces relaxation, lessens excitement, and slows motor activity. However, a drug that falls into one of these categories generally falls into the other also and is thus called a sedative-hypnotic. The effect of a sedative-hypnotic depends on the dose. A small dose produces sedation; a large dose produces sleep. However, because of differences in duration of action, some of these drugs are preferable for use as hypnotics and others as sedatives. The effects that sedative-hypnotics produce depend to some extent on the traits of the particular client, but we can still give a description of the effects generally to be expected. Sedative-hypnotics
are not useful as analgesics (pain-killers). The effect of a small dose is to produce sedation, a state of calmness in which the client tends to be less active and less responsive and possibly even sleepy. With a slightly greater dose, he tends to lose feelings of anxiety and inhibition, and lose some muscular coordination. His eyes may begin to move irregularly. If the dose is large enough, he will go to sleep. With a very large dose, he may enter a state similar to surgical anesthesia or die of respiratory depression. If large, but nonlethal doses are regularly given to a client for an extended period of time and then administration of the drug is discontinued, the client is likely to experience a withdrawal state in which he is hyperexcited and may even go into convulsions. Thus, sedative-hypnotics can cause physical dependence. There is a possibility of habituation (psychological dependence) with either small or large doses.

3-4. USES OF SEDATIVE-HYPNOTICS

a. Situational Anxiety. Anxiety is sometimes a normal response to a particular situation. If the situation is one in which a high level of physical or mental performance is necessary, a sedative-hypnotic may produce in the client a generalized feeling that he is performing well although his proficiency is, in fact, impaired. Nevertheless, there are situations in which sedative-hypnotics are valuable for reducing anxiety. One frequently recurring example is the use of a sedative-hypnotic to prepare a client for an unpleasant or painful medical or dental procedure.

b. Neurotic Anxiety. Neurotic anxiety is anxiety in which there is not an external situation sufficient to account for the dread and fear felt by the client. This anxiety is manifested in some clients as obsessive behavior, phobias (abnormal fears), depression, or excessive fatigability. Though sedative-hypnotics are useful in treating the symptoms of neurotic anxiety, they should never be used as a substitute for psychotherapy, where the client will not associate the administration of the drug too closely with relief of his anxiety, it is a good idea to use a longer-acting drug, such as phenobarbital, which does not have to be administered as frequently as some sedative-hypnotics. This helps reduce the likelihood of habituation, or psychological dependence.

c. Induction of Sleep. The pattern of a client’s insomnia is important to the physician in determining how it should be treated. If the client has trouble only in going to sleep, a rapidly acting hypnotic which lasts only for a short time is desirable. A client who has trouble only in staying asleep or who has trouble in both going to sleep and staying asleep may be given an intermediate-acting hypnotic, or he may be given a short-acting hypnotic with instructions to take a second dose upon awakening. The intermediate-acting hypnotic carries with it the possibility of a hangover the next morning. (Sedative-hypnotics cannot be expected to induce sleep in clients experiencing severe pain.)

d. Other Uses. Some drugs, such as epinephrine, and some maladies, such as hyperthyroidism, cause excitement or hyperactivity that can be reduced by the use of sedative-hypnotics. Sedative-hypnotics are sometimes desirable to reduce the activity
of a client; for example, a sedative-hypnotic may be used to make bed rest less frustrating. Sedative-hypnotics are sometimes used as muscle relaxants, anticonvulsants, and even general anesthetics.

3-5. SIDE EFFECTS

All of the sedative-hypnotics are capable of causing drowsiness, impaired judgment, and loss of coordination. These effects correspond to those of alcohol administered in amounts of comparable strength. In fact, alcohol and sedative-hypnotics have an additive effect in the body. The use of sedative-hypnotics, especially the long-acting ones, may be followed by a hangover, that is, a feeling of fatigue or grogginess. As previously mentioned, a withdrawal state may occur when a client is removed from a regimen of high doses given over an extended period. This withdrawal state corresponds to delirium tremens in alcoholics. It includes such symptoms as weakness, tremors, high blood pressure, fast breathing, fast pulse, and possibly convulsions, confusion, and hallucinations. Thus, it is possible to become physically dependent on sedative-hypnotics, as well as psychologically habituated to them. Tolerance to a nightly hypnotic dose does not usually develop to the point where increased doses are required. However, when these drugs are used continually as sedatives, tolerance may develop rapidly.

3-6. OVERDOSES OF SEDATIVE-HYPNOTICS

An intentional overdose of "sleeping pills" is frequently chosen as a means to commit suicide. When an individual ingests as little as eight times the hypnotic dose of a sedative-hypnotic, he may die of circulatory collapse or respiratory depression (slowing or cessation of breathing). However, if a client who has received even a very large overdose is given proper treatment soon after the overdose, he will probably not die. The lethal doses of the less potent sedative-hypnotics are so large that successful suicides are rare. The risk of death is greater if the person is under the influence of additional CNS depressants, such as alcohol.

3-7. SUMMARY OF INDIVIDUAL AGENTS

The use of barbiturates, a group of chemically related organic compounds, as sedative-hypnotics, began in 1903 with the introduction of barbital (Veronal). This was followed in 1912 by the introduction of phenobarbital (Luminal), still one of the most widely used CNS depressants. Today, out of about 50 barbiturates sold for clinical use, only about a dozen are widely used and a selected group of 5 or 6 is sufficient to meet the requirements of most prescribers. In addition, there are a number of nonbarbiturate sedative-hypnotics. These include the time-proven chloral hydrate and several newer drugs. (The nonbarbiturates discussed below are distinguishable from the barbiturates because the names of the barbiturates end with "-al.")
a. **Long-Acting Sedatives.** The long-acting sedatives have a duration of action of 6 to 8 hours. When used as hypnotics, they should induce a sleep of at least 4 to 6 hours, followed by a hangover.

   (1) **Phenobarbital (Luminal).** This drug is widely used as a sedative. In addition, it is used to induce sleep and to treat the symptoms of epilepsy, particularly grand mal epilepsy. Most other barbiturates are not effective in the treatment of epilepsy. This drug is less expensive than the other long-acting sedatives discussed here, but in comparable doses its therapeutic effectiveness is at least equivalent.

   (2) **Chlordiazepoxide hydrochloride (Librium).** A distinctive trait of chlordiazepoxide is the slowness with which it is excreted from the body; this gives it a longer duration of action than phenobarbital. Otherwise, its effects are similar to those of phenobarbital in comparable doses.

   (3) **Oxazepam (Serax).** This drug is very similar to chlordiazepoxide above.

   (4) **Flurazepam (Dalmane).** This drug is very similar to chlordiazepoxide.

b. **Intermediate-Acting Sedative-Hypnotics.** These drugs produce sedation for 4 to 6 hours. Like short-acting sedatives, these drugs have a greater potential for abuse than do the long-acting sedatives.

   (1) **Sodium amobarbital (Amytal Sodium).** This drug is typical of the intermediate-acting sedative-hypnotics. Doses may be varied to produce anything from mild sedation to preanesthetic hypnosis.

   (2) **Meprobamate (Equanil; Miltown).** This drug is nearly equivalent in its effects to amobarbital.

   (3) **Glutethimide (Doriden).** A few clients experience convulsions while using this drug. When used as a hypnotic, glutethimide may cause a hangover.

   (4) **Diazepam (Valium).** Though this drug is very similar chemically to chlordiazepoxide (Librium), its effect begins more quickly and its action is of shorter duration.

   (5) **Lorazepam (Ativan).** This drug is chemically similar to both diazepam and chlordiazepoxide. It has a short duration of action and onset of action.

c. **Short-Acting Hypnotics.** The short-acting sedative-hypnotics are used almost exclusively as hypnotics. Since the duration of action is only 2 to 4 hours, a client using one of these drugs as a sedative might become psychologically dependent on it because of the frequency with which his anxiety or discomfort is rapidly relieved by taking it. An advantage of these short-acting drugs as hypnotics is that after a full
night's sleep the client is likely to experience no hangover; the action of these drugs is completely exhausted after about 4 hours.

(1) **Chloral hydrate.** Sometimes, this old and very effective hypnotic is used as a sedative. However, it occasionally causes irritation of the stomach, and it should not be given to clients with serious heart, kidney, or liver disease.

(2) **Paraldehyde.** Paraldehyde is a very effective hypnotic, but it has an unpleasant taste and some of it is exhaled from the lungs of the client. This causes an odor more offensive to those dealing with the client than to the client himself. Since paraldehyde is infrequently used, care must be taken to avoid the use of deteriorated stock, which may be very acidic. Once opened, paraldehyde must be refrigerated.

(3) **Sodium pentobarbital (Nembutal).** Pentobarbital is the standard of the short-acting hypnotics.

(4) **Sodium secobarbital (Seconal Sodium).** Both sodium pentobarbital (above) and sodium secobarbital are effective short-acting hypnotics.

(5) **Triazolam (Halcion).** This drug is similar to chlordiazepoxide but has a short onset of action and short duration. Clients are less likely to experience hangover effects.

### 3-8. PHENOBARBITAL

a. **Action and Uses.** Phenobarbital is a long-acting barbiturate, requiring 30 to 60 minutes to become effective and acting over a period of 6 hours or more. The drug has many uses. It can be used as a sedative in times of mental stress or anxiety. It is often used in conditions such as hyperthyroidism, hypertension, peptic ulcer, and menopause. It is used as a hypnotic drug for insomnia and as an anticonvulsant in certain kinds of epilepsy.

b. **Administration.** The drug can be given orally, intramuscularly, or intravenously as indicated by the clinical situation. Unless there is specific indication for giving the drug parenterally, the oral route is preferred. The usual dose as a sedative is 16 to 32 mg. As a hypnotic, it is given in a dose of 100 mg. Dosage as an anticonvulsant varies with the needs of the client, but usually ranges from 16 mg to 64 mg.

c. **Untoward Effects.** Clients can become addicted to phenobarbital as they can to any potent sedative-hypnotic. This drug may exert a toxic effect upon the kidney, resulting in depressed kidney function. Overdosage may result in the typical symptoms of shock, respiratory complications (including respiratory failure), and kidney failure.
d. **Cautions and Contraindications.** Care must be taken not to give an overdose of the drug. The drug should not be used in clients with kidney disease.

e. **Supply.** Phenobarbital is supplied as 16-mg and 32-mg tablets; as a 1-ounce powder; as sodium phenobarbital injection in 2-ml ampules containing 162 mg per ml; and as a sterile powder in 125-mg ampules.

### 3-9. SODIUM SECOBARBITAL (SECONAL SODIUM)

a. **Action and Uses.** This drug is a short-acting barbiturate that becomes effective in 15 to 30 minutes and produces sleep lasting 2 to 4 hours. It is used in people who have difficulty in falling asleep, and as a preanesthetic agent.

b. **Administration.** The usual adult dose for treatment of insomnia is 100 mg given orally at bedtime. As a preanesthetic agent, 200 to 300 mg is given one to two hours before surgery.

c. **Cautions and Contraindications.** The drug should not be given to people who state they are allergic to it. Use of this drug may result in liver damage, since it is detoxified mainly by the liver. It should not be used on people with disorders of the liver.

d. **Supply.** The drug is supplied as 100-mg capsules.

### 3-10. SODIUM PENTOBARBITAL (NEMBUTAL)

a. **Action and Uses.** Since sodium pentobarbital and sodium secobarbital are both short-acting barbiturates, sodium pentobarbital has essentially the same actions and uses as sodium secobarbital, discussed above.

b. **Administration.** The usual hypnotic dose, oral or intravenous, is 100 mg.

c. **Cautions and Contraindications.** The cautions and contraindications are the same as with sodium secobarbital.

d. **Supply.** Sodium pentobarbital is supplied in 100-mg tablets and capsules. Sodium pentobarbital injection is supplied in 2-ml and 5-ml ampules containing 50 mg per ml.

### 3-11. DIAZEPAM (VALIUM)

a. **Action and Uses.** Diazepam is widely used as a daytime sedative. In addition, it has muscle relaxant properties and may be used to relieve muscle spasm (reflex spasm to muscle or joint inflammation or trauma), muscle spasticity (such as in cerebral palsy or paraplegia), athetosis, tetanus, and stiff-man syndrome. It can be used adjunctively in the treatment of convulsive disorders.
b. **Administration.** The usual oral dose is 2 to 10 mg, 2 to 4 times daily. The usual intramuscular or intravenous dose is 2 to 10 mg, repeated in 3-4 hours if necessary, but no more than 30 mg in an 8-hour period.

c. **Untoward Effects.** The untoward effects of diazepam are similar to those of other sedative-hypnotics. Skin rashes have also been reported.

d. **Supply.** Diazepam is supplied in 2 mg, 5 mg, and 10 mg tablets. Diazepam injection is supplied in 2 ml and 10 ml containers that contain 5 mg/ml.

---

**Section III. ANTIPSYCHOTIC TRANQUILIZERS AND RELATED ANTIDEPRESSANTS**

3-12. INTRODUCTION

The tranquilizers discussed in this section apparently stimulate the higher areas of the CNS to depress the lower areas and thus produce a tranquilizing effect. Sedatives, which are often called "tranquilizers" and which we discussed in the previous section, directly depress the CNS. To distinguish the type of tranquilizer discussed here from sedatives, we use the term antipsychotic tranquilizer or phenothiazine-type tranquilizer. These tranquilizers are used primarily in the treatment of psychoses, severe mental disorders. The sedative-hypnotics discussed previously are used to combat anxiety, but they are of little use in psychoses.

3-13. EFFECTS OF ANTIPSYCHOTIC TRANQUILIZERS

a. Unlike the sedative-hypnotics, some of the antipsychotic tranquilizers can cause convulsions when given in large doses. This is characteristic of CNS stimulants. However, in normal doses, these drugs produce a type of sedation in which the client is apathetic and unemotional but never as sedated as in anesthesia. Thus, an actively disturbed client would require less restraint after having received an antipsychotic tranquilizer. It is true, however, that a highly excited client might become a different type of problem upon receiving one of these drugs--that is, an immobile, inactive person. Nevertheless, these drugs are very useful. In addition to their use with actively disturbed clients, they can affect the thinking of unexcited schizophrenics as well.

b. Side effects of the synthetic antipsychotic tranquilizers (except reserpine) include dryness of the mouth, dilated eyes, lessening of near vision, constipation, and a fast pulse rate. The main group of antipsychotic tranquilizers, the phenothiazines, tend to cause a fall in body temperature except in the extremities; they dilate the blood vessels, which may produce hypotension or postural hypotension (low blood pressure which occurs when the client sits up or stands up). Some endocrine effects, such as a change in the menstrual cycle or lactation, may result.
c. The antipsychotic tranquilizers are neither habituating nor do they cause physical dependence. However, the sedative effects for a given dose decrease with prolonged use. That is, tolerance to the sedative effects (but not to the antipsychotic effects) develops rapidly. All in all, the experience of taking an antipsychotic tranquilizer is usually unpleasant to the client, since it makes him feel listless and easily fatigued.

3-14. TOXICITY CAUSED BY LARGE DOSES

In addition to the unpleasant side effects already discussed, there are other side effects that may result from the large doses of phenothiazine-type drugs ordinarily used. These include parkinsonism in which the muscles become rigid and there may be fine tremors. The degree of muscle rigidity may vary from impairment of facial expression to complete immobility of the body. Other effects may include dystonia (in which muscle tonicity is disordered) and akathisia (a feeling of restlessness). These effects -- parkinsonism, dystonia, and akathisia--are collectively called extrapyramidal effects. Other possible adverse effects of these drugs are dizziness, slate-colored pigmentation of the body and impaired vision (rarely). Allergic reactions to particular drugs may occur; for example, jaundice may result from the use of chlorpromazine.

3-15. THERAPEUTIC USES

The phenothiazine-type drugs are useful in controlling excited activity and hostile behavior in psychotic clients. In addition to sedation, these drugs produce other beneficial changes in the behavior of psychotics, including non-excited schizophrenics. Clinical records seem to indicate that schizophrenic clients tend to have a shorter stay in mental hospitals when they are given phenothiazine-type tranquilizers. These drugs are also useful in treating severe depression.

3-16. CHLORPROMAZINE HYDROCHLORIDE

a. Action and Uses. Chlorpromazine hydrochloride (Thorazine) acts to depress the central nervous system and to relieve the symptoms of nausea and vomiting. It is used to relieve anxiety, tension, and hyperactivity in psychotic and psychoneurotic clients. It is used to treat nausea and vomiting associated with recovery from an anesthetic, the action of certain drugs, radiation therapy, nitrogen mustard therapy, acute infections, cancer, and uremia. Also, it is used to relieve hiccups.

b. Administration. The drug may be given orally, intramuscularly, or intravenously. The usual oral dose is 25 to 100 mg. The usual parenteral dose for mild nausea and vomiting is 25 mg daily, given intramuscularly. For the severely disturbed manic client, dosage is much higher, up to 400 mg daily. Because this drug is irritating to tissue, it should be injected slowly, deep into the muscle. It is not to be given subcutaneously. The site should be massaged to help reduce local irritation.
c. **Untoward Effects.** Sedation and drowsiness are untoward effects in some instances, but in others they are the effects desired. Other side effects are dryness of the mouth, skin rash, sensitivity to light, nausea and vomiting, and nasal stuffiness. Low blood pressure may result, especially when the drug is given intravenously. Therefore, the client should remain in bed for an hour or two following parenteral administration. As a rule, these effects do not require that administration of the drug be stopped. Untoward effects that do require immediate stopping of the drug are the development of extrapyramidal effects (tremulousness, drooling, muscular rigidity, blank facial expression, and peculiar, stiff-legged gait), as well as jaundice, fever, sore throat, leukopenia (too few white blood cells), and anemia.

d. **Cautions and Contraindications.** The drug is not to be given to a comatose client. It should be used with caution when given with drugs that it potentiates (such as ethyl alcohol, morphine, and phenobarbital). Caution in its use should also be observed for clients in whom a sudden drop in blood pressure is considered dangerous. The drug should not be used on people who have liver disease.

e. **Supply.** Chlorpromazine hydrochloride is supplied in 25-mg, 50-mg, and 100-mg tablets; in 150-mg capsules; in 4-fl oz (118-ml) bottles of concentrated, flavored solution containing 30 mg per ml; and as a solution for injection containing 25 mg per ml in 2-ml ampules.

### 3-17. **SUMMARY OF RELATED AGENTS**

a. The following are phenothiazines with effects very similar to chlorpromazine:

   (1) *Promazine hydrochloride* (Sparine Hydrochloride). The therapeutic effects of promazine hydrochloride seem to be identical to those of chlorpromazine hydrochloride, but the toxic effects are apparently less. However, the same degree of caution should be used.

   (2) *Thioridazine hydrochloride* (Mellaril). This drug produces the same effects as chlorpromazine hydrochloride, except it does not have an antiemetic effect and it does not produce extrapyramidal effects (parkinsonism, dystonia, and akathisia) in ordinary doses.

b. The drugs listed here tend to have more pronounced extrapyramidal and antiemetic effects than other antipsychotic tranquilizers.

   (1) *Trifluoperazine hydrochloride* (Stelazine Hydrochloride).

   (2) *Perphenazine* (Trilafon).

   (3) *Haloperidol* (Haldol).
c. Promethazine hydrochloride (Phenergan), discussed elsewhere with the antihistamines, has antihistaminic and highly sedative properties, which are sometimes employed to enhance the action of analgesics given concurrently. It may be used for sedation both before and after an operation.

d. The following two mildly sedative drugs are used mainly on senile clients. They are used to relieve headaches and muscle spasms and in conjunction with other drugs to treat arthritis and angina pectoris.

   (1) Hydroxyzine hydrochloride (Atarax).

   (2) Hydroxyzine pamoate (Vistaril).

e. In addition to their use as antipsychotic tranquilizers, the following drugs are also used as antiemetics to control mild or severe nausea and vomiting:

   (1) Prochlorperazine maleate (Compazine). The antiemetic effects of this drug are equal to those of a dose of chlorpromazine five times as large. The side effects are generally mild; extrapyramidal symptoms may occur, but they can usually be relieved by reduction of the dose, concurrent administration of an antiparkinsonism drug, or temporary withdrawal of the drug. Prochlorperazine edisylate (Compazine Ethanedisulfonate) can be injected IM, as well as given orally. Prochlorperazine (Compazine) suppositories are given rectally.

   (2) Thiethylperazine maleate (Torecan). This weakly tranquilizing agent is used to treat nausea and vomiting.

f. Trimeprazine tartrate (Temaril) has both antipruritic and tranquilizing properties. An antipruritic is a drug that relieves or prevents itching.

3-18. RELATED ANTIDEPRESSANTS

The drugs listed below are pharmacologically similar to the group of antipsychotic tranquilizers called phenothiazines, but they are used in less potent doses to improve the state of mind of severely depressed clients. The side effects, also similar, may include dry mouth, constipation, weakened bladder, blurred vision, and increased pressure within the eye. Allergies may be revealed by symptoms such as skin rash and itching. Orthostatic hypotension (postural hypotension), low blood pressure when the client sits up or stands up, may occur. The client may feel weak and drowsy. Doses of these drugs, at first smaller than ordinary, are gradually built up until therapeutic effects are observed or the maximum dose is reached. Usually, it takes 1-3 weeks to observe any improvement in a severely depressed client. Therapy may continue as long as 3 months, after which the drug should be gradually withdrawn. These drugs probably do not cause physical dependence.
a. Amitriptyline Hydrochloride (Elavil Hydrochloride). This drug can be given at bedtime since it has a significant sedative effect.

b. Imipramine Hydrochloride (Tofranil).

c. Desipramine Hydrochloride (Norpramin; Pertofrane).

d. Nortriptyline Hydrochloride (Aventyl).

Section IV. NARCOTIC ANALGESICS

3-19. EFFECTS OF NARCOTIC ANALGESICS

Morphine is the standard of comparison for all addictive, or narcotic, analgesics (painkillers). Morphine is an ingredient of opium, which in its crude state is a sticky brown gum from a particular type of poppy. Though addiction to morphine and its derivatives, particularly to illegal heroin, is a serious social problem, morphine and its derivatives are essential to the practice of medicine. Heroin, however, is not used for therapeutic applications.

a. Analgesia. The first reactions to morphine are muscle relaxation and perhaps euphoria, a general feeling of well being. The pain-killing effects of morphine are of three different types. The first of these is an indifference to perceived pain. Though the client is aware of a pain, he does not react with fright, anxiety, or action. This effect has been compared to a temporary prefrontal lobotomy. The second source of relief is an actual reduction of perceived pain. Morphine does this by raising the "threshold" to pain stimuli so that a stimulus must be of greater intensity to be perceived. Thus, morphine is more effective against continuous pains than against intermittently sharp pains (which are occasionally great enough to get past the threshold raised by the morphine). Third, if the morphine is in a large enough dose, the client will become lethargic and perhaps go to sleep.

b. Respiratory Depression. Morphine slows the rate of breathing. In the case of an overdose, breathing may cease altogether, with death soon following.

c. Nausea. Soon after the drug is administered, the client may experience nausea. Morphine stimulates the vomiting center during its onset of action and thereafter depresses it. If the client vomits, he usually does so without great emotion or discomfort.

d. Antitussive Action. Morphine depresses the cough reflex.
e. **Postural Hypotension.** When the client sits up or stands up, he may experience the effects of low blood pressure. That is, he may become dizzy and even faint. This is called postural hypotension or orthostatic hypotension.

f. **Constipation.** Since morphine has a constipating effect, paregoric, which contains opium, is used to treat diarrhea.

g. **Miosis.** Morphine causes the pupils to contract.

### 3-20. TOLERANCE, ADDICTION, AND HABITUATION

a. Tolerance is the condition which develops after the continued use of a drug and which requires the use of progressively larger doses of the drug to achieve the same effect. Tolerance does not occur with all drugs, but it does occur with narcotic analgesics. Tolerance is not the same as addiction.

b. Addiction (physical dependence) occurs when a drug must be present in the body to maintain physiological balance. If administration of the drug stops, the individual experiences a withdrawal state. A withdrawal state is characterized by excitement, anxiety, nasal discharge, sweating, and goose-flesh, and -- in the case of severe withdrawal state -- pain in the muscles, joints, abdomen, fever, and even convulsions. Normally, this severe degree of withdrawal is seen only in addicts who have been unable to make a "connection" or who have been put in prison. In a controlled situation, when the client has been receiving narcotics for valid medical reasons, withdrawal is usually mild, and the client usually does not even realize the source of his discomfort. (Once an addict has endured the withdrawal state, however, he is still not free from his compulsion to use narcotics. In fact, the typical addict lives a life in which he repeatedly withdraws and returns to the use of narcotics.)

c. Habituation is a psychological dependence on drugs. We have seen how individuals may become habituated to the use of sedatives because they mentally associate relief from anxiety with the administration of the sedative. When the addict injects heroin, he experiences a pleasurable "rush." The addict, even after withdrawal, may be convinced that the use of heroin is essential to a feeling of well being, that without it he is unable to cope with his life and environment. (The addict typically has serious anxieties related to pain, sexuality, and feelings of aggression.) These factors may cause the addict to remain psychologically dependent on, that is, habituated to, narcotics even when he is no longer physically dependent on them.

### 3-21. CAUTIONS FOR THE USE OF NARCOTIC ANALGESICS

a. One of the main contraindications for the use of narcotic analgesics is a client's lack of sufficient respiratory reserve to withstand the respiratory depressions caused by narcotic analgesics. This is especially true of clients with emphysema, kyphoscoliosis (in which the spine is curved backwards or to the side), cor pulmonale (heart disease secondary to lung disease), and sometimes extreme obesity.
b. Extreme caution should be used when treating clients who have asthma, impaired liver function, or a low volume of blood.

c. It is generally unwise to treat migraine or arthritis with narcotic analgesics since these maladies are chronic and thus increase the possibility of addiction. However, narcotic analgesics are useful in relieving the pains of terminal cancer, but they should be used in doses as small as practicable with as long a delay as possible between doses. This extends the period over which the drug is effective.

3-22. MORPHINE

a. Action and Uses. Morphine, which is the most potent of the drugs derived from opium, is a powerful central nervous system depressant, having a selective action on respiration and pain sensation. These functions are greatly reduced by amounts of morphine that have only moderate effect upon general consciousness. The drug exerts a narcotic action manifested by analgesia, drowsiness, changes in mood, and mental clouding. The relief of pain following administration of morphine is often accompanied by euphoria. The combined properties of pain relief and euphoria make morphine a useful drug for relieving severe heart pain. Morphine also exerts an antidiarrheal action, but it is not used in the treatment of diarrhea. The opiate used for this purpose is paregoric.

b. Indications for Morphine. Only when simple measures fail and severe pain continues, or when a severely injured person must be moved quickly (as from a wrecked vehicle or aircraft) or in the event of a heart attack, is it wise to give morphine at once. However, if the use of morphine is indicated, it should be given without hesitation. Its ability to stop pain may be lifesaving. Severe pain can increase the severity of shock, and shock is deadly.

c. Administration. The drug is most often given parenterally. The usual dose for adults is 10 mg, 4 to 6 times a day as necessary. The dose given, route of administration, and the time should be entered on the client's record immediately after the drug is given.

d. Untoward Effects. Whenever morphine is administered, a number of toxic effects may occur, the most severe and dangerous of which is depression of respiration. This reaction is especially likely in people with asthma and other chronic bronchial conditions. Naloxone hydrochloride (Narcan), discussed later in this section, may be given as directed for the treatment of depressed respiration. Other reactions include vomiting (which results from the stimulation of the vomiting center in the brain), dryness of the mouth, constipation, urinary retention, and possibly physical dependence upon the drug.

e. Morphine Poisoning. Acute morphine poisoning results from an over dosage of the drug. A delayed type of morphine poisoning may occur from the intramuscular injection of the drug into chilled skin areas, burned clients, or into clients
with low blood pressure and shock. In such clients, the drug is incompletely absorbed or its absorption is delayed; therefore, the client may continue to complain of pain, and an additional dose may be given. When the circulation is improved, an excessive amount of morphine may suddenly be absorbed.

(1) **Symptoms.** When coma, depressed respiration, and pinpoint pupils appear concurrently in a client who has been given morphine, it is likely that he has morphine poisoning. The client is usually asleep or stuporous; he may be in a profound coma if the overdose is large. The respiratory rate is very low, sometimes only 2 to 4 per minute, and the client may be cyanotic. The blood pressure is normal at first, then falls progressively. The pupils are pinpoint in size, unless oxygen depletion is severe; in that case, they will be dilated. Urine formation is depressed; body temperature falls; and the skin becomes cold and clammy. The skeletal muscles are lax and soft, the jaw is relaxed, and the tongue may fall back and block the airway.

(2) **Treatment.** The prompt restoration of normal respiration is of first importance, since death in morphine poisoning is nearly always because respiratory failure. The client's airway must be kept open, and artificial respiration is too slow to provide adequate oxygenation. Naloxone may be given as directed to treat the respiratory depression. Cold towels may be used to keep the client awake. If the client has taken the morphine orally, he may be treated with emetics and gastric lavage. A careful record of the client's intake and output should be made, because overdosage of morphine may damage the kidneys and cause suppression of urine. After the danger has passed, a laxative may be indicated to relieve constipation.

**f. Cautions and Contraindications.** There are a number of contraindications to the use of morphine, as follows:

(1) **Abdominal pain.** A person's life may depend upon the correct diagnosis of abdominal disease, and pain is an important symptom. Relief of pain causes the true picture of the symptoms to become blurred. A diagnosis made on this basis may not be accurate. Therefore, morphine should not be given for any undiagnosed abdominal condition.

(2) **Injuries of the head.** Morphine is contraindicated because it distorts the symptom picture and interferes with diagnosis. Morphine also causes an increase in intracranial pressure.

(3) **Chest injuries or depressed respiration.** Morphine should not be given to anyone with a chest injury, or whose respiratory rate is under 12 per minute. In such a case, the drug would cause further respiratory depression, and this might be fatal.

(4) **Unconsciousness.** Morphine is contraindicated when the person is unconscious.
(5) A prior dose of morphine. A dose of morphine never should be repeated within 2 hours. It should not be repeated at all, unless necessary to control pain. It should not be repeated if there is any reason to believe that the first dose has not been absorbed. Sometimes when a client is in shock, his circulation is so poor that injected drugs are not absorbed. If a dose of morphine is repeated in such a case, both injections will be absorbed at once when circulation is restored, and morphine poisoning will result.

(6) Pending surgery. If there is a possibility that the client may soon be operated on, morphine should not be given, unless ordered by a medical officer. Morphine and surgical anesthesia both act to depress the respiration.

(7) Sedative. Morphine should not be used as a sedative in the treatment of anxiety, fear, or hysteria.

(8) Walking wounded. Morphine should not be given in the field to walking wounded. The drug will cause some to become confused and nauseated, and will increase disability in other ways.

(9) Shock. Morphine should not be used in shock, unless severe pain is present and is retarding the effect of shock treatment. If morphine is ordered for a client in shock, it should be given intravenously (by a medical officer) rather than intramuscularly.

(10) Liver disease. Morphine should not be given to persons with hepatic (liver) disease or infection.

g. Supply. Morphine injection is supplied in sterile cartridge-needle units containing 8, 10, and 15 mg of the drug. This form of issue should be protected from freezing, and in addition, the date on the package should be checked, since this drug is subject to deterioration in 24 months or less. Available for field use is a collapsible tube with needle attached (syrette), containing 16 mg of the drug (figure 3-1).
3-23. **CODEINE**

a. **Action and Uses.** Codeine, also derived from opium, exerts a narcotic action similar to that of morphine, though far less potent. When codeine is given concurrently with aspirin, its analgesic effect is greatly enhanced. Besides its analgesic activity, codeine has a selective action on the cough center and is often used as an antitussive, especially for the relief of nonproductive coughs.

b. **Administration.** For analgesia, codeine is given in a dose of 30 to 60 mg orally every 4 to 6 hours. As an antitussive, it is used in a dose of 15 to 30 mg orally every 4 to 6 hours.

c. **Untoward Effects.** Toxic reactions that occur with the use of codeine and with over dosage of codeine are the same as those that occur with morphine, but they are less severe. The treatment of such reactions is as described for the treatment of morphine poisoning.

d. **Cautions and Contraindications.** Codeine is an addicting drug, though it is less addicting than morphine. The same cautions and contraindications should be observed as those observed with the use of morphine.

e. **Supply.** Both codeine phosphate and codeine sulfate are supplied in injection and solution forms. Further, codeine is marketed in combination with aspirin as Empirin with Codeine #2, #3, and #4. Codeine is also combined with Tylenol in the products Tylenol with Codeine #1, #2, #3, and #4.

3-24. **MEPERIDINE HYDROCHLORIDE**

a. **Action and Uses.** Meperidine (Demerol) is a synthetic narcotic analgesic drug. Its analgesic properties are excellent, but it is not useful for the treatment of cough. It has a shorter duration of action than morphine, and this feature makes it preferable to morphine in certain clinical situations. These include certain diagnostic procedures, such as cystoscopy, retrograde pyelography, and gastroscopy. In addition, meperidine may be used as a preanesthetic medication, and in obstetrical analgesia. It is generally not used as an antidiarrheal or antitussive.

b. **Administration.** The usual dose of meperidine is 50 to 100 mg, given orally or by intramuscular injection, 4 to 6 times daily.

c. **Untoward Effects.** Some untoward effects that may occur after therapeutic doses of meperidine include dizziness, sweating, flushing of the skin, dryness of the mouth, constipation, and nausea and vomiting. Over dosage with this drug may result in severe respiratory depression and coma, or it may produce tremors and convulsions; the treatment is that described for treatment of over dosage with morphine.
d. **Cautions and Contraindications.** This drug is addicting and should be used with the same caution that is necessary with the opiates. The contraindications to the use of the drug are the same as those for morphine.

e. **Supply.** Meperidine hydrochloride is supplied as 50-mg tablets, in 30-ml vials containing 50 mg per ml, and in cartridge-needle units in a size of 1 or 2 ml, both sizes containing only 1 ml of solution. The strength of the solutions in either size may be 50 mg, 75 mg, or 100 mg per ml. The use of the cartridge-needle units requires the precautions cited previously. The period of potency of the drug in these units is 24 months.

### 3-25. PROPOXYPHENE HYDROCHLORIDE

a. **Action and Uses.** Propoxyphene (Darvon) is chemically and pharmacologically related to a narcotic called methadone. It possesses analgesic properties, but not anti-inflammatory or antipyretic effects. It is indicated for mild to moderate pain, but its superiority to aspirin for relief of pain is questionable.

b. **Usual Dosage.** The usual dosage is 65 mg, 3 to 4 times daily as needed for pain.

c. **Cautions and Warnings.**

(1) This preparation may impair the mental and/or physical abilities required to drive a car or operate machinery, especially during the first few days of therapy.

(2) This drug should be used cautiously in pregnant women and children due to the fact that adequate data on safety with these clients is lacking.

(3) Clients who receive this product for long periods of time may develop physical dependence, psychological dependence, and tolerance.

(4) Clients who have received other narcotic drugs for long periods of time may have developed physical dependence, and the sudden substitution of propoxyphene may cause acute withdrawal symptoms, because of the fact that propoxyphene will not support dependence upon other narcotics.

d. **Adverse Reactions.**

(1) Nausea, vomiting, sedation, dizziness, constipation, and skin rash are the more common adverse reactions.

(2) Development of morphine-type drug dependence has been reported.
(3) Excessive doses may cause confusion, muscle fasciculations, respiratory depression, coma, or convulsions.

(4) Euphoria may occur.

e. **Treatment of Overdosage.** Naloxone hydrochloride (Narcan), discussed later, is the specific antidote for propoxyphene.

f. **Supply.** This drug is supplied in 32 and 65 mg (Darvon) capsules and in propoxyphene hydrochloride, aspirin, and caffeine (Darvon Compound) capsules, which contain 389 mg of aspirin, 32 mg of propoxyphene hydrochloride, and 32.4 mg of caffeine.

### 3-26. NALOXONE HYDROCHLORIDE INJECTION--NARCOTIC ANTAGONIST

a. **Action and Uses.** Naloxone (Narcan) is a nonagonist or complete antagonist which will reverse most of the effects of narcotics, including respiratory depression, without the risk of producing agonistic or morphine effects of its own. It is indicated for the complete or partial reversal of narcotic depression, including respiratory depression, induced by:

   (1) Natural and synthetic narcotics.

   (2) The narcotic-antagonist analgesic, pentazocine (Talwin).

   (3) Propoxyphene (Darvon).

**NOTE:** Naloxone may also be used for the diagnosis of suspected acute opiate overdose.

b. **Administration.** In an emergency, Naloxone should be administered intravenously at a dosage of 0.01 mg/kg of body weight (about 0.8 mg) for an adult. The onset of action of naloxone IV is within 2 to 3 minutes. This dose may be repeated once or twice at 5-minute intervals. This drug may also be administered IM or SC. Failure to obtain significant improvement after 2 or 3 doses suggests that the condition may be due partly or completely to other disease processes or non-narcotic drugs. (In the newborn, naloxone in 10 to 15 mcg/kg doses may be injected directly into the umbilical vein, if the newborn shows evidence of narcotic-induced respiratory depression.)

c. **Cautions and Warnings.**

   (1) In addition to naloxone, other resuscitative measures such as maintenance of a free airway, artificial ventilation, cardiac massage, and vasopressor agents should be employed when necessary to counteract acute narcotic poisoning.
(2) Naloxone may precipitate acute withdrawal symptoms in clients physically dependent on narcotics.

(3) Repeated doses of naloxone may be necessary since the duration of action of some narcotics (that is, methadone) may exceed that of naloxone.

(4) Naloxone is not effective against respiratory depressions that is, to nonnarcotic drugs.

(5) Naloxone will not produce tolerance nor cause physical or psychological dependence.

d. Supply. Naloxone is available in 1-ml ampules containing 0.4 mg of naloxone hydrochloride.

Section V. NONADDICTIVE ANALGESICS AND ANTIPYRETICS

3-27. INTRODUCTION

a. Analgesics. An analgesic is a drug that relieves pain without causing a loss of consciousness; nonaddictive analgesics raise the threshold to pain stimuli. The threshold is the degree of intensity a stimulus must have in order to be perceived. (A local anesthetic is not considered an analgesic; it works by preventing the conduction of nerve impulses, which would be perceived as pain by the CNS. A general anesthetic is not an analgesic; it works by stopping consciousness.) Some analgesics relieve only specific types of pain, for example, integumental pain, characterized by its sharp, piercing quality, or visceral pain, which is dull, burning, and aching, and tends to depress the person.

b. Antipyretics. An antipyretic is an agent that is capable of lowering abnormally high body temperatures. That is, antipyretics are useful in relieving fever. They do not greatly affect the body temperature when it is already normal. Most of the nonaddictive analgesics have antipyretic effects.

c. Anti-inflammatory Agents. Many of the nonaddictive analgesics also have anti-inflammatory effects. That is, they reduce inflammation occurring in such maladies as rheumatoid arthritis and rheumatic fever.

3-28. ASPIRIN

A common name for aspirin is ASA (acetylsalicylic acid).

a. Action and Uses. Aspirin is the drug of choice when a mild analgesic is needed. It is useful in treating headache, neuralgia (paroxysmal pain, extending along
the course of a nerve or nerves), myalgia (muscle pain), arthralgia (joint pain), and other pains arising from integumental structures. It is also useful in relieving the discomfort of dysmenorrhea (painful menstruation), sore throat, toothache, and influenza. It is an effective anti-inflammatory agent for acute rheumatic fever, rheumatoid arthritis, and degenerative joint disease. It is an effective antipyretic agent. Uricosuric effects (excretion of uric acid) may be achieved with daily doses of 5-6 grams.

b. **Usual Dosage.** The usual adult oral dose is 0.3-1.0 gm, 4-6 times a day, as necessary.

c. **Adverse Effects.** Irritation of the gastric mucosa is common. Peptic ulceration, blood loss sufficient to cause iron-deficiency anemia, and massive gastrointestinal hemorrhage occur rarely. Dyspepsia, nausea, vomiting, and occult bleeding are the most common adverse effects with ordinary doses. During therapy with large doses of salicylates for prolonged periods, salicylism may occur; it is characterized by nausea, vomiting, tinnitus, decrease in auditory acuity, dizziness, sweating, thirst, and confusion. A small number of clients are hypersensitive to aspirin, and ordinary doses may cause skin eruptions, urticaria, or asthmatic-type anaphylactoid reactions.

d. **Overdosage.** Serious intoxication usually follows the ingestion of at least 1 grain per pound of body weight (about 150-175 mg/kg). Toxicity is characterized by hyperthermia, CNS stimulation followed by depression and coma, acid-base disturbances, hypoprothrombinemia, and gastroenteritis. Respiratory alkalosis appears first, followed by metabolic acidosis. The minimum lethal dose (M.L.D.) is 5-10 grams.

e. **Treatment of Overdosage.**

1. Obtain a blood pH to determine acid-base balance.

2. Treat dehydration and alkalosis with normal saline and potassium as indicated.

3. Metabolic acidosis can be corrected with fluids and adequate sodium bicarbonate as determined by blood pH.

4. Perform gastric lavage if client is received within 4 hours after ingestion.

5. Vitamin K, 50 mg IV, should be administered for hypoprothrombinemia.

6. Treat fever with tepid water sponge baths.

7. Short-acting barbiturates should be given cautiously, if convulsions occur.
(8) Support respiration.

(9) In presence of cardiovascular collapse, maintain blood pressure with fluids.

f. Cautions and Warnings.

(1) Aspirin is contraindicated or should be used with caution in clients with hemorrhagic tendencies, diabetes, gastric ulcer, gastrointestinal irritation, and hepatic disease.

(2) Aspirin should not be given concurrently with coumarin, since it will prolong the prothrombin time.

(3) In sensitive clients or when prolonged high doses of aspirin are required, gastric irritation can be reduced by using enteric-coated tablets such as Ecotrin, designed to dissolve in the intestine.

(4) Gastrointestinal effects may be reduced or eliminated by taking aspirin with food, milk, or a full glass of water.

(5) Children and teenagers should not use aspirin (salicylates) for chickenpox or flu-like symptoms before a doctor is consulted about Reyes Syndrome, a rare but serious illness.

g. Supply. Aspirin is available in 80 mg tablets for pediatric use and in 325 mg tablets. It is also available in 325 mg enteric-coated (Ecotrin) tablets, 325 mg suppositories, and in various combinations such as aspirin with codeine (Ascodeen) and aspirin with magnesium oxide and aluminum hydroxide (CAMA).

3-29. ACETAMINOPHEN

a. Action and Uses. Acetaminophen (Tempra; Tylenol; APAP) is a mild analgesic used for temporary relief of minor muscular aches and pains, headache myalgia, arthralgia, dysmenorrhea, and discomfort and fever associated with common cold and viral infections. It is the mild analgesic of choice in clients allergic or sensitive to aspirin, ulcer clients, and clients receiving an anticoagulant or a uricosuric agent, such as probenecid. Acetaminophen does not possess anti-inflammatory or uricosuric action.
b. **Usual Dosage.** The usual dosage is 325 to 650 mg, every 4-6 hours as needed, not to exceed 2.6 grams per 24-hour period. The pediatric dose is as follows (see Table 3-1).

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 months</td>
<td>40 mg</td>
</tr>
<tr>
<td>4-11 months</td>
<td>80 mg</td>
</tr>
<tr>
<td>1-2 years</td>
<td>120 mg</td>
</tr>
<tr>
<td>2-3 years</td>
<td>160 mg</td>
</tr>
<tr>
<td>4-5 years</td>
<td>240 mg</td>
</tr>
<tr>
<td>6-8 years</td>
<td>320 mg</td>
</tr>
<tr>
<td>9-10 years</td>
<td>400 mg</td>
</tr>
<tr>
<td>11 years</td>
<td>480 mg</td>
</tr>
</tbody>
</table>

Table 3-1. Pediatric dose of Acetaminophen.

c. **Adverse Effects.** Gastrointestinal irritation is negligible. Prolonged administration may cause methemoglobinemia and other abnormal pigmentation, hemolytic anemia, and with large doses, hepatic toxicity.

d. **Cautions and Warnings.**

1. Do not exceed the recommended dosage. Consult a physician for use in children under three years or for oral use longer than 10 days.

2. Chronic daily ingestions have resulted in liver damage.

e. **Supply.** Acetaminophen is supplied as an elixir, containing 160 mg per 5 ml; as a 10 percent solution in a bottle for pediatric use, supplied with a dropper calibrated at 0.6 ml; as 325 mg and 500 mg tablets, and as 120 mg, 325 mg, and 650 mg suppositories.

Section VI. CNS STIMULANTS

3-30. **INTRODUCTION**

In this lesson, we have discussed many drugs that are depressant to the CNS. There are many more that we did not mention. Drugs that are used to stimulate the CNS, on the other hand, are few in number. They stimulate various portions of the CNS and differ in site and mechanism of action. They are not employed exclusively as CNS stimulants because they have many other actions. The CNS can be stimulated only for a brief period, because the excitation is soon followed by depression.
3-31. AMPHETAMINES

The amphetamines are discussed in this subcourse primarily because of their drug abuse potential.

a. Action and Uses. The amphetamines are sympathomimetic amines with potent CNS stimulant properties. The amphetamines have a significant potential for abuse. They should be used with extreme caution and only for limited periods of time in weight reduction programs. The amphetamines are indicated only in the following situations:

   (1) Attention deficit-hyperactivity disorder (AD-HD), formerly called minimal brain dysfunction in children.

   (2) Narcolepsy.

   (3) In exogenous obesity, as a short-term (a few weeks) adjunct in a regimen of weight reduction based on caloric restriction.

b. Usual Dosage of Dextroamphetamine Sulfate.

   (1) Narcolepsy: 5-60 mg in divided doses.

   (2) Attention deficit-hyperactivity disorder: Not recommended in children under 3 years of age. For children 3-5 years of age: 2.5 mg daily, increased in increments of 2.5 mg weekly, until optimum response is obtained. For children 6 years of age and older: Ten mg once or twice daily, increased in increments of 10 mg weekly until optimum response is obtained.

   (3) Obesity: 5-30 mg per day in divided doses.

c. Adverse Effects.

   (1) Cardiovascular: Palpitation, tachycardia, elevation of blood pressure.

   (2) CNS: Overstimulation, restlessness, dizziness, insomnia, euphoria, dysphoria, tremor, headache; rarely, psychotic reactions at therapeutic doses.

   (3) Other: Dryness of mouth, unpleasant taste, diarrhea, urticaria, impotence, changes in libido.

d. Overdosage. Restlessness, confusion, assaultiveness, hallucinations, and panic states are manifestations of acute poisoning. Fatigue and depression usually follow the central stimulation. Cardiovascular effects such as arrhythmias, hypertension or hypotension, and circulatory collapse may be seen. Fatal poisoning usually terminates in convulsions and coma.
e. **Treatment of Overdosage.**

(1) Lavage, if drug has been orally ingested, and sedate with a barbiturate or diazepam (Valium).

(2) Maintain a high volume of acid urine.

(3) Use saline cathartic if the drug has been orally ingested.

(4) Give artificial respiration if cyanosis is present.

(5) Maintain blood pressure with fluids in the presence of cardiovascular collapse.

(6) Administer as an alternative chlorpromazine (Thorazine), 1 mg/kg IM for sedation.

f. **Cautions and Warnings.**

(1) Amphetamines are contraindicated in advanced arteriosclerosis, symptomatic cardiovascular disease, moderate to severe hypertension, hyperthyroidism, and known hypersensitivity or idiosyncrasy to the sympathomimetic amines.

(2) Do not administer to clients with a history of drug abuse.

(3) Do not use during or within 14 days following the administration of MAO inhibitors.

(4) Tolerance to anorectic (appetite-reducing) effect usually develops within a few weeks.

(5) Amphetamines may impair the ability of the client to engage in potentially hazardous activities.

(6) Tolerance and extreme psychological dependence have occurred.

(7) Abrupt cessation following prolonged high dosage results in extreme fatigue and mental depression.

(8) Manifestations of chronic intoxication include severe skin diseases, marked insomnia, irritability, hyperactivity, and personality changes, including psychosis often clinically indistinguishable from schizophrenia.
(9) Amphetamines are not recommended for pregnant women. Annual studies have suggested that the amphetamines are potentially embryotoxic and teratogenic (tending to produce physical defects in the developing embryo).

(10) Amphetamines may decrease the hypotensive effect of guanethidine.

3-32. SPECIFIC AMPHETAMINES AND RELATED PREPARATIONS

a. Amphetamine Sulfate (Benzedrine).

b. Dextroamphetamine Sulfate (Dexedrine).

c. Methamphetamine Hydrochloride (Desoxyn, Methedrine).

d. Methylphenidate Hydrochloride (Ritalin).

e. Diethylpropion Hydrochloride (Tenuate; Teplanil).

f. Phenmetrazine Hydrochloride (Preludin).

g. Chlorphentermine (Pre-Sate).

Continue with Exercises

Return to Table of Contents
EXERCISES, LESSON 3

Answer the following exercises by marking the lettered response that best answers the question or completes the incomplete statement.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. What factor determines whether a sedative-hypnotic is more useful as a sedative or more useful as a hypnotic?
   a. Its length of action.
   b. Its potency per milligram.
   c. The rapidity with which it takes effect.
   d. Its specific effect on the electric currents in the brain.

2. What effect should a moderate dose of a sedative-hypnotic have on the performance of a student taking a difficult examination?
   a. Immediate sleep.
   b. Improved performance due to enhanced powers of concentration.
   c. Unjustified feeling of performing well.
   d. No effect.

3. When a client is being treated for neurotic anxiety with a sedative, why is a long-acting sedative usually preferred?
   a. To avoid psychological dependence on the drug.
   b. To avoid the troublesome labor of frequently administering a drug.
   c. To restore the client's confidence in himself.
   d. To utilize the greater potency of long-acting sedatives.
4. A dose of a long-acting sedative sufficient to induce sleep is given to a client. In the morning, he is likely to experience:
   a. A hangover.
   b. Delirium tremens.
   c. A withdrawal state.
   d. Fears of persecution.

5. Comparable doses of the drugs below produce similar sedative effects. Which of these long-acting sedatives is the least expensive?
   a. Chlordiazepoxide.
   b. Oxazepam.
   c. Phenobarbital.
   d. Dichlorobenzamine.

6. Which of the following is a contraindication for phenobarbital?
   a. Psychosis.
   b. Epilepsy.
   c. Pregnancy.
   d. Kidney disease.

7. Two effective short-acting hypnotics are:
   a. Diazepam and chlordiazepoxide.
   b. Amobarbital and meprobamate.
   c. Secobarbital and pentobarbital.
   d. Phenobarbital and oxazepam.
8. To the client, the overall effects of a phenothiazine are:
   a. Intolerable.
   b. Unpleasant.
   c. Imperceptible.
   d. Pleasurable.

9. Which of the following is a drug used specifically, but not solely, in the therapy of psychotic clients?
   a. Chlorpromazine.
   b. Diazepam.
   c. Pentobarbital.
   d. Phenobarbital.

10. Which of the following drugs is NOT used clinically?
   a. Codeine.
   b. Heroin.
   c. Morphine.
   d. Opium.

11. Which of the following is NOT a significant pain-alleviating effect attributable to morphine?
   a. Hypnotic effect.
   b. Less objection to perceived pain.
   c. Reduction of perceived pain.
   d. Reduction of pain-generating toxins.
12. What effect does morphine have on respiration?
   a. Depression.
   b. Stimulation.
   c. Increase in muscular tone.
   d. Occurrence of rhythmic irregularities.

13. Which of the following drugs tends to constipate?
   a. Aspirin.
   b. Diazepam.
   c. Paregoric.
   d. Phenobarbital.

14. A client in a hospital has been receiving moderate doses of a narcotic analgesic regularly for therapeutic purposes. When the pain for which it has been administered has ceased and the drug is discontinued, the probable result will be:
   a. Postural hypotension.
   b. Convulsions.
   c. Angry demands for more narcotics.
   d. Discomfort, with the cause unknown to the client.

15. Which of the following does NOT contribute to the tendency of heroin to produce psychological dependence?
   a. Anxieties about sex, aggression, and pain.
   b. Feelings of inability to survive emotionally without narcotics.
   c. The need for increasingly large doses to maintain physiological balance.
   d. A pleasurable surge immediately after injection.
16. A client in shock who is given intramuscular injections of morphine may suffer which of the following, as a result of the injection.
   a. Morphine poisoning.
   b. Heart attack.
   c. Anemia.
   d. Damaged peripheral circulation.

17. A client who has been given morphine is presumed to have morphine poisoning whenever there is concurrent appearance of coma, depressed respiration, and:
   a. Flushed face.
   b. Pinpoint pupils.
   c. Cyanosis.
   d. Vomiting.

18. Morphine should NOT be used in the treatment of emergency clients whose symptoms include:
   a. c, d, e, or f below.
   b. d, e, or f below.
   c. Pain in abdomen.
   d. Head injury.
   e. Chest injury.
   f. Unconsciousness.
19. When codeine is used as an antitussive, the single dose falls within a range of:
   a. 2--4 mg.
   b. 15--30 mg.
   c. 32--64 mg.
   d. 0.25--0.5 gm.

20. The oral analgesic dose of codeine is:
   a. 2--4 mg.
   b. 15--30 mg.
   c. 30--60 mg.
   d. 0.25--0.5 gm.

21. The contraindications to the use of morphine are also contraindications to the use of:
   a. Aspirin.
   b. Meperidine.
   c. Secobarbital.
   d. Chlorpromazine.

22. Which of the following will reverse most of the effects of narcotics?
   a. Caffeine.
   b. Naloxone.
   c. Epinephrine.
   d. Dextroamphetamine.
23. When aspirin is given to a client whose body temperature is normal, his temperature will:
   a. Stay the same.
   b. Increase.
   c. Decrease.

24. Which of the following drugs acts as both an analgesic and antipyretic?
   a. Mephobarbital.
   b. Meprobamate.
   c. Morphine.
   d. Aspirin.

   *Check Your Answers on Next Page*
SOLUTIONS TO EXERCISES, LESSON 3

1. a  (para 3-3)
2. c  (para 3-4a)
3. a  (para 3-4b)
4. a  (para 3-5)
5. c  (para 3-7a(1))
6. d  (para 3-8d)
7. c  (paras 3-7c(4), 3-9a, 3-10a)
8. b  (para 3-13c)
9. a  (paras 3-15, 3-16)
10. b  (para 3-19)
11. d  (para 3-19a)
12. a  (para 3-19b)
13. c  (para 3-19f)
14. d  (para 3-20b)
15. c  (para 3-20c)
16. a  (para 3-22e)
17. b  (para 3-22e(1))
18. a  (para 3-22f(1)-(4))
19 b  (para 3-23b)
20. c  (para 3-23b)
21. b  (para 3-24d)
22. b (para 3-26a)

23. a (paras 3-27b, 3-28a)

24. d (para 3-28a)

Return to Table of Contents