

Some Forensic Aspects on Antidepressants Drugs

Vinod Dhingra¹, Ritika Gupta²

Author Affiliation: ¹Senior Scientific Officer, Regional Forensic Science Laboratory, Gwalior, Madhya Pradesh 474009, India. ²Ritika Gupta, Scientific Assistant, Forensic Sciences Laboratory, New Delhi 110085, India.

Corresponding Author: Vinod Dhingra, Senior Scientific Officer, Regional Forensic Science Laboratory, Gwalior, Madhya Pradesh 474009, India.

E-mail: vdhingraso@hotmail.com

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Abstract

Antidepressants are the most prescribed for depression. The exact mechanism of action of antidepressant is unknown. The prevailing theory is that antidepressants increase the concentration of one or more brain chemicals (neurotransmitters) that nerves in the brain use to communicate with one another. The neurotransmitters affected by antidepressants are nor epinephrine, serotonin and dopamine. The different classes of antidepressants differ in the neurotransmitters they affect. This determines some of their side effects and potential drug interactions. All available antidepressants are effective and for most cases of depression there is no good evidence that any antidepressant is more effective than another. Side effects and potential drug interactions are major factors that influence selection of antidepressants. This article highlights some forensic aspects, their types, side effects and potential drug interactions of the major antidepressants classes.

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Introduction

Antidepressant drugs are an effective medication in treating the severe alleviated depression and anxiety, including dysthymia, anxiety disorders, obsessive compulsive disorder, eating disorders, chronic pain, neuropathic pain and, in some cases, dysmenorrhoea, snoring, migraines, attention-deficit hyperactivity disorder, substance abuse and sleep disorders. They can be used alone or in combination with other medications. An antidepressant should be more efficacious than placebo to justify the risk associated with side effects [1]. Studies have shown that antidepressant-induced mania can occur in 20–40% of bipolar patients [2]. Antidepressant drugs are available under the different names and in different doses form such as injectable, inhaled and by oral preparation. Some studies have shown that the use

of some antidepressants correlate with an increased risk of suicide in some patients and especially youth [3]. This problem has been serious enough to warrant government interventions in some places to label greater likelihood of suicide as a risk of using antidepressants [4]. Before the 1950s, opioids, amphetamine, and methamphetamine were commonly used as antidepressants. Their use was later restricted due to their addictive nature and side effects. These are of the following types

Tricyclic antidepressant

Tricyclic antidepressants are chemical compounds used primarily as antidepressants. They are named after their chemical structure, which contains three rings of atoms. Examples Imipramine HCl, Nortriptyline, Doxepin HCl, Amitriptyline HCl, Trimipramine, Dothiepin, Clomipramine, Nitroxazepine Amoxapine. The

side effects of these compounds are dry mouth, blurred vision, urinary retention, constipation, dizziness and emesis (or vomiting).

Tetracyclic

Tetracyclic antidepressants contain four cyclic rings as part of their structure. Tetracyclic antidepressants are similar to tricyclic antidepressant and act by inhibiting reuptake of neurotransmitters serotonin and noradrenaline in the brain, and elevate mood. They are effective antidepressants but are used less often now due to their side effect profile. Examples Mianserin HCl., Mirtazapine. The side effects of these compounds are anxiety, depression, hot flashes, insomnia, major depressive disorder, panic disorder and post traumatic stress disorder.

Monoamine oxidase

Antidepressants such as Monoamine oxidase ease depression by affecting chemical messengers (neurotransmitters) used to communicate between brain cells. An enzyme called monoamine oxidase is involved in removing the neurotransmitters norepinephrine, serotonin and Dopamine from the brain. Monoamine oxidase also affects other neurotransmitters in the brain and digestive system, causing side effects. Example Moclobemide. The side effects of these compounds are dry mouth, nausea, diarrhea or constipation, drowsiness, insomnia, skin reaction at the patch site, dizziness or lightheadedness and muscles aches.

Selective Serotonin Reuptake Inhibitors

Selective serotonin reuptake inhibitors and related drugs work by increasing a chemical called serotonin in the brain. Serotonin is a neurotransmitter (a messenger chemical that carries signal between nerve cells in the brain). After carrying a message, serotonin is usually reabsorbed by the nerve cells (known as 'reuptake'). Examples Fluoxetine, Sertraline. The side effects of these compounds are increasing risk of bone fractures, akathisia, suicidal ideation, photosensitivity, reduce sexual desire and insomnia, Diarrhea.

Serotonin Norepinephrine Inhibitor

Serotonin Norepinephrine Inhibitor work by changing the levels of one or more of these naturally occurring brain chemicals. Serotonin Norepinephrine Inhibitor block the absorption (reuptake) of the neurotransmitters serotonin

and norepinephrine in the brain. They also affect certain other neurotransmitters. Changing the balance of these chemicals seems to help brain cells send and receive messages, which in turn boosts mood. Medications in this group of antidepressants are sometimes called dual-action antidepressants. Example Venlafaxine. The side effects of these compounds are constipation, cough, increased in sweating, sleep problems, weight loss, yellow eyes and skin (jaundice), and upper right abdominal pain.

Serotonin Reuptake Inhibitors or Triazolopyridine eg. Trazodone

All the antidepressants, discussed above contain Amitriptyline HCl, Trimipramine, Dothiepin, Clomipramine, Nitroxazepine, Amoxapine, Mianserin HCl, Mirtazapine, Moclobemide, Fluoxetine, Sertraline, Venlafaxine, Trazodone, Trianeptine, or formed by the combination of all these drugs and the Common Side-Effects are Hypertension, Pre-eclampsia, Suicidal ideation, Sexual drive, Failure to reach orgasm and Erectile dysfunction. These compounds also shows Common Withdrawal symptoms are Dependence, Nausea, Chills, Muscles aches, Dizziness, Anxiety, Irritability, Insomnia Fatigue.

Some Forensic Aspects

One of the challenges that chemist often have to contend with is separation of different compounds in mixtures. Forensic chemists, for example, are often asked to identify pills or powders found at the scene of crime or a drug overdose. Those pills or powders may be single pure substances, or more commonly mixture of pure substances. It is quite natural that every person must not be aware that what antidepressant actually is, and how it acts on our body as well as what are their side-effects. In India and outside countries, various case related to antidepressant can be seen. It may be homicidal, suicidal and accidental. In Homicidal cases, the culprit used to provide overdose of antidepressant to the subject. In homicidal cases, the culprit knows the diseases and problems of the subject, still he use to provide overdose of medicine intentionally. Consequently, death of the subject may occur. In suicidal cases, the subject himself uses to take overdose of the antidepressant drugs instead of

knowing all the problems related to him. As a result, diseases and death of person may occur. Accidental cases and suicidal cases are very common in comparison to homicidal cases. Such type of cases occurs due to mishandling of doctors especially in accidental cases. When the cases of antidepressant are investigated, the Forensic chemist asked for the answers of following questions:

- Which type of antidepressant drugs was given or taken by the subject?
- What was the dose given to the subject?
- At what time medicine was given.
- Is the patient was suffering from any other diseases or not etc.

After finding answers of all these questions the forensic chemist may conclude what was the mode of death and either the death was natural or the person was killed intentionally.

Forensic detection and identification of antidepressants

The separation of analyte of interest forms two basic approaches, the first one is the sample preparation step and the second is the detection of the compound of interest. A number of extraction techniques have been routinely used for the removal of as many as interfering compounds and pre concentration of the analytes. A variety of methods GC-MS, LC-MS have been given in literature for identification and determination of the amount of antidepressants in different biological matrices which can fabricate a broad investigating area in the field of therapeutics as well as forensics. These methods offer good precision and accuracy over the

entire analytical range, allowing the development of very rapid and efficient methods.

Conclusion

In the present work a study has been made on antidepressant drugs by forensic scientist at crime scene from medicines of different trade names. This study helps to forensic scientist in identification of drugs at crime scene as well as in laboratory. A very small number of cases involving non-medical use of antidepressants have been reported over the past 30 years. Several cases of the misuse of amitriptyline alone or together with morphine or in other drug dependent patients and of dothiepin with alcohol or in methadone patients have been reported. Therefore, we have concluded that with the help of these information a forensic scientist or police can easily identify the different types of antidepressant drugs from the crime scene and it also help in identification of persons who bought or misuse these drugs via intentionally or not.

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