

DIVISION OF NARCOTIC DRUGS  
Vienna

RECOMMENDED  
METHODS  
FOR TESTING  
METHAQUALONE/  
MECLOQUALONE

MANUAL FOR USE BY  
NATIONAL NARCOTICS  
LABORATORIES



UNITED NATIONS  
New York, 1988

ST/NAR/15

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## INTRODUCTION

### Background

Over the past few years there has been a considerable increase in the number of substances newly included under international control. At the same time, seized quantities of drugs already under control have also shown an alarming and unprecedented increase in certain regions. This new situation, involving an increase both in the frequency and volume of seizures, presents a challenge not only to national law enforcement authorities, but also to the technical and scientific staff of forensic laboratories.

Analysts have to be able to deal with more substances and preparations and to use faster, more accurate and more specific methods of identification and analysis. In addition, the international character of drug trafficking requires the timely exchange of analytical data between laboratories and law enforcement authorities both on the national and the international levels. Development of internationally acceptable methods of testing would contribute greatly to the achievement of these objectives.

The Commission on Narcotic Drugs, at its tenth special session, in February, 1988, reviewed the technical and scientific assistance programme of the Division of Narcotic Drugs with special emphasis on the development of laboratory methodologies. It noted with satisfaction that the harmonization of laboratory methods and the programme on establishment of recommended methods of testing for national forensic laboratories was pursued vigorously and that such methods had already been developed for heroin, cocaine, cannabis products, opium/crude morphine, amphetamine/methamphetamine and ring-substituted amphetamine derivatives.

In emphasizing the importance of the expert group meetings organized by the Division on various scientific and technical aspects of drug control and the high practical value for national law enforcement and laboratory services of the technical manuals as the outcome of the expert meetings, the Commission strongly recommended that such meetings and the publication of laboratory manuals continue on a regular basis.

### Purpose of the manual

In accordance with the recommendation of the Commission on Narcotic Drugs, a group of eleven experts was convened in June 1988 in Ottawa, Canada, by the Division of Narcotic Drugs in co-operation and with the financial support of the Government of Canada through UNFDAC. The present manual published by the United Nations Division of Narcotic Drugs reflects the conclusions of the group of experts and has been designed

to provide practical assistance to national authorities by describing recommended methods to be used in forensic laboratories for the identification and analysis of methaqualone and mecloqualone. The manual may also serve as a guide to national authorities in assessing existing methods used within their own government and university laboratories.

This manual is one in a series of similar publications dealing with the identification and analysis of various groups of drugs under international control; it was preceded by manuals on heroin (ST/NAR/6), cocaine (ST/NAR/7), cannabis (ST/NAR/8), amphetamine/methamphetamine (ST/NAR/9), opium/crude morphine (ST/NAR/11) and ring-substituted amphetamine derivatives (ST/NAR/12). Similar manuals on LSD and benzodiazepine derivatives are in preparation.

These manuals suggest approaches that may help the forensic analyst to select a technique appropriate to the sample currently being examined. The analyst may then choose to follow any of the methods described in the manual, as each method can be expected to produce reliable analytical information with respect to the samples to which they are applied. Each method has been used for a number of years in reputable forensic laboratories and has been published in the scientific literature. In identifying these methods, the expert group was aware that many other useful and acceptable methods produce worthwhile analysis and information for the forensic analyst, and that a number of other acceptable options are recorded in the forensic scientific literature.

#### Use of the Manual

Few methods are perfect, least of all in forensic drug analysis where the materials under examination are very likely to show significant variation both in their physical form and chemical composition. The choice of methodology and approach to analysis remains within the control of the analyst working within his or her own country. The analyst alone has seen the suspect material and can best judge the correct approach to the problem at hand. Furthermore, the choice of methods may necessarily depend on the availability of reference materials and of instrumentation.

Not all methods listed need to be applied to all samples suspected to contain methaqualone/mecloqualone. Requirements vary, for example, as a result of local trends in samples encountered, facilities available, and the standard of proof acceptable in the prosecution system within which the analyst works. The more complex methods are needed only for certain forensic requirements, such as comparison of samples or for source determination.

In order to establish the identity of any controlled drug, it is suggested that the criteria should be at least two independent analytical parameters. The selection of these parameters in any particular case would take into account the drug involved and the laboratory resources available to the analyst. For example, two uncorrelated TLC systems would count as two parameters. Uncorrelated TLC systems in this context means that either the solvent systems or the coating on the plates are completely different. When possible, three entirely different analytical techniques should be used, for example: colour test, chromatography (TLC, GLC or HPLC) and spectroscopy (IR or UV). The actual choice of parameters is left to the discretion of the chemist.

Attention is also drawn to the vital importance of the availability of textbooks on drugs of abuse and analytical techniques. Furthermore, the analyst must continually keep abreast of current trends in analysis, consistently following current analytical and forensic science literature. Analysts should refer to these and to previous manuals in this series for general descriptions of the analytical techniques included in this manual.

It is equally important that the latest information on changes in drugs available in the illicit traffic be quickly disseminated. This may often need to be done prior to publication in specialized periodicals dealing with forensic and other chemical analyses, since these publications are available to the forensic community some two to three years after the changes become known. The value of frequently published national reports on the latest information on such changes in drugs and on work being undertaken and analytical results obtained within individual laboratories cannot be over-emphasized.

The Division of Narcotic Drugs would welcome observations on the contents and usefulness of the present manual. Comments and suggestions may be addressed to:

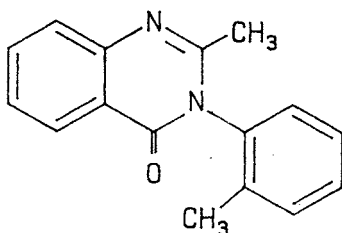
Division of Narcotic Drugs  
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I. DESCRIPTION OF THE PURE COMPOUNDS

METHAQUALONE

2-methyl-3-(2-methylphenyl)-4(3H)-quinazolinone  
2-methyl-3-o-tolyl-4(3H)-quinazolinone

Scheduled under the "Convention on Psychotropic Substances 1971"  
methaqualone Schedule II



C<sub>16</sub>H<sub>14</sub>N<sub>2</sub>O  
M. Wt. = 250.3

m.pt. = 114-117°C

METHAQUALONE HYDROCHLORIDE

C<sub>16</sub>H<sub>14</sub>N<sub>2</sub>O.HCl  
M. Wt. = 286.8

m.pt. = 250°C (decomp.)

SOLUBILITIES

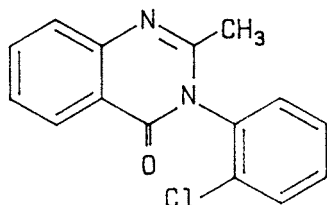
	<u>Base</u>	<u>Hydrochloride</u>
Water	insoluble	soluble
Ethanol	soluble	soluble
Diethyl ether	soluble	insoluble
Chloroform	very soluble	soluble



MECLOQUALONE

3-(2-chlorophenyl)-2-methyl-4(3H)-quinazolinone  
3-(o-chlorophenyl)-2-methyl-4(3H)-quinazolinone

Scheduled under the "Convention on Psychotropic Substances 1971"  
mecloqualone Schedule II



C<sub>15</sub>H<sub>11</sub>ClN<sub>2</sub>O  
M. Wt. = 270.7

m.pt. = 125-128°C

MECLOQUALONE HYDROCHLORIDE

C<sub>15</sub>H<sub>11</sub>ClN<sub>2</sub>O.HCl  
M. Wt. = 307.2

m.pt. = 239-241°C

SOLUBILITIES

	<u>Base</u>	<u>Hydrochloride</u>
Water	insoluble	soluble
Ethanol	soluble	soluble
Diethyl ether	soluble	insoluble
Chloroform	very soluble	soluble

## II. PRODUCTION, PHYSICAL AND CHEMICAL CHARACTERISTICS OF METHAQUALONE/MECLOQUALONE

The two sources of illegally distributed methaqualone and mecloqualone are diversion from legitimate pharmaceutical trade and illegitimate manufacture in clandestine laboratories. Methaqualone was first prepared in 1951 and introduced pharmaceutically in 1965 for use as a non-addictive, non-barbiturate "sleeping pill". Mecloqualone was synthesized in 1960 and is available as a legitimately dispensed hypnotic in some European countries.

Although found to be useful at first as legitimate pharmaceuticals, the abuse of these substances has become so widespread that several Member States have banned them in their country under Article 13 of the Convention on Psychotropic Substances 1971.

In North America, the legitimate manufacture of methaqualone ceased in 1983. In Canada, only the combination product containing methaqualone and diphenhydramine is commercially available and is a controlled drug preparation. On the other hand, there are indications that these substances are still produced in clandestine laboratories.

The synthetic routes for these drug substances are not complicated and are easily performed in clandestine laboratories. Two basic methods have been encountered. The first is a two-step reaction involving the preparation of N-acetyl anthranilic acid (from anthranilic acid and acetic anhydride) followed by condensation with either *o*-toluidine to produce methaqualone or *o*-chloroaniline to produce mecloqualone. Phosphorus trichloride is used to remove water produced in the reaction. The second method is a one-step reaction carried out by refluxing anthranilic acid, *o*-toluidine and acetic acid. Polyphosphoric acid is usually added to remove water. Purification, if carried out, involves dissolution of the solid residue in methanol and precipitation of the hydrochloride salt from a methanol-diethyl ether solution.

Clandestinely produced methaqualone appears on the illicit market as a brown, grey or black tacky powder with a 30-70% purity. The colour depends upon the amount of impurities present. It is also available as tablets and capsules from illicit manufacture. Recently it has been used as a cutting agent for heroin and in those cases is usually present at about 30% concentration. Several years ago, many counterfeit methaqualone tablets, flooding the market, actually contained diazepam. Both the free base and the hydrochloride salts of methaqualone and mecloqualone from licit and illicit production may be encountered in capsule, tablet or powder form.

### III. THE ANALYSIS OF METHAQUALONE/MECLOQUALONE

#### A. Sampling

The principal reason for a sampling procedure is to produce a correct and meaningful chemical analysis. Because most methods - qualitative and quantitative - used in forensic science laboratories for the examination of drugs require very small aliquots of material, it is vital that these small aliquots be entirely representative of the bulk from which they have been drawn. Sampling should be undertaken to conform to the principles of analytical chemistry, as laid down, for example, in national pharmacopoeias or by such organizations as the Association of Official Analytical Chemists.

There may be situations where, for legal reasons, the normal rules of sampling and homogenization cannot be followed if, for example, the analyst wishes to preserve some part of an exhibit as visual evidence. Alternatively, it may be necessary to perform separate assays on two powder items, rather than combining the powders prior to a single assay being performed on the mixture, because each has been separately exhibited by the seizing officer, and the legal system within which the analyst works requires individual results on every exhibit which is to be taken before the courts.

To preserve valuable resources and time, forensic analysts should seek, on all possible occasions, to use an approved sampling system, thereby reducing the number of quantitative determinations needed. To facilitate such an approach, the forensic analyst may need to discuss individual situations with both seizing officers and the legal personnel with whom he works.

Methaqualone/mecloqualone exhibits both from the licit market by diversion and from illicit manufacture may be encountered as powders, tablets or capsules. Also, they may be present as the free base or as the hydrochloride salt.

#### 1. Powders

##### (a) Sampling of single package items

The simplest sampling situation is where the submitted item consists of a single package of material - in the case of methaqualone or mecloqualone, the material will often be a powder. The material should be removed from its container or wrappings, placed in a clean clear plastic bag and the net weight recorded. The material should be thoroughly homogenized prior to the application of the sequence of chemical tests, although presumptive testing may be applied at this stage if it is thought that the sampling or homogenization process will be

lengthy and there is still some doubt as to the identity of the material. The simplest way to homogenize a powder is to shake it thoroughly within the clear plastic bag into which it has been transferred. If the powder contains aggregates, these may be broken down by passing through successively finer sieves, or by pounding in mortar with a pestle, or by use of an adapted commercial food-mixer or food-processor.

Alternatively, the technique of coning-and-quartering can be applied, as follows: the sample is mixed by shaking or stirring. Large fragments are reduced in size if necessary; the material is then poured on a flat surface to form a cone. The "cone" is flattened and the material is then divided at right angles, forming quarters. Opposite quarters are taken for a sample; the remainder of the material is returned to the receptacle from which it was removed. Should further coning-and-quartering be desired to reduce sample size, particle sizes are further reduced, the material mixed thoroughly, poured onto a flat surface, and divided as before.

(b) Sampling of items consisting of more than one package

The analyst should examine the contents of all packages by eye, and possibly screen by using a simple colour test or TLC to determine:

1. If all packages contain suspect methaqualone or mecloqualone material, and/or
2. If one or more packages contain material different to that of the majority of packages. The simplest indicator is the physical appearance of the powder. If one or more packages obviously differ in content, these should be segregated and subjected to separate analysis.

The compositing of multiple container items is as follows:

- (a) If there are less than 10 packages - all packages should be sampled.
- (b) If there are 10 - 100 packages, randomly select 10 packages.
- (c) If there are more than 100 packages - randomly select a number of packages equal to the square root of the total number of packages rounded to the next highest integer.

If the powders are found to be the same then the contents of a number of packages may be combined; the combined bulk material may then be homogenized in, for example, an adapted commercial food-processor. Alternately, the bulk may be subjected to coning-and-quartering.

When different types of material have been identified in the various packages, then each sub-group should be composited in an identical fashion to that previously outlined.

Sampling errors for quantitative methods are reduced if large aliquots of material are subjected to sequential dilution with the dissolving solvent. If the total sample size is large, this approach may be adopted. However, when large amounts of material are used for the first dissolution, it may be necessary to add the solvents by pipette to avoid error due to insoluble materials. Insoluble adulterants are a frequent occurrence in "street" samples seized within all countries.

(c) Sampling of materials containing gummy or large aggregates

If the particles can be easily reduced to powder, then this approach should be used and sampling procedure followed as outlined previously. Powdering may be achieved by mortar and pestle, commercial food-processor/mixer, or industrial grinder. If the material cannot be easily broken down, then random sized particles should be drawn from at least three different parts of the item. A minimum of 1 gramme should be collected, weighed accurately and subjected to assay.

2. Tablets and capsules - Commercial or licit preparations

The preliminary determination of commercial origin is a subjective one. Clear-cut examples of products of commercial origin would be dosage units resembling descriptions as pictorial representations in national compendia of pharmaceutical preparations. Commercial preparations usually undergo quality control by the manufacturer; therefore, little useful information would be gained by screening a large number of units from each package. The amount of ingredient per tablet or capsule determined will be statistically valid for the entire lot.

(a) Single container

1. 1-50 dosage units -- Randomly select 1/2 total number of units to a maximum of 20. Determine average weight, powder to pass through a 20-mesh sieve and mix thoroughly.
2. 51-100 dosage units -- Randomly select 20 units, proceed as above.
3. 101-1,000 dosage units -- Randomly select 30 units, proceed as above.
4. Greater than 1,000 dosage units -- Randomly select a number of units equal to the square root of the total number present, rounded to the next higher integer; proceed as above.

(b) Multiple containers

Segregate containers by lot numbers and treat each group as described in 1 (b) above. Report results separately for each group.

Determine the square root of the total number of packages in each group. Randomly select a number of packages equivalent to the square root, rounded to the next highest integer.

From each of the selected packages, randomly select a number of dosage units equivalent to the square root of the total number of dosage units divided by the square root of the number of packages, rounded to the next higher integer.

Form a composite by grinding, sieving through a 20-mesh sieve and thoroughly mixing. Perform the analysis on the composite.

3. Tablets and capsules - Illicit origin

For illicit preparations, quality control may be regarded as non-existent. Wide variations may be suspected in tablet make-up, although in most instances, some of the active constituent will be present in each tablet. Some screening of individual units or containers is, therefore, necessary.

(a) Single container

Determine the total number of dosage units and the average weight per dosage unit (du).

For sample sizes up to 10 du -- Screen all dosage units.

For sample sizes from 11 to 27 du -- Randomly select and screen 3/4 of all dosage units, rounding upward to the next higher integer.

For sample sizes from 28 du -- Randomly select and screen 1/2 of all dosage units rounding upward to the next higher integer and selecting a minimum of 21 du and a maximum of 50 du.

Based on the results of the screening tests, proceed as follows:

1. If all dosage units appear to be identical, form a composite of screened dosage units as directed for licit preparations and analyze.
2. If the sample contains two dosage forms, subdivide the sample. If necessary, screen additional dosage units until both subsamples contain material for analysis, then form two composites and analyze.

3. If more than two dosage forms are present, the strategy is to make a composite of the most abundant dosage form, then to screen additional units until a sample of the same size is formed that contains only the less abundant dosage forms. This procedure is repeated until a composite is formed for each dosage form or until the sample is exhausted.

The percentage of dosage units containing a given controlled substance may be estimated by using the percent of units found to contain that substance out of the total number of units which were randomly selected and screened.

(b) Multiple containers

Randomly select a number of dosage units from each of a randomly selected number of containers, as determined in the compositing procedures for licit preparations, above. Screen each unit.

Based on the results of the screening test, proceed as follows:

1. If all screened units appear the same, combine screen units from all containers and form a composite.
2. If all screened units do not appear the same, each container should be treated as a separate exhibit or entity. Thus for each container, proceed according to the direction above for a single container.

4. Residues from clandestine laboratory glassware

Because of the trace amounts of drug usually present on glassware and other equipment found in clandestine laboratories, the analyst should not attempt to perform presumptive tests but should proceed directly with conclusive analytical procedures.

Wash the syringe or glassware with a minimum amount of chloroform or methanol and concentrate it to dryness under a stream of nitrogen. Proceed with selected tests.

#### B. Extraction Technique

Since methaqualone/mecloqualone exhibits may be from licit or illicit manufacture, a simple extraction procedure may not work in all cases because of interference from raw materials, intermediates and by-products from clandestine routes or from pharmaceutical excipients in legitimately produced products. Nevertheless the following procedure provides a fast and simple way of isolating methaqualone or mecloqualone from most of these forms.

The representative sample (powder, tablet or capsule content), (see III A Sampling) is suspended in 1 M sodium bicarbonate solution. Methaqualone/mecloqualone (as the free base) may be extracted quantitatively with several portions of chloroform. The combined organic layers are filtered, dried over anhydrous sodium sulphate and evaporated.



C. Presumptive Tests

1. Colour tests

It must be stressed that positive results to colour tests are only presumptive indications of the possible presence of methaqualone or mecloqualone. Many other materials, some harmless and not controlled by national legislation or international treaties such as diphenhydramine and controlled substances such as cocaine, phencyclidine and chlordiazepoxide may give similar colours with the test reagents. It is mandatory for analysts to confirm the results of colour tests by the use of alternative techniques.

(a) Cobalt thiocyanate test

Reagent A: 16% hydrochloric acid solution

Reagent B: 2.5 g cobalt (II) thiocyanate in 100 ml of water

METHOD

Place a small amount of the suspected material into a test tube. Add one drop of reagent A and one drop of reagent B. A blue colour indicates the possible presence of methaqualone or mecloqualone.

Note

Cocaine and PCP also give a blue colour.

(b) Fischer-Morris test

Reagent A: Concentrated formic acid (88%)

Reagent B: 5% aqueous sodium nitrite solution

METHOD

Place a small amount of suspected material into a test tube. Add seven drops of reagent A and 5 drops of reagent B. Let stand for 1-2 minutes, then add 15-20 drops of chloroform. Shake, let it stand and observe the colour of both layers.

RESULTS	<u>Cobalt Thiocyanate Test</u>	<u>Fischer-Morris Test</u>	
		<u>water layer</u>	<u>chloroform layer</u>
Methaqualone	blue	no colour	yellow
Mecloqualone	blue	no colour	yellow
Cocaine	blue	faint green	faint green
Phencyclidine	blue	tinged	tinged
Caffeine	pink	no colour	no colour
Heroin	blue	faint yellow	yellow
Diphenhydramine	blue	yellow	no colour
Diazepam	blue green	faint yellow	faint yellow

References:

1. Rapid Testing Methods for Drugs of Abuse, (ST/NAR/13).
2. Microgram 16 (1983), pp. 46-56.

#### D. Thin-layer chromatography

##### PLATES

Activated silica gel G on glass backed plates; the coating (0.25 mm thickness) contains a fluorescing additive which fluoresces at 254 nm.

##### DEVELOPING SOLVENTS

SYSTEM A:	Cyclohexane	75
	Toluene	15
	Diethylamine	10
SYSTEM B:	Methanol	100
	Concentrated ammonia	1.5

##### Preparation of solutions to be applied to the TLC plates

Powder: Prepare a solution at a concentration of 5 mg per ml in methanol.

Capsules and Tablets: Extract the material as outlined above in section III B and prepare a solution containing the equivalent of approximately 5 mg of drug per ml of methanol.

Standard Solutions: All made at a concentration of 5 mg/ml in methanol.

Apply 1 to 2 ul of the 5 mg per ml solutions of the drug sample and standards to the plate.

##### VISUALIZATION

The plates must be dried prior to visualization. This can be done at 120°C for 5 minutes in an oven or, more quickly, by use of a hot air blower. It is important for proper colour development that all traces of diethylamine and ammonia be removed from the plate.

##### Visualization methods

1. UV light at 254 nm
2. Acidified potassium iodoplatinate reagent

##### Spray reagent

Acidified potassium iodoplatinate reagent: Dissolve 0.25 g of platinum chloride and 5 g of potassium iodide in sufficient water to produce 100 ml. This is potassium iodoplatinate reagent; for the acidified version add 5 ml of concentrated hydrochloric acid to 100 ml of iodoplatinate solution.

RESULTS

$R_f$  x 100 values:

<u>COMPOUND</u>	<u>DEVELOPING SYSTEM</u>	
	<u>A</u>	<u>B</u>
Methaqualone	40	74
Mecloqualone	30	74
Cocaine	52	67
Heroin	19	46
Diphenhydramine	56	55
Caffeine	5	63
Diazepam	29	75

E. Gas-liquid chromatography

1. Packed column technique

Operating conditions:

Detector: FID  
Column: 6 ft (or 2 m), 2 to 4 mm ID glass  
Packing: 3% OV-1, SE-30 or OV-17 on 80-100 Chromosorb W HP  
Carrier gas: Nitrogen  
Column temperature: 240°C  
Injector/detector temperature: 280°C  
Internal standard: tetraphenylethylene or n-alkanes

METHOD

Preparation of internal standard solution

Dissolve tetraphenylethylene (or one of the n-alkanes) in chloroform to give a concentration of 4 mg/ml. Each analysis requires 2.5 ml.

Preparation of the standard solution

Accurately weigh methaqualone HCl standard and dilute with internal standard solution to give a concentration of 4 mg/ml.

Preparation of sample solutions

Obtain a representative sample from the powder, tablets or capsules as outlined under sampling procedure in III A above. Grind it to a powder. Accurately weigh the sample containing about 10 mg of methaqualone HCl or mecloqualone HCl and transfer quantitatively to a 5 ml erlenmeyer flask. Pipette in 2.5 ml of internal standard solution and add ca 1 ml 1 M sodium bicarbonate solution. Heat on a steam bath for 5-8 minutes, cool to room temperature, stopper and shake the flask. Let the layers separate and inject 1-2 ul of the chloroform (bottom)

layer into the gas chromatograph. The content(%) of methaqualone HCl (or mecloqualone HCl) in the sample can be calculated using the general formula below:

$$C_x \% = \frac{C_{r.std.}}{C_{sam.}} \times \frac{A_x/A_{int.std. \text{ in sam. chrom}}}{A_{r.std.}/A_{int.std. \text{ in std. chrom}}} \times 100$$

where:

$C_x$  % = content of methaqualone HCl (or mecloqualone HCl) in the sample (w/w %)

$C_{r.std.}$  = concentration of methaqualone HCl (or mecloqualone HCl) in the standard reference solution (w/v %)

$C_{sam.}$  = concentration of the sample (w/v%)

$A_x$  = peak area for methaqualone HCl (or mecloqualone HCl) obtained during the sample chromatography

$A_{r.std.}$  = peak area for methaqualone HCl (or mecloqualone HCl) obtained during the standard chromatography

$A_{int.std. \text{ in sam. chrom}}$  = peak area of the internal standard obtained during the sample chromatography

$A_{int.std. \text{ in std. chrom}}$  = area of the internal standard obtained during the standard chromatography

## 2. Capillary column technique

Operating conditions:

Detector:	FID
Column:	Fused silica, chemically bonded and cross-linked methylsilicone or methylphenylsilicone, such as OV-1, SE-54, BP-1 or DB-1
Film thickness:	0.25 um
Length:	25 m, ID 0.25 mm
Carrier gas:	Nitrogen 1 ml/min
Split ratio:	20:1

Column temperature: 250°C

Injector/detector temperature: 275°C

Internal standard: tetraphenylethylene or n-alkanes

METHOD

Prepare sample and standard solutions at a concentration of 4 mg/ml as described for the packed column procedure (see above). Inject 1 ul of solutions into the gas chromatograph.

RESULTS

ELUTION PROFILES ON SELECTED COLUMNS (Retention indices)

COMPOUND	3% OV-1 <u>packed</u>	3% OV-17 <u>packed</u>	DB-1 <u>Capillary</u>
Methaqualone	2125	2568 (10.4 min)	2135 (3.98 min.)
Mecloqualone	2230	2714	2236 (4.77 min.)
Caffeine	1810	2230	1796
Cocaine	2187	2569	2173
Diazepam	2425	2900	2431
Diphenhydramine	1873	2109	1900
Heroin	2614	- ( 45 min)	2577
Tetraphenylethylene	-	-	2442 (7.01 min.)

References:

1. Journal of the Association of Official Analytical Chemists 60 (1977), pp. 935-939.
2. Journal of Forensic Science 21 (1976), pp. 552-563.

F. High performance liquid chromatography

1. Normal phase

Column: 125 mm by 4.9 mm ID

Packing material: Silica HPLC grade, 5 um diameter (Spherisorb S5W or equivalent)

Mobile phase: A solution containing 1.17 g (0.01M) of ammonium perchlorate in 1000 ml of methanol. Adjust to pH 6.7 by addition of ca 1 ml of 0.1 M sodium hydroxide in methanol

Flow rate: 2.0 ml per minute

Detection: UV at 254 nm

Sample and standard solutions: All materials are dissolved in mobile phase to give an approximate concentration of 1 mg per ml

Injection volume: 1 to 5 ul by syringe or loop injector

Quantitation: By peak area, external standard method

Reference: J. Chromatography 323 (1985), 191-225

2. Reverse Phase

Column: 250 mm by 4.6 mm ID

Packing material: Octadecyl-silica HPLC 5 micron (ODS-Hypersil or equivalent)

Mobile phase: Acetonitrile 40  
1% aqueous ammonium acetate 45  
2.5% aqueous diethylamine 15  
The pH is adjusted to 8-9 by addition of ammonia or acetic acid

Flow rate: 1.5 ml per minute



Detection: UV at 254 nm

Sample and standard solutions: All materials are dissolved in mobile phase to give an approximate concentration of 1 mg per ml

Injection volume: 1 to 5 ul by syringe or loop injector

Quantitation: By peak area, external standard method

Reference: Recommended Methods for Testing Illicit Ring-substituted Amphetamine Derivatives, UNDDND, ST/NAR/12, United Nations (New York) 1987.

RESULTS

Capacity ratios (K' values)

<u>COMPOUND</u>	<u>NORMAL PHASE</u>	<u>REVERSE PHASE</u>
Methaqualone	0.2	5.14
Mecloqualone	-	6.08
Caffeine	0.2	1.06
Cocaine	2.8	7.94
Diazepam	0.1	9.92
Diphenhydramine	3.3	13.83
Heroin	3.0	4.28

### G. Infrared Spectroscopy

In some countries, confirmation of identity by spectroscopic means is required. Theoretically each substance has a unique infrared spectrum and this method would permit the unequivocal identification of methaqualone and mecloqualone. With licit samples, however, a prior separation and isolation of the drug in a pure form free from pharmaceutical excipients and, in some cases, free from other drugs is essential. With samples from clandestine laboratories, adulterants, starting materials, intermediates and by-products may also be present.

For powders, considered from prior chromatographic analysis to be reasonably pure, the infrared spectrum of the powder may be run directly in a KBr disk for comparison with those of the methaqualone or mecloqualone free bases or HCl salts. For tablets, capsules and powders suspected to be mixtures, the extraction procedure outlined in section III B above is suitable for liberating the free base in a pure form. Because of the possibility of solvate formation, the analyst should carry the reference substance through the identical extraction procedure.

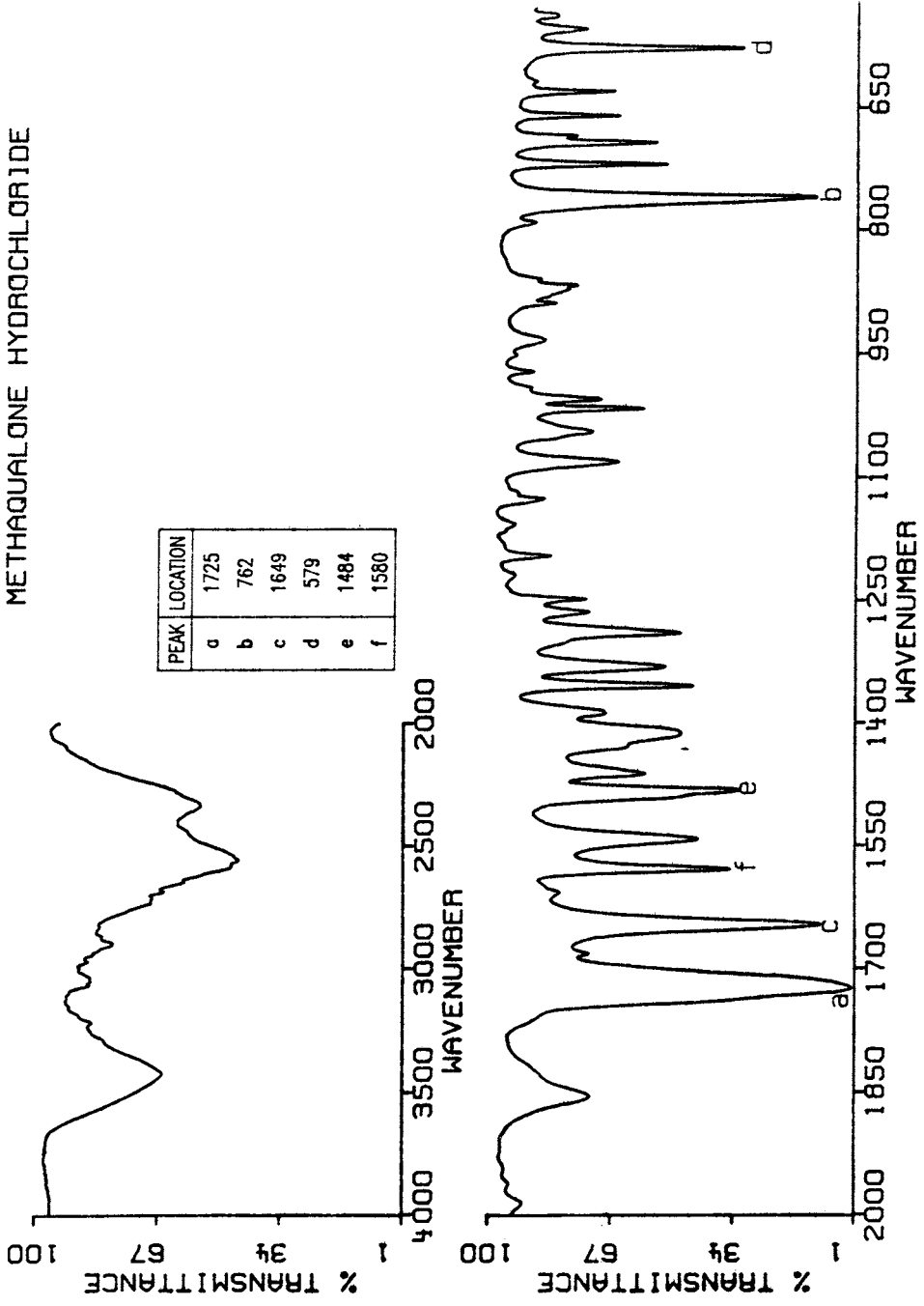
#### METHOD

For a description of the standard halide disk method, see previous manuals in this series.

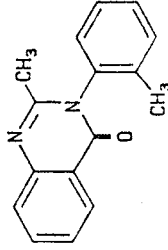
#### RESULTS

To assist in identifying methaqualone/mecloqualone, significant absorption bands are indicated on the attached spectra of the pure reference substances. The intensities, however, may vary from sample to sample. Differences in the absorption bands in the region of  $1200-1000\text{ cm}^{-1}$  may be used to distinguish methaqualone from mecloqualone.

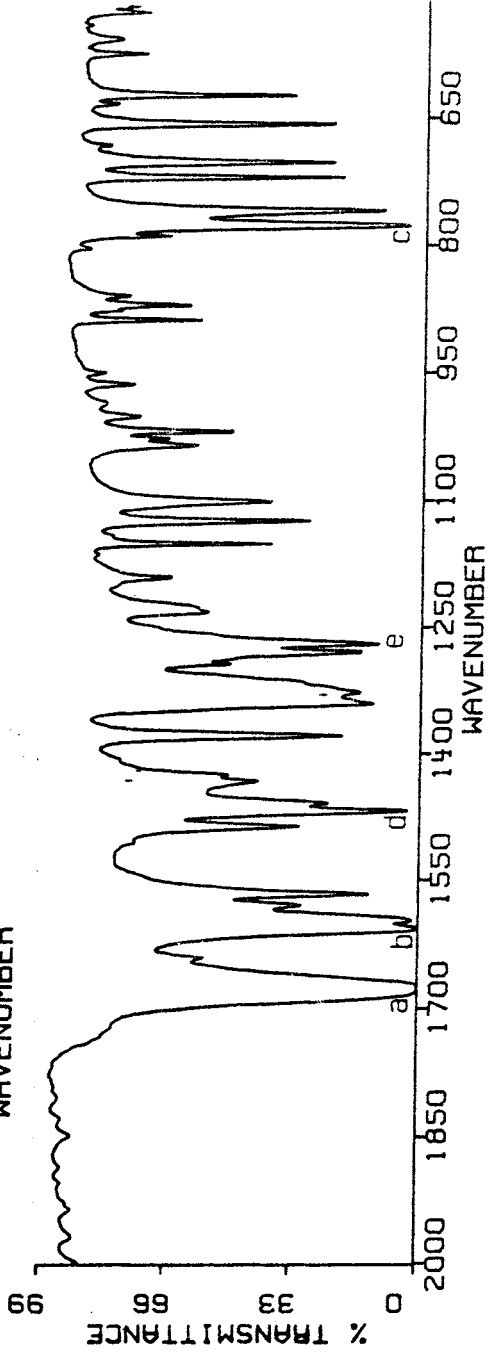
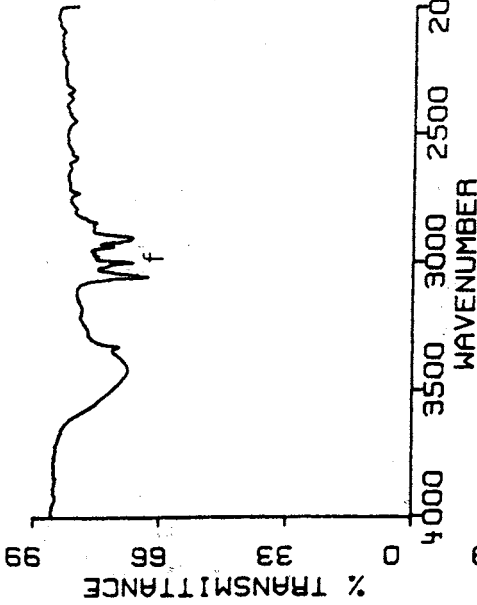
METHAQUALONE HYDROCHLORIDE



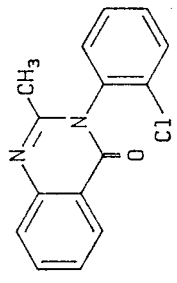
# METHAQUALONE



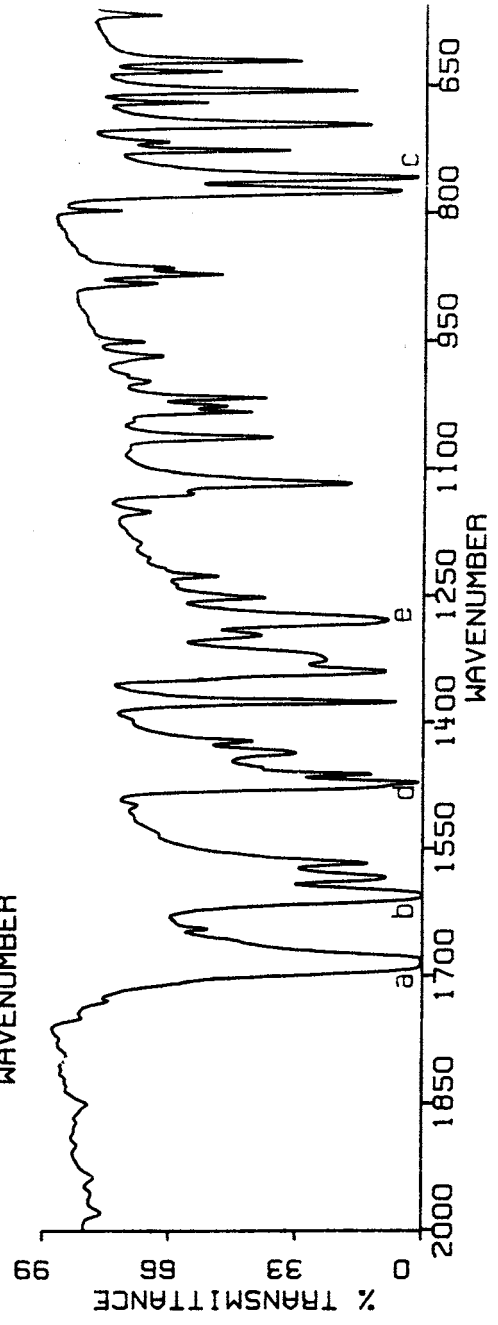
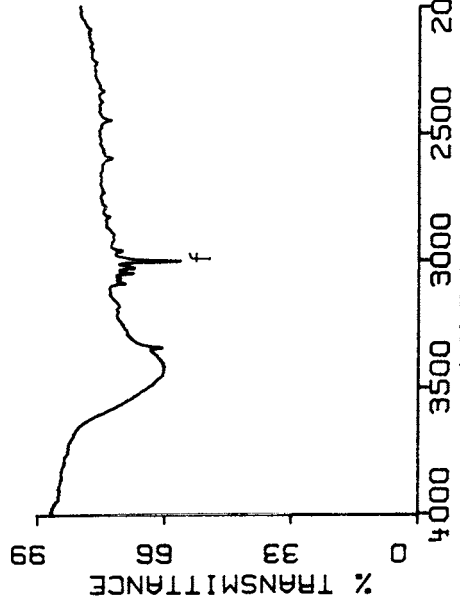
PEAK	LOCATION
a	1676
b	1609
c	778
d	1469
e	1271
f	3012



MECLOQUALONE



PEAK	LOCATION
a	1683
b	1607
c	760
d	1473
e	1280
f	3009



H. Analysis of methaqualone/mecloqualone impurities

Since the majority of exhibits is from diverted pharmaceutical grade material, the analysis of impurities/adulterants is not of prime importance. However, analysts encountering illicitly produced material, may find in the following references useful information on methodology for the analysis of methaqualone/mecloqualone analogs, isomers, precursors and reaction by-products.

References:

1. Journal of the Association of Official Analytical Chemists 60 (1977), pp. 935-939.
2. Journal of Forensic Sciences 26 (1981), pp. 793-833.
3. Journal of Forensic Sciences 30 (1985), pp. 1022-1047.
4. Journal of Forensic Sciences 33 (1988), pp. 1035-1044.