

**ADVISORY COUNCIL ON THE MISUSE OF DRUGS**  
**Home Office, 2 Marsham Street, London SW1P 4DF**

December 2005

Rt Hon Charles Clarke MP  
The Home Office  
2 Marsham Street  
London SW1P 4DF

Dear Home Secretary

On 1 March 2005 the then Minister responsible for drugs, Caroline Flint, asked the Advisory Council on the misuse of Drugs to consider any evidence on Khat, including two pieces of research commissioned by the Home Office and carried out by Turning Point and NACRO.

She asked the council to assess the detrimental effects of Khat use, but with a particular awareness of the cultural and social sensitivities relating to its use.

I have the pleasure of enclosing the Council's report and recommendations on Khat use in the UK. It has been prepared following a detailed consideration of evidence by a specially formed working group of the Council, and with the advice and contributions of a number of experts.

On the basis of the evidence, the Council recommends that Khat is not controlled under the Misuse of Drugs Act 1971. Use of the substance is very limited to specific communities within the UK, and has not, nor does it appear likely to, spread to the wider community. However, that is not to say that use of Khat is without detrimental effects and its use should be discouraged.

In keeping with this view, the Council makes a number of other recommendations relating to educating and informing users and potential users of the harms associated with Khat use, ensuring effective advice and treatment is available, and restricting supply to children.

Yours sincerely



**Professor Sir Michael Rawlins**  
**Chairman**

Advisory Council on the Misuse of Drugs  
(ACMD)

# **Khat (Qat): Assessment of Risk to the Individual and Communities in the UK.**

# CONTENTS

	Page
<b>1. Introduction</b>	<b>4</b>
<b>2. UK Drug Situation</b>	<b>6</b>
i. Legal status	
ii. Prevalence	
iii. Distribution	
iv. Use and cost	
<b>3. Khat Use Around the World</b>	<b>11</b>
i. Africa and the Middle East	
ii. Europe	
iii. USA and the rest of the world	
<b>4. Import and Export of Khat</b>	<b>13</b>
i. Import and export to and from the UK	
ii. Legal status in other countries	
iii. The link to organised criminal networks	
<b>5. The Pharmacology of Khat</b>	<b>16</b>
i. The active ingredients	
ii. Pharmacokinetics and pharmacodynamics	
iii. Mechanism of action	
iv. Related drugs	
<b>6. Harmful Effects of Khat</b>	<b>18</b>
i. Effects on families and communities	
ii. Psychiatric sequelae	
iii. Khat dependence and use of other drugs	
iv. Cardiovascular effects	
v. Oral cancers	
vi. Khat use during pregnancy and male reproductive health	
vii. Other medical complications	
<b>7. Treatment and Prevention of Khat Use</b>	<b>26</b>
i. Public health measures	
ii. Treatment of dependence	
<b>8. Recommendations</b>	<b>28</b>

# 1. Introduction

## 1.1

Khat is a herbal product consisting of the leaves and shoots of the shrub *Catha edulis* (Fig 1). It is cultivated primarily in East Africa and the Arabian Peninsula, harvested and then chewed to obtain a stimulant effect. There are many different varieties of *Catha edulis* depending upon the area in which it is cultivated. Khat use has been reported for centuries, there are Arab reports that it was being used in Yemen in the sixth century. Ethiopians may have brought it to Africa after conquering Yemen, and its use spread from here in the fifteenth century. Khat first came to the attention of the non-Arabic world in 1775 when its use was characterised by European botanists visiting Yemen<sup>1</sup>. It is known by a variety of different names (see box 1).

Fig1: The *Catha edulis* shrub.



Box 1: Some terms for khat:

Mirra	Qat	Catha	Bushman's tea
Jaad	Herari	Tschat	Flower of paradise
Kaad	Chat	Tohai	Abyssinian tea
Qaat	Gat	African salad	Tea of the Arabs

## 1.2

Khat is currently imported and used legally in the UK. In February 2005 the Minister Responsible for Drugs asked the Advisory Council on the Misuse of Drugs (ACMD) to advise the government as to the current situation in the UK and the risks associated with khat use. This document is a review of the scientific evidence reporting levels of khat use, risks and current treatment options. Scientific papers quoted in this report were identified by Pub Med, cross referencing missing references from the bibliographies of relevant papers and from personal communication by the experts who have presented to the ACMD Khat Working Group.

## 2. UK drug situation

### Legal Status

#### 2.1

Khat is not currently controlled under the Misuse of Drugs Act 1971 but the two main psychoactive component chemicals, cathinone and cathine, are classified as Class C drugs under the Act (see box 2). An offence is committed if cathinone or cathine are extracted from the plant. This offence has been identified but there have been no successful prosecutions to date. Khat is licensed as a medicinal product under the Medicines Act 1968. To date khat has never been imported as a medicinal product. It can be also be imported to the UK legally when declared as a vegetable.

Box 2: The classification of drugs, in Schedule 2 of the 1971 Misuse of Drugs Act, is based on the harm they cause:

**Class A:** (most harmful) includes cocaine and heroin

**Class B:** (intermediate category) includes amphetamines and barbiturates

**Class C:** (least harmful) includes cannabis, anabolic steroids and benzodiazepines

### Prevalence

#### 2.2

One of the main epidemiological tools for monitoring drug use in England and Wales, the British Crime Survey, does not report on khat use. There is no evidence of khat use in the general population, all the epidemiological data available have reported on communities in which khat use is prevalent, ie the Somali, Ethiopian, Kenyan and Yemeni communities.

#### 2.3

The Home Office commissioned a report by the National Association for the Care and Resettlement of Offenders (NACRO) to characterise khat use in Somali communities around the UK<sup>2</sup>. Researchers conducted 602 interviews using privileged access interviewers in four cities in England. Of the total sample, 39% had used khat at some time, 34% had used khat in the month prior to interview and less than 4% admitted to using on a daily basis. Of the 235 people who identified themselves as having ever used khat, 81% were male. A similar study interviewed 207 Somalis living in London<sup>3</sup>. In this study 78% of the overall sample had ever used khat, 67% had used in the week prior to interview and 6% were using khat on a daily basis. The difference in the studies is most likely due to the sex ratio, with 73% of the latter sample being male compared to 54% in the former study. Both studies report more use of khat by males.

## 2.4

A report by Turning Point <sup>4</sup> interviewed 23 men and 22 women in the UK from Somali, Ethiopian and Yemeni communities. 82% of the sample had ever used khat, 60% identified themselves as current users and 26% reported that they used most days. High levels of use were also reported in a study of young people from the Somali community in Sheffield <sup>5</sup>. Nearly half the 97 participants reported chewing khat in the week prior to interview and 32% admitted using on a daily basis. A large survey by the Centre for Ethnicity and Health, University of Central Lancashire <sup>6</sup> reports that 37% of all respondents who identified themselves as 'Black African' were current users of khat. This number rose to 60% in those who identified themselves as 'Middle Eastern'.

## 2.5

There is little data on the different age groups and khat use. The mean age in the NACRO study <sup>2</sup> was 36 years. For recent users (used within a month of the survey) the mean was 39 years and for non-users 34 years, suggesting that khat use is more prevalent amongst middle-aged persons.

## 2.6

None of the studies above use random sampling techniques. Khat chewers were more likely to be sampled and thus the extent that these findings can be generalized to the communities studied is limited. It is apparent that khat use is widespread in the communities mentioned but almost unknown outside of these ethnic groups.

## **Distribution (Fig 2)**

### 2.7

Khat imports arrive daily via European airports (mainly England and The Netherlands) and there is an efficient distribution network to the khat using communities across the UK. Most users buy khat at the *mafresh* <sup>footnote<sup>1</sup></sup>, a meeting place where khat is bought and chewed. As the trade in khat is a legitimate business, it is quite distinct from the trade in illegal drugs.

### 2.8

*Mafreshi* are subject to health and safety requirements as they are public areas where khat is sold but many are unknown to the local authorities. Khat can also be bought at small shops within the ethnic community to be used alone at home or with friends. An alternative supply of khat is via 'mobile traders', these people sell khat from the back of a car or van on the street.

## **Setting and cost**

### 2.9

Men tend to use in groups, often at the *mafresh*. *Mafreshi* proprietors often sell soft drinks and cigarettes alongside khat. A proportion of khat users survey in the NACRO report (10%) chew daily, most use once (26%) or twice

---

<sup>1</sup> Sometimes spelt mufrage or mafrish.

(24%) a week <sup>2</sup>. The majority of khat users (60%) chewed 1 or 2 bundles of khat in an average chewing session, and an average session lasted 6 hours (range 1-20 hours). A bundle (Fig 3) is an inexact measure of khat use but is approximately 250g of the plant *catha edulis*, including the stalks and leaves. A bundle of khat typically sold in a *mafresh* costs about £3-5 (Axel Klein, DrugScope –personal communication).

Fig3: A bundle of khat.



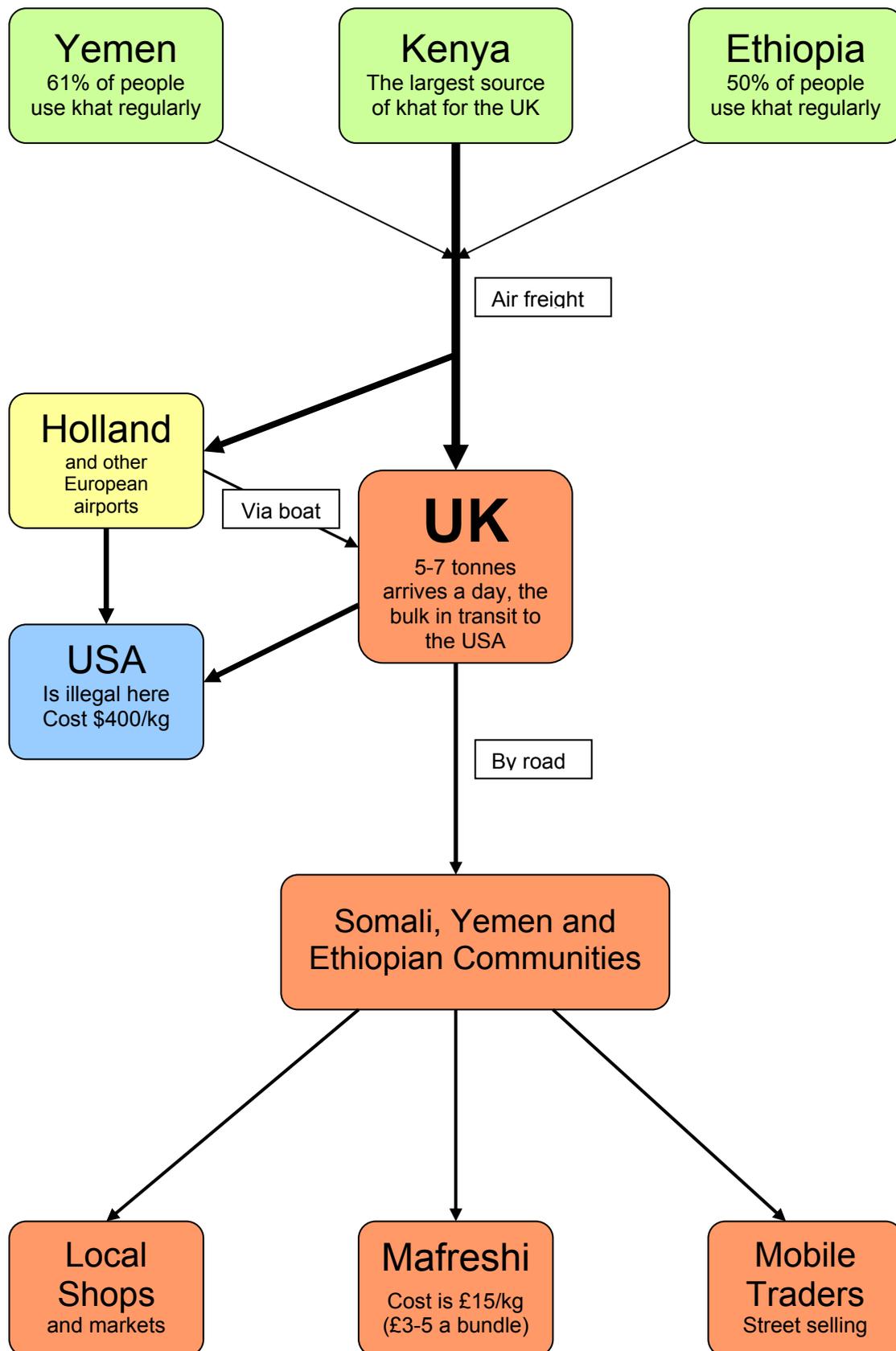
## 2.10

There is a social stigma surrounding the use of khat by Somali women <sup>2</sup>. A significant difference between women and men in terms of using khat on their own was found; 65% of women who currently chewed, used on their own compared to 34% of male users. Only a small proportion (9%) of current khat users chewed in mixed sex groups. There were no significant differences between frequency of khat use, number of bundles used and length of chewing session. Interestingly, both men and women reported using for enjoyment and to socialise as the most frequent reason to chew (65% of men and 62% of women).

## 2.11

Women were much less likely to report that people within their family were aware of their khat use<sup>2</sup>. Women were more likely than men to report difficulty in affording khat (38% and 20% respectively) and were more likely to report wanting to stop using khat (50% and 27%). Furthermore one study found that women are more likely report spending over £150 per month on khat (7%) than men (2%)<sup>6</sup>.

Fig 2: The distribution network of khat from a UK perspective.



### 3. Khat use around the world

#### Africa and the Middle East.

##### 3.1

Khat chewing is common in the countries of the horn of Africa (Ethiopia, Somalia, Somaliland, Kenya, Eritrea, Djibouti and Uganda), and across the Arabian Sea into Yemen and Saudi Arabia. Khat chewing is a legal pastime and part of the social and cultural fabric in these countries. Population data quantifying the levels of khat use is varied. The situation is further hampered in Somalia due to the catastrophic civil war. The only reliable published evidence of khat use in Somalia sampled 4,854 people randomly, 31.3% of whom admitted using khat in the week prior to interview<sup>7</sup>. No data of lifetime prevalence or variations between the sexes are given.

##### 3.2

A large survey of 10,468 adults in rural Ethiopia reports that 55.7% of the sample had used khat at sometime in their lives, and that 50% were current users<sup>8</sup>. Among current chewers 17.4% reported using on a daily basis. Khat use correlated with Muslim religion (80% of current chewers used it to gain concentration for prayer), high educational achievement and tobacco smoking. A smaller survey of 1,200 adults in a similar area estimated 31.7% of the population as current khat users<sup>9</sup>. A small survey (n=181) of University teachers in Ethiopia found that 21% were current users of khat, this contrasted to 13.3% that smoked cigarettes<sup>10</sup>.

##### 3.3

Khat use is also reported in Kenya, a small survey found it was the third most common drug used after alcohol and tobacco<sup>11</sup>. Among 90 juveniles attending court in Nairobi it was the fifth most common drug with 5.6% of respondents reporting use<sup>12</sup>. A study sampling 181 adults in Uganda found 31.5% lifetime khat use and 20.4% current users, there was a correlation between khat use and tobacco smoking. It appears that khat use is less prominent in these countries.

##### 3.4

Khat chewing is common in Yemen. A study of 800 adults in an urban setting found lifetime use rates of 81.6% in men and 43.3% in women<sup>13</sup>. Current adult users of khat were estimated at 61.1% in a large survey of 2500 people in Yemen<sup>14</sup>. No published data detailing rates of khat use in Saudi Arabia were found.

##### 3.5

In summary rates of khat use appear high in Somalia, Yemen and Ethiopia. Khat use appears less prevalent among the Somali community living in the UK than the population living in Somalia.

## **Europe**

### **3.6**

There is no published evidence as to the rates of khat use in other European countries. A report from Italy describes khat use as being a common pastime amongst the Somali community in Rome <sup>15</sup>. It is likely khat is available throughout European cities where there are Yemeni and Somali communities.

## **The rest of the world**

### **3.7**

There are no published epidemiological data on khat use in the United States of America. However reports on the US Drug Enforcement Agency website ([www.usdoj.gov/dea](http://www.usdoj.gov/dea)) report that khat seizures increased from 17.6 metric tons in 1996 to 37.2 metric tons in 2001 indicating substantial amounts of khat are consumed in the US. Khat was controlled under the Canadian Controlled Drugs and Substances Act in 1997 but again use seems confined to immigrant communities that chew khat in their country of origin <sup>16</sup>.

### **3.8**

There is clear evidence that khat use is widespread in the Horn of Africa and the Arabian peninsula. However there is no evidence of khat use spreading beyond the peoples from these regions in the countries they have settled in.

## 4. Import and export of khat

### Import and export to and from the UK

#### 4.1

Khat is imported from the khat growing regions of Kenya, Ethiopia and Yemen. The UK is a major destination for imports and exports of khat onto other countries in the world. In the first 6 months of 2005 there were imports each day of approximately 5-7 tonnes from Kenya, 500kg from Ethiopia and 175 kg from Yemen (equates to roughly 25000 bundles or doses), the bulk of which was held in transit for export to the US (Joe Onofrio –personal communication). Khat arrives packaged in boxes with 50-100 bundles of khat wrapped in banana leaves inside (Figs 4&5) It is clear that the UK is a conduit for the distribution of khat to other countries in the world where it is illegal.

Fig 4: Bundles of khat wrapped in banana leaves packed into a box.



Fig 5: Bundles of khat unwrapped.



#### Legal status in other countries

##### 4.2

Khat has a varied legal status across Europe. Most countries include cathinone and cathine, the main active chemical constituents of khat, under drug misuse legislation and they are listed in the UN Convention on Psychotropic Substances 1971. In response to an enquiry as to whether khat is controlled; France, Germany, Ireland, Italy, Finland, Sweden, Denmark and Slovenia responded positively. Greece, The Netherlands, Malta, Cyprus, The Czech Republic and Portugal reported that the plant *catha edulis* was not controlled.

##### 4.3

Khat is illegal in the United States of America, cathinone is a Schedule I drug (the same as heroin and cocaine), and cathine is a Schedule IV drug. Reports on the US Drug Enforcement Agency website ([www.usdoj.gov/dea](http://www.usdoj.gov/dea)) indicate that khat seizures increased from 17.6 metric tonnes in 1996 to 37.2 metric tonnes in 2001 (equivalent to 150000 bundles or doses). Khat was controlled under the Canadian Controlled Drugs and Substances Act in 1997 but again use seems confined to immigrant communities that chew khat in their country of origin<sup>16</sup>. Khat is considerably more expensive in North America than in those countries where it remains a legal drug: in the US street value is \$400 per kg and in the UK £16 per kg (Joe Onofrio –personal communication).

## **The link to organised criminal networks**

### **4.4**

There is no specific evidence linking khat use, distribution or selling networks to serious organised crime in the UK from published media or any of the law enforcement agencies that presented information to the ACMD Khat Working Group.

### **4.5**

It is clear that khat dealing in the UK is a low profit business. If khat becomes more expensive due to criminalisation there is the potential for exploitation by organised criminal gangs already involved in the trade of illegal drug.

## 5. The pharmacology of khat

### The Active Ingredients

#### 5.1

Fresh leaves of khat contain the alkaloid stimulants **cathinone** (S-(-)- $\alpha$ -aminopropiophenone) and **cathine** (S,S-(+)-norpseudoephedrine) in addition to more than 40 alkaloids, glycosides, tannins and terpenoids. The amount of cathinone in fresh khat has shown to range from 78-343mg/100g<sup>1</sup>. However a recent study isolated 1140mg/100g of cathinone from a sample of khat that was confiscated and stored at -20°C before being analysed<sup>17</sup>. The stored product loses activity rapidly, becoming physiologically inactive after about 36 hours. Cathinone and cathine are controlled substances under Class C of the UK Misuse of Drugs Act 1971.

### Pharmacokinetics and pharmacodynamics

#### 5.2

Cathinone and cathine are isolated from the leaves of the *catha edulis* plant by the action of enzymes in saliva. Chewing khat has been shown to be an efficient way of extracting cathinone and cathine; four non-drug using volunteers chewing an average of 44g khat for 1 hour managed to extract an average of 90% of the available cathinone and 89% of cathine. The average maximal plasma concentration of cathinone (Tmax) occurred at 2.3 hours and at 2.6 hours for cathine (Toennes *et al*, 2003). A study in six subjects chewing a single amount of khat corresponding to 0.8mg/kg body weight showed maximal plasma concentration of cathinone to be 2 hours<sup>18</sup>. Terminal elimination half life for cathinone in the former study was 1.5 hours and in the later 4.3 hours. The terminal elimination half life for cathine was over 5 hours.

#### 5.3

Drugs that have a fast onset of action have a high addictive potential. Although chewing khat is an efficient way to extract the active ingredients, it takes a long time to reach maximal plasma levels and hence khat has less reinforcing properties than other stimulants such as amphetamine and cocaine.

### Mechanism of action

#### 5.4

Drugs of abuse are thought to exert their reinforcing properties by increasing concentrations of the neurotransmitter dopamine in specific regions of the brain. There is evidence from animal studies that cathinone causes dopamine release (see paragraph 6.22) and also the release of neurotransmitters at serotonergic (5-HT) synapses and peripheral noradrenergic sites<sup>19,20</sup>. These biochemical properties are similar to those of amphetamine, especially its sympathomimetic properties. Chronic administration of khat extract or cathinone caused a depletion of serotonin in the basal ganglia of rat brain<sup>21</sup>. The authors suggest that low levels of serotonin and possibly the release of

dopamine produced by cathinone may be the mechanism for an increase in aggressive behaviour measured in the laboratory animals.

### **Related drugs**

#### **5.5**

As mentioned above amphetamine causes similar neurochemical responses as khat. However the subjective responses experienced in response to taking amphetamine are much more dramatic than those of khat. Methcathinone, sometimes known as ephedrone, is a synthetic chemical that has a similar structure to that of cathinone. It can be made in illegal laboratories and is sometimes taken as an alternative to methamphetamine; ephedrine and pseudoephedrine are the main pre-cursor chemicals. Methcathinone has been reported to increase levels of serotonin by inhibiting the serotonin uptake transporter <sup>22</sup>. The effects of Methcathinone are reported to be more intense than those of khat.

## 6. Harmful effects of khat

### Effects on families and communities

#### 6.1

Several respondents in the NACRO and Turning Point reports cited khat use as causing problems for the family<sup>2,4</sup>. Women were more likely than men to report that khat use was responsible for family breakdown and violent behaviour. Furthermore some felt that their partners spent too much money on khat and it hampered their employment prospects. A small proportion of people (75 out of 602 or 12%) felt they were personally affected by another persons khat use, 10 reported they had experienced their partner's mood swings due to khat and 10 people said that use of khat had a negative impact on the extended family<sup>2</sup>.

#### 6.2

Families and communities have expressed mixed concerns and attitudes in relation to the impact of khat use for their communities, families and carers. Some have reported a belief that khat has a severe negative impact on the economic, health and social requirement of Somali, Yemen and Ethiopian communities. However there is also a viewpoint that Khat is an important part of the culture, particularly in relation to social occasions such as weddings, funerals, parties and religious ceremonies.

#### 6.3

The opinion that khat use was a factor in the breakdown of families has emerged in several surveys of khat using communities<sup>2,4,6</sup>. Specifically the time and money spent on chewing khat was cited as a source of contention between spouses. Male family members who spend a lot of time using khat were seen as having an impact on families, in particular causing wives and children to become isolated from the family network. Women as users are often reported as the hidden population either using in isolation in the home or as a group of women in isolation from others. Women as mothers and partners have sighted khat as causing considerable harm to their families including family breakdown and relationship problems, saying that they are unable to afford household essentials such as food and clothes due to prolonged khat use.

#### 6.4

Very low offending rates were reported in the NACRO report<sup>2</sup>. Of the three individuals who reported having committed violence, all were recent khat users. There does not appear to be a link with acquisitive crime. The rates detected are particularly low considering the financial status, social situation and location of many of the khat using communities.

#### 6.5

There is one published report of a man detained for driving under the influence of drugs and alcohol in the UK<sup>23</sup>. The detainee's co-ordination was noted to be good, but he was euphoric, had a short attention span and was

easily distracted. In forensic medical examiners opinion he was impaired through alcohol and drugs under Section 4 of the road traffic act.

#### 6.6

In Frankfurt, Germany a case series of 19 incidents of drivers detained whilst under the influence of khat has been published<sup>24</sup>. Blood and urine samples were collected and analysed and an assessment as to driving ability made. In 3 of the cases was driving felt to be impaired, although it was noted that there was marked impairment of 'psychophysical functioning' in 10 cases; including slow pupil reactivity, dry mouth, and increased heart rate. In the most impaired case no cathinone was detected in the plasma, and there was no correlation between impairment and plasma levels of cathinone and cathine. In fact of the 9 cases where plasma levels were highest, impairment was said to be slight or imperceptible. It was noted that in only 3 cases did the toxicology reveal another substance was also taken; twice this was cannabis and once an opioid. It was noted that this was unusual for driving cases and reflected the different nature of khat use from other drugs of abuse.

#### 6.7

In summary there is some evidence that khat using can be seen as a strain in family relationships. However it is impossible to say that a person's khat use is the cause of family disruption, or just a convenient scapegoat for it. There is little evidence that khat using fuels acquisitive crime in the way that heroin and crack use does. Khat users do not appear to use other drugs of abuse, a situation possibly helped by its legal status. Users are not criminalised and do not have to come into contact with dealers who sell a range of illicit drugs. It is possible that intoxication with khat may impair driving in some cases, but from the available evidence it seems that using khat alone causes very little impairment in an individual's ability to drive.

### **Psychiatric sequelae**

#### 6.8

Users of khat report increased levels of energy, alertness, self-esteem, sensations of elation, enhanced imaginative ability and capacity to associate ideas when chewing. However over stimulation of the central nervous system can lead to psychiatric disorders and there are case reports of people developing psychosis after use of khat<sup>25,26</sup>. Unfortunately as yet there are few controlled studies investigating the possibility of a causal link between khat use and psychosis.

#### 6.9

A recent study surveyed 4,854 inhabitants of Hargeisa, a city in Somalia involved in the civil war, for the presence of psychiatric morbidity<sup>7</sup>. Unusually high levels of psychiatric morbidity were found (8.4% severely disabled) with a high male to female ratio (7.7 men to 1 woman). Those who displayed positive psychiatric symptoms had an earlier age of onset of khat use and used greater quantities of khat (2 or more bundles a day). However those who were former combatants also displayed a higher vulnerability to psychiatric symptoms. There was also an association between the experience of

traumatic events, amount of khat use and psychosis. It is likely that the combination of trauma, psychosis and khat use is linked, although it is not possible to determine cause and effect.

#### 6.10

A study in Yemen investigated the prevalence of psychiatric symptoms in a sample of 800 people <sup>13</sup>. Although khat use was prominent in the population studied (81.6% of men and 43.3% of women), there was no association with use and psychiatric symptoms as measured by the rating scale Symptoms Checklist-90. In fact use of khat appears to be inversely associated with phobic symptoms.

#### 6.11

The clear differences between the studies can be explained in several ways. Khat use in both countries is a culturally accepted practice. However khat use by combatants to avert tiredness and fear is very different to the usual practice of use in a social setting as surveyed in the Yemeni population. It is likely that the change in the reasons, quantities and frequency of khat use and the traumatic environment it is used in may contribute to development of psychosis. The studies quantified psychiatric distress in different ways and the populations studied were subtly different.

#### 6.12

Mood effects have been associated with khat use. The NACRO report asked respondents about the health effects of their khat use <sup>2</sup>. Of recent khat users, 65% reported sleeping problems, 51% reported loss of appetite and 53% reported feeling tired and depressed upon waking after a day using khat. Although the above are symptoms of depression they are also commonly seen as a consequence of stimulant use.

#### 6.13

A study in Yemen asked healthy volunteers to chew khat for 3 hours for 3 days and abstain for 7 days and measured mood after each period of time <sup>27</sup>. Subjects chewing khat reported significantly lower mood than when they abstained. However in this study the researchers and subjects were aware of the treatment session (i.e. were not blind), there was no control chewed plant matter, subjects were using out of their usual context, and were asked to chew daily.

#### 6.14

In summary it is evident that khat use is widespread amongst communities in East Africa and the Middle East and here it causes little morbidity. However khat may contribute to psychiatric morbidity in those vulnerable through traumatic life experiences. Unfortunately many of those settled in the UK from khat using communities may have suffered such trauma and are subject to considerable stress during the process of immigration to a new country and culture. Khat use outside its usual social context may further contribute to this problem. There is little published literature on the link between psychosis and khat use in the UK, however anecdotal evidence suggests a link is possible.

## **Khat dependence and use of other drugs**

### **6.15**

Dependence on drugs or alcohol is defined as a syndrome of symptoms by ICD-10, an international manual for the classification of mental disorders. Khat is included as 'other stimulants, including caffeine'. A diagnosis of dependence can be made if three or more symptoms have been experienced at some time in the year preceding assessment (see box 3). A person may use a substance for many years without becoming dependent if use does not result in harm and they are in control of their drug use.

Box 3: ICD-10 criteria for dependence (simplified):

1. A strong desire or compulsion to take the substance
2. Difficulties in controlling substance-taking behaviour
3. Physiological withdrawal state upon cessation of substance use
4. Evidence of tolerance to a substance
5. Neglect of alternative interests due to time spent using the substance
6. Persisting with substance use despite evidence of harmful consequences

### **6.16**

The mesocorticolimbic dopamine system is key in the ability of an organism to learn by mediating the action of rewards<sup>28</sup>. Addictive drugs such as opiates, alcohol, cocaine and amphetamines act by stimulating this system, which is more usually activated by natural rewards (food, liquids and sex). It has been suggested that the ability of drugs of abuse to circumvent the usual negative feedback in this system may be responsible for the phenomena of craving and the increased salience of drug-related stimuli<sup>29</sup>. If the same is true of khat this would indicate a dependence potential.

### **6.17**

Studies in rats have shown that animals will self-administer oral khat extract and cathinone in a dependent fashion, with evidence of development of tolerance<sup>30</sup>. Furthermore cathinone causes an increase in the level of dopamine in a dose dependent manner, although at a lesser magnitude than amphetamine<sup>31</sup>. As with amphetamine and cathinone, khat produced a long lasting behavioural sensitisation in rats, in addition animals chronically dependent upon khat extract showed a decrease in levels dopamine in the basal ganglia<sup>32</sup>.

#### 6.18

There is very little research evidence of khat dependency in humans. An exploratory study of 75 male khat users in the UK showed that 39% scored highly on the severity of dependence scale, indicating a possible dependency<sup>33</sup>. Only 6% of the sample reported evidence of psychological dysfunction on the GHQ-12 scale. Subjects were not assessed by a psychiatrist using operational criteria (such as ICD-10), so a robust diagnosis of dependence can not be ascribed.

#### 6.19

In the NACRO report some subjects reported they would do 'whatever was necessary' to get a supply of khat if they ran out. However by far the majority reported they would 'go without' (44%) or 'do other things' (40%), only 4% of respondents said they would drink alcohol or use other drugs<sup>2</sup>. Asked if recent users thought their khat use was out of control, 5% of men and 15% of women responded in the affirmative, 27% and 50% respectively expressing a desire to stop using khat. In other surveys of the Somali community, the problems of escaping trauma in Somalia and the difficulties of adapting to life in the UK are thought in some cases to contribute to using khat in a dependent fashion<sup>34</sup>.

#### 6.20

Due to cultural and religious factors very few respondents from the Somali community report drug or alcohol use. In the NACRO report only 6 of the 602 interviewees reported cannabis use, 7 reported alcohol use and none reported use of any Class A drugs<sup>2</sup>. Nicotine was commonly used at the same time in social khat chewing sessions.

#### 6.21

In summary it seems likely that khat use has the potential to develop into dependency. However it seems this is much less likely than dependency on stimulants such as amphetamine and more like the type of dependency seen with caffeine. The vast majority of people who chew khat do not use in a dependent fashion and there is no evidence of more widespread drug misuse amongst khat users.

### **Cardiovascular effects**

#### 6.22

All abused central nervous system stimulants also stimulate the cardiovascular system. In normal non-khat using volunteers, chewing khat leads to a significant increase in systolic and diastolic blood pressures persisting for between 3 and 4 hours after the onset of chewing (Toennes *et al* 2003; Widler *et al* 1994). No change in heart rate was found in either study. Other studies have found the same increases in blood pressure but also significant increases in heart rate<sup>35,36</sup>. There is evidence that tolerance develops to these sympathomimetic effects in chronic users<sup>37</sup>.

### 6.23

There is some evidence that khat use is associated with acute myocardial infarction (MI). A case-control study in Yemen looked at 100 adults presenting with MI<sup>38</sup>. Khat chewing was significantly associated with MI in a dose dependent relationship. Chewing the large quantities of khat, daily and in longer sessions had a causative association with developing an MI. However the results must be viewed with caution as there was some demographic discrepancy between the case and control group. Furthermore it is difficult to disentangle khat use from tobacco smoking as this was also higher in the case group social khat use and smoking are often combined.

### 6.24

An earlier study found that in those suffering from an MI, khat use was associated with earlier age at presentation<sup>39</sup>. Khat users reportedly had an increased desire to smoke tobacco. Animal studies have indicated that cathinone has vasoconstrictor properties and it is this that may contribute to, or precipitate myocardial infarction<sup>40</sup>.

## **Oral cancers**

### 6.25

There is evidence of a high level of oral cancers in countries in which khat is widely consumed<sup>41</sup>. However it is difficult to isolate the contribution of khat to development of cancer in epidemiological studies as many people also use tobacco or alcohol, two substances that are established as risk factors for the development of oral and pharyngeal cancers. Pre-clinical research suggests that khat is more likely than residual pesticides to be responsible for this increased incidence (see below).

### 6.26

The potential of khat to induce cancerous changes has been investigated *in vitro* using human cell lines<sup>42,43</sup>. Khat extract, cathinone and cathine individually or in combination induced cell death by apoptosis. Animal research has shown that khat extracts induces structural chromosomal changes in cells that are seen in the development of cancers<sup>44</sup>.

### 6.27

In humans potential pre-cancerous changes in the mouths of khat chewers have been demonstrated. A large study of 2500 Yemeni men showed that khat chewing was associated with keratotic white lesions in the mouth<sup>14</sup>. Furthermore the development of a lesion was related to the side of the mouth in which an individual chewed khat and increased in incidence in those using the most frequently and for the longest period of time. Khat chewers showed more genetic damage in buccal mucosa cells when compared to non-chewing controls, this change was not seen in bladder cells<sup>45</sup>.

## **Khat use during pregnancy and male reproductive health**

### **6.28**

Animal data have revealed some potentially harmful effects of khat use in pregnancy. Extracts of khat given to pregnant rats was associated with reduced maternal food consumption, a reduction in litter size and reduced foetal growth<sup>46</sup>. Some visceral and skeletal malformations were noticed at the highest dose of khat suggesting a teratogenic effect.

### **6.29**

A large study of 1,141 pregnant mothers in Yemen showed that khat chewing mothers were older and had a greater number of pregnancies than non-khat using mothers. The khat chewing mothers had more low birth weight babies than non-chewers but there was no difference between the groups in stillbirth or congenital abnormalities<sup>47</sup>. There is one report of a pregnant woman developing tachycardia, hypertension and chest pain after a khat chewing session<sup>48</sup>. However there are no other published data of any adverse incidents associated with khat chewing during pregnancy.

### **6.30**

One of the chemicals isolated when khat is chewed, cathine (nor-pseudoephedrine) has found to be excreted in the breast milk of khat chewing mothers<sup>49</sup>. However it is not known if cathine is excreted in sufficient amounts to have an effect on a breast feeding infant or if it is harmful to children. However there are no published data on developmental delay in the children of khat using mothers.

### **6.31**

In summary, khat chewing may have an impact on foetal birth weight. However there is no published evidence that it causes teratogenic effects in humans. In light of this and evidence of cathine excreted in breast milk it would be prudent to advise pregnant and lactating women to avoid chewing khat.

### **6.32**

In men there is evidence that khat chewing is associated with lower sperm count, sperm motility, semen volume and percentage of normal spermatozoa<sup>50</sup>. There are reports that khat can lower libido and lead to sexual impotence in men following long term use, possibly by affecting spermatogenesis and plasma testosterone concentration<sup>51</sup>. The evidence on male reproductive health is very limited.

## **Other medical complications**

### **6.33**

Residual pesticide on khat leaves is a cause of concern for khat chewers. A study in Yemen has addressed this problem<sup>52</sup>. The investigators reported that khat production and the use of pesticides have increased in recent years. Two sources of khat were identified that had significantly different residual levels of the pesticide dimethoate on the leaves. There was a difference in adverse health effects depending on which source the khat came from; with more

complaints of weakness, runny nose and congestion from the source with the higher level of residual pesticides.

#### 6.34

The report noted that although there were measures in place to regulate the use of pesticides in Yemen, many farmers were not compliant. Public information in Yemen advises chewers to wash khat before use. Although a causal relationship can not be demonstrated, the association between residual pesticides and adverse health effects warrants consideration and future attention.

#### 6.35

Khat extract given to animals has shown to increase levels of the liver enzymes ALP, ALT and AST<sup>53</sup>. After six months of using khat extracts animals showed histopathological changes in the liver, with many showing signs of chronic inflammation<sup>54</sup>. However khat use did appear to have some protective effects; with decreased levels of cholesterol, and increased levels of the cardio-protective HDL being found in animals given khat extracts for six months<sup>55</sup>. Although these data suggest that khat use may impact upon the functioning of the liver, there is no evidence of any changes in humans. Khat use has been shown to have no significant impact upon gallbladder volume and emptying<sup>56</sup>.

#### 6.36

In summary there is evidence of some harms and potential health benefits of khat using. However the increased risk of early myocardial infarction far outweighs the potential cardio-protective effects of lowered cholesterol. Further research would be needed to tease out these potentially conflicting associations.

## 7. Treatment and prevention of khat use

### Public Health Measures

#### 7.1

Information and knowledge about the dangers of using khat is limited in the published literature, amongst health-care professionals, and amongst khat users themselves. Reports to the ACMD Khat Working Group suggested that some khat users were reluctant to wash khat in a belief that it would cause the plant to lose its potency. Men tend to use khat in the *mafreshi*, these tend to be poorly ventilated rooms in which there is much tobacco smoke..

#### 7.2

Health education and khat information programmes would enable khat users to become better informed of the risks associated with khat misuse. Harm-prevention measures such as encouraging the sellers and users of khat to wash the leaves before consumption would minimise the risk from pesticides. Simple measures such as these would not only educate but empower khat users to be in control of their use.

### Treatment

#### 7.3

At present the consequences of khat use are not well recognised by health care professionals. There are no specific pharmacological agents available to treat a case of khat dependence. Addiction services have some experience in treating individuals with dependency on stimulants and would therefore be able to use such a model as a basis for treatment of khat dependence. However, evidence suggests that khat chewers are extremely unlikely to use other drugs or alcohol, and therefore are different from the majority of individuals seeking treatment in addiction services.

#### 7.4

Khat use is rarely perceived as a problem and not seen as a drug. Because of this khat users are unlikely to attend for treatment services at current treatment facilities. A more useful method to engage the community would be a 'one-stop shop' that could combine services that the community are likely to use (such as housing, employment and benefit advice) with khat using information. Workers would require specific training to be aware of culturally sensitive issues and to deliver health advice and harm reduction strategies. This could be done by encouraging primary and secondary care to provide outreach at such facilities or be involved in training people from the local community.

#### 7.5

There are only two published case reports of the pharmacological treatment of khat dependence<sup>57,58</sup>. In both cases bromocriptine was used. Bromocriptine is a direct agonist of dopamine receptors and it is occasionally used in the treatment of stimulant addiction although the effectiveness of dopamine

agonists in the treatment of stimulant addiction has not been proven by several large scale clinical trials <sup>59</sup>.

#### 7.6

Khat dependency is a rare phenomenon and it is likely that it will continue to be treated on a case by case basis. Greater information for, and education of, health care professionals will help the detection of cases, engagement into treatment and hopefully successful outcomes.

## 8. Recommendations

### 8.1

The ACMD believes that it would be inappropriate to classify khat under the Misuse of Drugs Act 1971. The prevalence of khat in the UK is relatively low and isolated to the Somali and Yemeni communities. There is no evidence of khat use in the general population. Furthermore, the evidence of harm resulting from khat use is not sufficient to recommend its control. The Council does, however, believe there is great value in education and information about khat use and its impact, and as such they have made a number of recommendations on this issue

### 8.2

The Council heard evidence that there was a general ignorance about the issues and life-styles of Yemeni, Somali and Ethiopians communities in the UK. There was a general concern about the levels of poverty and social isolation within these communities.

### 8.3

The relationship between Khat use and more problematic drug use is unclear, but what is clear is that a lot of Khat users have many of the factors that place them at high risk of future drug use: for example, poor housing, poor education, social isolation and poor health are common characteristics of those that use Khat.

### 8.4

The Council heard evidence that many Khat users used in a manner that placed them in the category of problematic use; for example;

- using outside the context of previous cultural or social norms
- using repeatedly
- using large amounts and over long periods, to the detriment of other activities.

The Council also heard some evidence of association between Khat use and domestic violence/family breakdown and Khat use and educational and/or employment failure.

### 8.5

How far these are related primarily to Khat use or secondarily to other factors with Khat use being only incidentally involved still needs to be determined. However, whatever the association, the Committee overwhelmingly felt that there should be a concerted effort to reduce the risks, harms and problems associated with Khat use and to prevent Khat users moving onto other, more dangerous drugs.

8.6

**Recommendation 1**

The ACMD recommend that Khat is not controlled under the Misuse of Drugs Act 1971.

8.7

**Recommendation 2**

The Council felt that there was a need to educate primary health care professionals and others directly involved with members of these communities about the health and social problems and requirements of these populations, and specifically about the problems associated with Khat use.

The need for education was in the following areas

- The health risks associated with Khat use
- The dangers of Khat use
- Risk reduction and safer Khat use
- Treatment options for Khat use
- Prevention of Khat use

8.8

The Council felt that this education should be, at least partly focused through local communities, including peer education models, and through primary care services and NOT exclusively through addiction services.

8.9

It was agreed that this education activity had to ensure that it reached female users – who often use in an isolated manner, at home alone and at night. As such, in designing and delivering education strategies, providers should do so with an awareness of the particular sensitivities of dealing with women in these communities.

8.9

**Recommendation 3**

The Council overwhelmingly felt that Khat users, when seeking advice and help, should not automatically be encouraged to attend addiction services. Drug Action Teams should focus on ensuring that local communities and primary care services use the best approaches to treatment, prevention and education

8.10

As with education, particular consideration needs to be given by service providers, to ensure that advice and treatment services are appropriate for female, as well as male, users. Interventions involving families should be considered.

#### 8.11

In addition to the harm reduction and education approaches above, the Committee felt some concern over the nature and location of retail and consumption of Khat. There was evidence of khat use by children under the age of 18, and by significant numbers of users in poorly ventilated, often unhygienic Marfreshi (Khat chewing dens).

#### 8.12

##### ***Recommendation 4***

In response to the concerns in paragraph 8.11 above, the Council recommends that the Government/local relevant authorities explore the possibility of a voluntary agreement amongst retailers of khat on excluding sale of khat to those under 18 years old.

#### 8.13

##### ***Recommendation 5***

Furthermore, the Council recommends an awareness raising campaign of the health and safety implications of chewing Khat in Marfreshi (e.g. – health implications from poorly ventilated, smoky environments), and a voluntary undertaking from community leaders and Mafreshi owners adhere, wherever possible to current health and safety regulations on ventilation, lighting, fire escapes etc.

## Reference List

- (1) Dhaifalah I, Santavy J. Khat habit and its health effect. A natural amphetamine. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub.* 2004;148:11-15.
- (2) Patel SL, Wright S, Gammampila A. Khat use among Somalis in four English Cities. *Home Office.* In press.
- (3) Griffiths P, Gossop M, Wickenden S, Dunworth J, Harris K, Lloyd C. A transcultural pattern of drug use: qat (khat) in the UK. *Br J Psychiatry.* 1997;170:281-284.
- (4) Turning Point. Khat use in Somali, Ethiopian and Yemeni communities in England: issues and solutions. *Home Office.* In press.
- (5) Nabuzoka, D. and Badhadhe, F. A. Use and perceptions of khat among young Somalis in a UK city. *Addiction Research* 8[1], 5-26. 2005.  
Ref Type: Generic
- (6) Bashford, J., Buffin, J., and Patel, K. Drug misuse needs assessment project. Report 2:The findings. 1-50. 1-5-2003. Centre for Ethnicity and Health.  
Ref Type: Report

- (7) Odenwald M, Neuner F, Schauer M et al. Khat use as risk factor for psychotic disorders: a cross-sectional and case-control study in Somalia. *BMC Med.* 2005;3:5.
- (8) Alem A, Kebede D, Kullgren G. The prevalence and socio-demographic correlates of khat chewing in Butajira, Ethiopia. *Acta Psychiatr Scand Suppl.* 1999;397:84-91.
- (9) Belew M, Kebede D, Kassaye M, Enquoselassie F. The magnitude of khat use and its association with health, nutrition and socio-economic status. *Ethiop Med J.* 2000;38:11-26.
- (10) Kebede Y. Cigarette smoking and khat chewing among university instructors in Ethiopia. *East Afr Med J.* 2002;79:274-278.
- (11) Othieno CJ, Kathuku DM, Ndetei DM. Substance abuse in outpatients attending rural and urban health centres in Kenya. *East Afr Med J.* 2000;77:592-595.
- (12) Maru HM, Kathuku DM, Ndetei DM. Substance use among children and young persons appearing in the Nairobi Juvenile Court, Kenya. *East Afr Med J.* 2003;80:598-602.
- (13) Numan N. Exploration of adverse psychological symptoms in Yemeni khat users by the Symptoms Checklist-90 (SCL-90). *Addiction.* 2004;99:61-65.

- (14) Ali AA, Al-Sharabi AK, Aguirre JM, Nahas R. A study of 342 oral keratotic white lesions induced by qat chewing among 2500 Yemeni. *J Oral Pathol Med.* 2004;33:368-372.
- (15) Nencini P, Grassi MC, Botan AA, Asseyr AF, Paroli E. Khat chewing spread to the Somali community in Rome. *Drug Alcohol Depend.* 1989;23:255-258.
- (16) Ahmed AG, Salib E. The khat users: a study of khat chewing in Liverpool's Somali men. *Med Sci Law.* 1998;38:165-169.
- (17) Toennes SW, Harder S, Schramm M, Niess C, Kauert GF. Pharmacokinetics of cathinone, cathine and norephedrine after the chewing of khat leaves. *Br J Clin Pharmacol.* 2003;56:125-130.
- (18) Widler P, Mathys K, Brenneisen R, Kalix P, Fisch HU. Pharmacodynamics and pharmacokinetics of khat: a controlled study. *Clin Pharmacol Ther.* 1994;55:556-562.
- (19) Kalix P. Effect of the alkaloid (-) cathinone on the release of radioactivity from rabbit atria prelabelled with 3H-norepinephrine. *Life Sci.* 1983;32:801-807.
- (20) Kalix P. The pharmacology of khat. *Gen Pharmacol.* 1984;15:179-187.

- (21) Banjaw MY, Miczek K, Schmidt WJ. Repeated *Catha edulis* oral administration enhances the baseline aggressive behavior in isolated rats. *J Neural Transm.* 2005.
- (22) Cozzi NV, Foley KF. Methcathinone is a substrate for the serotonin uptake transporter. *Pharmacol Toxicol.* 2003;93:219-225.
- (23) Walter HP. Drink-drive: broken jaw, lager and khat ingestion. *J Clin Forensic Med.* 1996;3:51-53.
- (24) Toennes SW, Kauert GF. Driving under the influence of khat--alkaloid concentrations and observations in forensic cases. *Forensic Sci Int.* 2004;140:85-90.
- (25) Nielen RJ, van der Heijden FM, Tuinier S, Verhoeven WM. Khat and mushrooms associated with psychosis. *World J Biol Psychiatry.* 2004;5:49-53.
- (26) Yousef G, Huq Z, Lambert T. Khat chewing as a cause of psychosis. *Br J Hosp Med.* 1995;54:322-326.
- (27) Hassan NA, Gunaid AA, El-Khally FM, Murray-Lyon IM. The effect of chewing Khat leaves on human mood. *Saudi Med J.* 2002;23:850-853.
- (28) Spanagel R, Weiss F. The dopamine hypothesis of reward: past and current status. *Trends Neurosci.* 1999;22:521-527.

- (29) Robinson TE, Berridge KC. The neural basis of drug craving: an incentive-sensitization theory of addiction. *Brain Res Brain Res Rev.* 1993;18:247-291.
- (30) Schechter MD. Dopaminergic nature of acute cathine tolerance. *Pharmacol Biochem Behav.* 1990;36:817-820.
- (31) Pehek EA, Schechter MD, Yamamoto BK. Effects of cathinone and amphetamine on the neurochemistry of dopamine in vivo. *Neuropharmacology.* 1990;29:1171-1176.
- (32) Banjaw MY, Schmidt WJ. Behavioural sensitisation following repeated intermittent oral administration of *Catha edulis* in rats. *Behav Brain Res.* 2005;156:181-189.
- (33) Salam, S and Croucher, R. Khat chewing amongst UK resident male Yemeni adults: an exploratory study. [In press]. 5-11-2005.  
Ref Type: Generic
- (34) Isse H. *Social and health implications of khat usage among Somali refugees in the UK.* [MA dissertation]. University of East London, 1999.
- (35) Hassan NA, Gunaid AA, El-Khally FM, Al-Noami MY, Murray-Lyon IM. Khat chewing and arterial blood pressure. A randomized controlled clinical trial of alpha-1 and selective beta-1 adrenoceptor blockade. *Saudi Med J.* 2005;26:537-541.

- (36) Hassan NA, Gunaid AA, Abdo-Rabbo AA et al. The effect of Qat chewing on blood pressure and heart rate in healthy volunteers. *Trop Doct.* 2000;30:107-108.
- (37) Nencini P, Ahmed AM, Amiconi G, Elmi AS. Tolerance develops to sympathetic effects of khat in humans. *Pharmacology.* 1984;28:150-154.
- (38) Al-Motarreb A, Briancon S, Al-Jaber N et al. Khat chewing is a risk factor for acute myocardial infarction: a case-control study. *Br J Clin Pharmacol.* 2005;59:574-581.
- (39) Al-Motarreb A, Al-Kebsi M, Al-Adhi B, Broadley KJ. Khat chewing and acute myocardial infarction. *Heart.* 2002;87:279-280.
- (40) Al-Motarreb AL, Broadley KJ. Coronary and aortic vasoconstriction by cathinone, the active constituent of khat. *Auton Autacoid Pharmacol.* 2003;23:319-326.
- (41) Nasr, A. H. and Khatri, M. L. Head and neck squamous cell carcinoma in Hajjah, Yemen. *Saudi.Med.J.* 21[6], 565-568. 2000.  
Ref Type: Journal (Full)
- (42) Dimba E, Gjertsen BT, Francis GW, Johannessen AC, Vintermyr OK. *Catha edulis* (Khat) induces cell death by apoptosis in leukemia cell lines. *Ann N Y Acad Sci.* 2003;1010:384-388.

- (43) Dimba EA, Gjertsen BT, Bredholt T et al. Khat (*Catha edulis*)-induced apoptosis is inhibited by antagonists of caspase-1 and -8 in human leukaemia cells. *Br J Cancer*. 2004;91:1726-1734.
- (44) Goldenberg D, Lee J, Koch WM et al. Habitual risk factors for head and neck cancer. *Otolaryngol Head Neck Surg*. 2004;131:986-993.
- (45) Kassie F, Darroudi F, Kundi M, Schulte-Hermann R, Knasmuller S. Khat (*Catha edulis*) consumption causes genotoxic effects in humans. *Int J Cancer*. 2001;92:329-332.
- (46) Islam MW, al-Shabanah OA, al-Harbi MM, al-Gharably NM. Evaluation of teratogenic potential of khat (*Catha edulis* Forsk.) in rats. *Drug Chem Toxicol*. 1994;17:51-68.
- (47) Eriksson M, Ghani NA, Kristiansson B. Khat-chewing during pregnancy-effect upon the off-spring and some characteristics of the chewers. *East Afr Med J*. 1991;68:106-111.
- (48) Kuczkowski KM. Herbal ecstasy: cardiovascular complications of khat chewing in pregnancy. *Acta Anaesthesiol Belg*. 2005;56:19-21.
- (49) Kristiansson B, Abdul GN, Eriksson M, Garle M, Qirbi A. Use of khat in lactating women: a pilot study on breast-milk secretion. *J Ethnopharmacol*. 1987;21:85-90.

- (50) el-Shoura SM, Abdel AM, Ali ME et al. Deleterious effects of khat addiction on semen parameters and sperm ultrastructure. *Hum Reprod.* 1995;10:2295-2300.
- (51) Mwenda JM, Arimi MM, Kyama MC, Langat DK. Effects of khat (*Catha edulis*) consumption on reproductive functions: a review. *East Afr Med J.* 2003;80:318-323.
- (52) Date J, Tanida N, Hobara T. Qat chewing and pesticides: a study of adverse health effects in people of the mountainous areas of Yemen. *Int J Environ Health Res.* 2004;14:405-414.
- (53) Al-Mamary M, Al-Habori M, Al-Aghbari AM, Baker MM. Investigation into the toxicological effects of *Catha edulis* leaves: a short term study in animals. *Phytother Res.* 2002;16:127-132.
- (54) Al-Habori M, Al-Aghbari A, Al-Mamary M, Baker M. Toxicological evaluation of *Catha edulis* leaves: a long term feeding experiment in animals. *J Ethnopharmacol.* 2002;83:209-217.
- (55) Al-Habori M, Al-Mamary M. Long-term feeding effects of *Catha edulis* leaves on blood constituents in animals. *Phytomedicine.* 2004;11:639-644.

- (56) Murugan N, Burkhill G, Williams SG, Padley SP, Murray-Lyon IM. The effect of khat chewing on gallbladder motility in a group of volunteers. *J Ethnopharmacol.* 2003;86:225-227.
- (57) Giannini AJ, Miller NS, Turner CE. Treatment of khat addiction. *J Subst Abuse Treat.* 1992;9:379-382.
- (58) Giannini AJ, Nakoneczie AM. Treatment of Khat Addiction with Bromocriptine Mesylate: A Case Report and Review of Cocaine- and Amphetamine-Like Effects. *Am J Ther.* 1995;2:487-489.
- (59) Kosten TR, George TP, Kosten TA. The potential of dopamine agonists in drug addiction. *Expert Opin Investig Drugs.* 2002;11:491-499.

**This report was produced with the assistance of Dr T M Williams, and Professor David J. Nutt, Psychopharmacology Unit, University of Bristol.**

### Members of the Advisory Council on the Misuse of Drugs

Professor Sir Michael Rawlins	Professor of Clinical Pharmacology, University of Newcastle upon Tyne
Dr Dima Abdulrahim	Briefings Manager, National Treatment Agency
Lord Victor Adebawale	Chief Executive, Turning Point
Mr Martin Barnes	Chief Executive, Drugscope
Dr Margaret Birtwistle	Specialist General Practitioner, Senior Tutor – Education and Training Unit, St. George’s Hospital & Forensic Medical Examiner
Reverend Martin Blakebrough	Director, Kaleidoscope Drugs Project, Kingston upon Thames
Dr Cecilia Bottomley	Specialist Registrar in Obstetrics and Gynaecology
Ms Carmel Clancy	Principal Lecturer (Mental Health and Addictions), Middlesex University
Professor Ilana Crome	Professor of Addiction Psychiatry, Keele University Medical School, Harplands Hospital
Ms Robyn Doran	Registered Mental Health Nurse & Service Director Substance Misuse, CNWL Mental Health Trust
Ms Dianne Draper	Public Health Policy Support Officer, Leeds
Mr Robert Eschle	School Teacher and Magistrate
Ms Vivienne Evans	Chief Executive, ADFAM
Professor C Robin Ganellin FRS	Emeritus Professor of Medicinal Chemistry
Dr Clare Gerada	General Practitioner, London; Primary Care lead for Drug Misuse
Dr Laurence Gruer	Director of Public Health Medicine for NHS Scotland
Mr Patrick Hargreaves	Adviser (Drugs and Alcohol), Durham County Council Education Department.
Mr Paul Hayes	Chief Executive, National Treatment Agency
Mr Andrew Hayman	Assistant Commissioner, Metropolitan Police, Chair of the Association of Chief Police Officers Drugs Committee
Mr Russell Hayton	Clinical Nurse Specialist & Clinical and Services Governance Manager, Plymouth Drug and Alcohol Action Team
Ms Caroline Healy	Director of Childline

Dr Matthew Hickman	Deputy Director, Centre for Research on Drugs & Health Behaviour, Senior Lecturer in Public Health
Mr Alan Hunter	Director – Law Regulatory & Intellectual Property and Secretary to the Association of British Pharmaceutical Industry.
Professor Leslie Iversen FRS	Professor of Pharmacology, University of Oxford
His Honour Judge Thomas Joseph	Resident Judge, Croydon Crown Court
Professor Michael Lewis	Professor of Oral Medicine, Cardiff University
Dr John Marsden	Research Psychologist, Institute of Psychiatry
Mr Peter Martin	Former Chief Executive, Addaction
Mrs Samantha Mortimer	Head of PSHE and Citizenship, St Paul's Catholic High School, Manchester
Professor David Nutt	Director of Psychopharmacology Unit, University of Bristol
Dr Richard Pates	Consultant Clinical Psychologist & Clinical Director Community Addiction Unit, Cardiff
Mr Trevor Pearce	Acting Director General, National Crime Squad
DCC Howard Roberts	Deputy Chief Constable, Nottinghamshire Police
Mrs Kay Roberts	Pharmacist, Glasgow
Dr Roy Robertson	General Medical Practitioner, Edinburgh
Dr Mary Rowlands	Consultant Psychiatrist in Substance Misuse, Exeter
Dr Polly Taylor	Veterinary Surgeon
Ms Monique Tomlinson	Freelance Consultant in Drug Misuse
Mr Arthur Wing	Assistant Chief Officer, Sussex Probation Area

### Members of the Khat Working Group

#### Members

Dr Clare Gerada, Chair	ACMD Member, General Practitioner
Ms Carmel Clancy	Principal Lecturer (Mental Health and Addictions), Middlesex University
Professor Les Iversen	ACMD Member, Psychopharmacology, Oxford University
Mrs D. Kay Roberts	ACMD Member, Pharmacist
Dr Mary Rowlands	ACMD Member, Consultant Psychiatrist
Ms Kate Davies	Centre for Ethnicity and Health, University of Central Lancashire
Mr Hassan Isse	Khat Group Hounslow
Dr. Les King	Chemist
Mr Abdul Shaif	Sheffield Yemeni Community Centre
Dr. Tim Williams	University of Bristol
Inspector Kieran Wood	Drugs Unit, New Scotland Yard,

#### Officials

John Leneghan	The Welsh Assembly
Joe Onofrio	HMRC
Robb Phipps	Northern Irish Assembly
Mark Prunty	Department of Health

**The following gave oral evidence to the Khat working group**

Axel Klein	Drugscope
Richard Kramer	Turning Point
Shilpa Patel	Middlesex University, Author of NACRO Khat report
Professor Peter Houghton	Kings College, London