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Review Article

Screening/spot test of narcotics

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ABSTRACT

Narcotics are the substances used to treat moderate to severe pain. They could be natural like opiates such as morphine, codeine etc., synthetic like fentanyl, methadone etc., and semi-synthetic like oxycodone, hydrocodone etc. These drugs act as pain relievers, induces the state of stupor or sleep, and increase the physical dependence on them. In forensic autopsy case, the forensic pathologist may require a complete toxicological investigation for different poisons including stimulants. In India, Forensic Science Laboratories run by Government under the Home ministry usually carry out this. The samples must be analysed by the forensic toxicologist/chemists/scientist. This article deals with the screening/spot test for narcotics. It attempts to simplify the standard procedures in a step-wise manner, which can be of handy reference for the forensic toxicologist.

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1. Introduction

Narcotics, the word is borrowed from the Greek word 'narkōtikós', which means lethargic or stuporous. The expression narcotic is generally used to refer to a class of drugs that are analgesics, central nervous system depressants and produces insensibility or stupor. Narcotics commonly termed as Opioids, usually produces analgesia, mood swings, physiological dependence, heavy tolerance and a hedonic or rewarding effect, which contributes to compulsive use of the drug by the abuser. The effects caused by narcotics include euphoria, drowsiness, respiratory, depression, constipation, constricted pupils. Narcotics majorly attacks the Central Nervous System and Peripheral Nervous System and usually found in these areas as well as in the Gastrointestinal Tract. Such drugs act by binding to opioid receptors in the body, as narcotics mediate both the psychoactive and somatic effects of opioids, though they do not cross the blood-brain barrier, but can shift other

opioids from binding to the respective receptors. Forensic Scientists/Toxicologists have a hard time in searching appropriate tests to analyse samples of narcotics in medico-legal cases, autopsies, and even for academic purposes.¹⁻⁹

In India, The Narcotic Drugs and Psychotropic Substance (NDPS) Act, 1985 covers all kinds of activities related to narcotic substances. Bare act reads as follows:

“An Act to consolidate and amend the law relating to narcotic drugs, to make stringent provisions for the control and regulation of operations relating to narcotic drugs and psychotropic substances [to provide for the forfeiture of property derived from, or used in, illicit traffic in narcotic drugs and psychotropic substances, to implement the provisions of the International Conventions on Narcotic Drugs and Psychotropic Substances] and for matters connected therewith.”¹⁰

In simplified terms, the act states that possessing, manufacturing, production, selling, transportation, purchasing, inter-state importing and exporting, or using cannabis is punishable with rigorous imprisonment

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attracting ten years of jail or fine extending up to one lakh rupees.

We have tried to set out standard procedures for screening/spot test for narcotics that are easily available and useful for the forensic science laboratory. This article covers the different narcotics drugs like Acetorphine, Alphaprodine, Anileridine, Benzylmorphine, Bezitramide, Buprenorphine, Butorphanol, Codeine, Cyclazocine, Dextromoramide, Dextropropoxyphene, Diamorphine, Diethylthiambutene, Dihydrocodeine, Dipipanone, Embutramide, Etorphine, Ketobemidone, Methadone, Morphine, Pentazocine, Pethidine, Phenazocine, Phenoperidine, Profadol and Thebacon.

2. Acetorphine

2.1. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. The bluish-grey colour is observed which changes to yellowish-brown indicate the presence of acetorphine.

3. Alphaprodine

3.1. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. The bluish-grey colour is observed which indicates the presence of alphaprodine.

3.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. The brownish-red colour is observed which indicates the presence of alphaprodine.

4. Anileridine

4.1. Diazotisation test

1. Few drops of the extract are dissolved in 2M hydrochloride acid.
2. One drop of it is then taken on a tile.
3. One drop of 1% solution of sodium nitrite followed by a drop of 4% solution of naphtha-2-ol in 2M sodium hydroxide is added to it.
4. Orange colour is observed which indicates the presence of anileridine.

4.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Orange colour is observed which indicates the presence of anileridine.

5. Benzylmorphine

5.1. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. The red colour is obtained which changes to violet indicate the presence of benzylmorphine.

6. Bezitramide

6.1. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Violet colour is observed which changes to orange shows the presence of bezitramide.

7. Buprenorphine

7.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Black colour is observed which indicates the presence of buprenorphine.

7.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Violet colour is observed which indicates the presence of buprenorphine.

8. Butorphanol

8.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Black colour is observed which indicates the presence of butorphanol.

8.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Grey colour is observed which indicates the presence of butorphanol.

9. Codeine

9.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Black colour is observed which indicates the presence of codeine.

9.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Violet colour is observed which indicates the presence of codeine.

9.3. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Green colour is observed which changes to orange shows the presence of codeine.

10. Cyclazocine

10.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Black colour is observed which indicates the presence of cyclazocine.

10.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Brown colour is observed which changes to green indicate the presence of cyclazocine.

10.3. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Green colour is observed which changes to orange shows the presence of cyclazocine.

11. Dextromoramide

11.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. The solution is heated at 100°C.
4. Green colour is observed which indicates the presence of dextromoramide.

12. Dextropropoxyphene

12.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Brown colour is observed which indicates the presence of dextropropoxyphene.

12.2. Marquis test

1. Two ml of extract is taken in a test tube.

2. Few drops of marquis reagent are added to it.
3. Play of colour is observed which changes from black to violet and finally to green which indicates the presence of dextropropoxyphene.

12.3. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Grey to brown colour is observed which shows the presence of dextropropoxyphene.

13. Diamorphine

13.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Black colour is observed which indicates the presence of diamorphine.

13.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Violet colour is observed which indicate the presence of diamorphine.

13.3. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Blue to grey colour is observed which shows the presence of diamorphine.

14. Diethylthiambutene

14.1. Liebermann's test

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. The solution is heated at 100°C.
4. Orange colour is observed which indicates the presence of diethylthiambutene.

14.2. Marquis test

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Violet colour is observed which indicate the presence of diethylthiambutene.

14.3. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Green to greenish-blue colour is observed which shows the presence of diethylthiambutene.

14.4. Sulphuric acid test

1. Two ml of extract is taken in a test tube.
2. Few drops of sulphuric acid are added to it.
3. Orange colour is observed which indicate the presence of diethylthiambutene.

14.5. Nitric acid test

1. Two ml of extract is taken in a test tube.
2. Few drops of cold nitric acid are added to it.
3. A pink-brown colour change to green is observed which indicate the presence of diethylthiambutene.

15. Dihydrocodeine**15.1. Marquis test**

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Violet colour is observed which indicate the presence of dihydrocodeine

15.2. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Grey to green colour is observed which shows the presence of dihydrocodeine.

16. Dipipanone**16.1. Mandelin's test**

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Green to blue colour is observed which shows the presence of dihydrocodeine.

17. Embutramide**17.1. Marquis test**

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Blue colour is observed which indicate the presence of embutramide.

17.2. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Brown colour is observed which shows the presence of embutramide.

18. Etorphine**18.1. Marquis test**

1. Two ml of extract is taken in a test tube.

2. Few drops of marquis reagent are added to it.
3. The bluish-grey colour to yellowish-brown is observed which indicate the presence of etorphine.

19. Ketobemidone**19.1. Marquis test**

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Orange colour is observed which indicate the presence of ketobemidone.

19.2. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Blue to green colour is observed which shows the presence of ketobemidone.

20. Methadone**20.1. Liebermann's test**

1. Two ml of extract is taken in a test tube.
2. Few drops of libermann's reagent are added to it.
3. Brown to orange colour is observed which indicates the presence of methadone.

20.2. Mandelin's test

1. Two ml of extract is taken in a test tube.
2. Few drops of mandelin's reagent are added to it.
3. Green to blue colour is observed which shows the presence of methadone.

21. Morphine**21.1. Marquis test**

1. Two ml of extract is taken in a test tube.
2. Few drops of marquis reagent are added to it.
3. Play of colour from purple-red which gradually changes to violet and finally to blue which shows the presence of morphine.

21.2. Froehde's test

1. A drop of the extract is taken in a porcelain basin.
2. The solution is then dried.
3. Few drops of Froehde's reagent are added to it.
4. Play of colour from violet changes to green and finally to pink colour which shows the presence of morphine.

21.3. Ferric chloride test

1. Two ml of extract is taken in a test tube.
2. Few drops of ferric chloride solution are added to it.

- Blue colour is observed which shows the presence of morphine.

21.4. Liebermann's test

- Two ml of extract is taken in a test tube.
- Few drops of Liebermann's reagent are added to it.
- Black colour is observed which indicates the presence of morphine.

21.5. Porphyroxine test

- Two ml of the extract is taken in a test tube.
- Few drops of acetic acid followed by dilute hydrochloric acid are added to it.
- Pink or rose red colour is obtained which indicates the presence of morphine.

22. Pentazocine

22.1. Folin-Ciocalteu test

- Two ml of extract is taken in a test tube.
- Few drops of Folin-Ciocalteu reagent are added to it.
- The solution is made alkaline with 2M sodium hydroxide.
- Blue colour is obtained which indicates the presence of pentazocine.

22.2. Mandelin's test

- Two ml of extract is taken in a test tube.
- Few drops of Mandelin's reagent are added to it.
- Green colour is observed which shows the presence of pentazocine.

23. Pethidine

23.1. Liebermann's test

- Two ml of extract is taken in a test tube.
- Few drops of Liebermann's reagent are added to it.
- Reddish orange colour is observed which indicates the presence of pethidine.

23.2. Marquis test

- Two ml of extract is taken in a test tube.
- Few drops of Marquis reagent are added to it.
- Orange colour is observed which indicates the presence of pethidine.

24. Phenazocine

24.1. Marquis test

- Two ml of extract is taken in a test tube.
- Few drops of Marquis reagent are added to it.

- Orange colour is observed which indicates the presence of phenazocine.

25. Phenoperidine

25.1. Marquis test

- Two ml of extract is taken in a test tube.
- Few drops of Marquis reagent are added to it.
- Red colour is observed which indicates the presence of phenoperidine.

26. Profadol

26.1. Folin-Ciocalteu test

- Two ml of extract is taken in a test tube.
- Few drops of Folin-Ciocalteu reagent are added to it.
- The solution is made alkaline with 2M sodium hydroxide.
- Blue colour is obtained which indicates the presence of profadol.

26.2. Liebermann's test

- Two ml of extract is taken in a test tube.
- Few drops of Liebermann's reagent are added to it.
- Black colour is observed which indicates the presence of profadol.

27. Thebacon

27.1. Marquis test

- Two ml of extract is taken in a test tube.
- Few drops of Marquis reagent are added to it.
- Yellow to violet colour is observed which indicates the presence of thebacon.

28. Conclusion

During the analysis of any poison, screening/spot test is very useful for knowing the presence of the narcotics by such preliminary tests, which can be confirmed by the confirmatory tests later on. Thus, it saves time for the toxicologist in ruling out various non-narcotic poisons and gives a quick clue to the doctors for patient management in emergency poisoning cases. The result of the analytical methods depends on the amount and purity of the sample extracted. Screening/spot test has been developed after repeated trial and testing. The techniques are being improved every time. The forensic toxicologists need to know the best available method and help to detect the poison in criminal investigations.

29. Preparation of Solutions

1. **Ferric chloride solution:** 10 g of ferric chloride is dissolved in 100 ml distilled water.
2. **Folin-Ciocalteu reagent:** Dissolve 100 g of sodium tungstate and 25 g of sodium molybdate in 800 ml of purified water in a 1.5-l flask. Add 50 ml of concentrated orthophosphoric acid and 100 ml of concentrated hydrochloric acid and reflux for 10 hours. Cool, add 150 g of lithium sulfate, 50 ml of purified water and 0.5 ml of elemental bromine, and allow to stand for 2 hours. Boil for 15 minutes to remove excess bromine, cool, filter if necessary, and dilute to 1 litre with purified water. This solution is yellow and should be stable for 4 months if stored at 4°C.
3. **Froehde's reagent:** 1 g of molybdic acid or sodium molybdate is dissolved in 100 ml of hot concentrated sulphuric acid.
4. **Lie bermann's reagent:** 1 gm of sodium or potassium nitrite is dissolved in 10 ml of sulphuric acid with cooling and swirling to absorb the brown fumes.
5. **Mandelin's reagent:** 1 g of ammonium vanadate is dissolved in 1.5 ml of water and dilute to 100 ml with concentrated sulphuric acid.
6. **Marquis reagent:** 100 ml of concentrated sulphuric acid is mixed with 1 ml of formaldehyde solution. [40% (v/v)].

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None.

31. Conflict of Interest

None.

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