

## The Quest for Well-Being and Pleasure: Experiences of the Novel Synthetic Opioids AH-7921 and MT-45, as Reported by Anonymous Users Online

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### Abstract

**Background:** Two novel synthetic opioids, MT-45 and AH-7921, with mostly undocumented effects and risks, have emerged on the expanding market for recreational drugs on the Internet. The aim of the present study was to characterize the experiences of AH-7921 and MT-45 as described by the users on international drug discussion forums.

**Methods:** A systematic data search resulted in 96 self-reports which were collected from the leading edge resources of drug related information online. The data were analysed qualitatively using thematic analysis.

**Results:** The experiences of MT-45 and AH-7921 were characterized by the following themes: (1) Administration of the substances, (2) Well-being and energy, (3) Sedation and reduced here-and-now awareness, (4) Tolerance and withdrawal effects, (5) Side effects, (6) Evaluation of the effects, (7) Increased appreciation, sociableness and intimacy and (8) Self-medication. The experiences appeared to include not only the general and expected opioid effects like withdrawal, analgesia, euphoria, cough suppression, fatigue, constipation, itching, involuntary muscle spasm, nausea and pupillary constriction but also a noteworthy increase in energy. Furthermore, the users also experienced reduced inhibition and a facilitation of social situations. The results also showed that users engaged in different forms of self-medicating behaviour aimed at reducing pain or withdrawal symptoms from traditional opioid use.

**Conclusion:** The spread of unpredictable, potent and novel opioids constitutes a public health concern which needs to be further monitored in order to minimize potential harm.

**Keywords:** Novel psychoactive substances; Opioid; Opiate; MT-45; AH-7921

### Abbreviations:

NPS: Novel Psychoactive Substances; EMCDDA: European Monitoring Centre for Drugs and Drug Addiction

### Introduction

Numerous Novel Psychoactive Substances (NPS) with mostly unknown effects and risks are continuously emerging on the international market for recreational drugs. In the year 2015, 100 new drugs were identified by the EU Early Warning System [1]. A total of about 560 NPS are currently monitored by the European Monitoring Centre for Drugs and Drug Addiction, EMCDDA [1]. For the most part, these compounds have effects which are similar to the traditional drugs, and the majority of them are known to be psycho-stimulants or synthetic cannabinoids [1,2]. However, in recent years, novel synthetic opioids have also appeared on the market. For the time being, eighteen of the NPS monitored by the EMCDDA are opioids [1]. This is a disturbing trend since the typical opioid effects can include life-threatening symptoms such as respiratory depression, but also imparts a build-up of tolerance and high addictive potential. In addition, novel opioids are known to be more potent than their traditional

counterparts, which constitute a great risk of overdose and death, especially if surreptitiously sold as heroin.

The first novel opioid on the market was labelled “Krypton”, which consisted of a mixture of O-desmethyltramadol (an active metabolite of tramadol) and an extract from the plant *Mitragyna speciosa* called “Kratom” [3]. Several cases of Krypton-intoxication with fatal outcome have been documented [4]. Recently, additional synthetic opioids have been identified. Two of these are AH-7921 and MT-45 [5-7].

MT-45 is a piperazine derivate originally synthesized by a pharmaceutical company in the 1970s [8]. The first report of MT-45 to the EU Early Warning System was in December of 2013 [6]. During 2013 and 2014 several fatal intoxications and acute cases of respiratory depression or unconsciousness involving MT-45 occurred, which reflect the imminent harm potential associated with novel opioids [6,9]. Other documented side effects attributed to the use of MT-45 included hearing loss, cataract and dermatitis [9,10].

The opioid AH-7921 (“AH” refers to “Allen and Hanburys”, the company that patented the substance [5]) was officially acknowledged through seizures made by the customs and the police in a number of countries in 2013 [11]. Sometimes the name “doxylam” is used [5]. Animal model studies of AH-7921 have confirmed its morphine-like actions as mu-agonist, and its opioid-like withdrawal and respiratory depression effects [12]. Studies of toxicological or pharmacological

actions of AH-7921 on humans have not been published [5]. The substance has some structural similarities to both fentanyl and phencyclidine [5]. Several cases of AH-7921 intoxication with fatal outcome have been reported in Sweden, Norway, and the UK [4,11].

It is expected that additional novel synthetic opioids will appear on the market. A quick Google search (3rd June 2016) with the key words buy legal synthetic opioids generated several million hits and numerous vendors were identified among the first 100 hits. The following are examples of other opioid products offered for sale: Despropionylbezitramide, Dermorphine, Desmethylprodine, Parafluorobutyrfentanyl, Acetylfentanyl, W-15, W-18 and MPPP.

As the supply of novel opioids is rapidly expanding and evolving over time, there is a great need for up to date information, especially regarding the effects and side effects. Online drug discussion forums have previously been proven to be an important source of updated and considerably reliable information. The analysis of systematically collected data from drug discussion forums has provided valuable information about, e.g., synthetic cannabinoids [13,14], the hallucinogen 4-HO-MET [15], the dissociative MXE [16] and the stimulant ethylphenidate [17]. In the present study we have focused on the novel opioids AH-7921 and MT-45 since they seem to be vastly abundant on the market while scientific knowledge about their effects is scarce. It is also alarming that several deaths and serious complications have been attributed to their use.

The aim of the present study was to characterize the experiences of AH-7921 and MT-45, as described by the users on online drug discussion forums.

## Methods

### Data collection

The raw data for the present study consisted of anonymous self-reports published by users of MT-45 and AH-7921 in the public domain of the Internet. The most significant and "leading edge" websites about NPS have earlier been investigated by Deluca et al. [18], who identified the following open access and key-online resources for accurate and timely information about NPS: bluelight.org, drugs-forum.com, legalhighsforum.com and erowid.org. These resources were searched, using their local search engine, with the keywords "MT-45" and "AH-7921". The number of reports involving the use of MT-45 was found to be limited. Therefore, additional Google searches were undertaken with the keywords "MT-45 trip report". Two additional websites were identified: shroomery.org and ukchemicalresearch.org. The inclusion criteria were self-reports containing experiences of MT-45 or AH-7921. Reports were excluded if a combination of drugs (including alcohol or energy drink) were described.

A total of 190 user reports, 141 involving the use of AH7921 and 49 about MT-45, were gathered. In total, the raw data consisted of 54 pages of text in a Word document.

### Participants

In total, the 190 reports were written by 96 different user aliases. It is likely, but not certain, that these correspond to 96 different persons, since one person can theoretically register more than one user alias. No information about age or gender was present.

## Data Analysis

The data were analysed using inductive thematic analysis, as described by Braun and Clarke [19]. The analysis aimed at identifying recurrent patterns and themes in the data, which was accomplished through several steps. The first step involved a thorough reading and re-reading of the data in order to get familiar with the content. Next, the data set was systematically divided into smaller units of meaningful and case-specific extracts of information, which in the succeeding step was coded into even more basic elements of information (CEs). For example, the following extract "Slight itchiness and insomnia were also present" generated the codes "Experienced itching" and "Experienced insomnia". The analysis resulted in a total of 1116 CEs. In the next step, the CEs were related and combined to find recurrent patterns and broader categories. The categories were given names and provisional descriptions. The analysis resulted in 63 categories, which in turn were related and subordinated into eight overarching themes which characterized the users' experiences. The raw data for MT-45 and AH-9721 were analysed together but the names of the substances were preserved with each CE in order to identify relevant quotations. During the analysis the raw data was repeatedly consulted for verification and support of the abstracted themes.

## Ethical Considerations

The gathered information consisted of publicly available information on the Internet. No interaction or interventions with the users took place. Therefore, the process of gathering data was considered an observation of public behaviour online, in compliance with the ethical guidelines and recommendations provided by SACHRP [20]. In order to further protect the users' anonymity, we removed the report-URLs and user aliases from the data set.

## Results

The analysis of self-reports involving the use of MT-45 or AH-7921 generated 1116 Coded Elements (CEs), which were arranged into 63 categories. The categories were sorted, based on a higher level of abstraction, into eight different themes which characterized the experiences: (1) Administration of the substances, (2) Well-being and energy, (3) Sedation and reduced here-and-now awareness, (4) Tolerance and withdrawal effects, (5) Side effects, (6) Evaluation of the effects, (7) Increased appreciation, sociableness and intimacy and (8) Self-medication. The themes are presented below with some representative quotations. The abbreviations "MT" and "AH" were used for MT-45 and AH-9721 respectively.

### Administration of the substances

The first theme describes the dosages used, the routes of administration, and the acute side effects related to administration. Oral administration was the most commonly described route of administration. Other ways included inhalation/vaporizing, snorting (intranasal), sublingual and rectal administration. Table 1 summarizes the reported doses and routes of administration. First-time users typically used a lower dose or allergy test: "My first try was 5 mg, for checking any adverse reactions" (AH) // "Allergy test: 3 mg is placed into sublingual cavity" (MT). The inexperienced users appeared to administer lower doses than the experienced users. It was also common to start off with a lower initial dose which was later increased if the potency of effects turned out to be unsatisfactory. Some users depicted strong cravings for prolonged effects and repeated

administrations: “there is a strong urge to re-dose when coming down”, while others described the opposite: “no strong desire to take anything more”.

Administration	Lowest dose (mg)	Highest dose (mg)	Median (mg)
Oral (AH)	10	400	75
Oral (MT)	10	200	55
Inhale/Vaporize (AH)	10	50	15
Inhale/Vaporize (MT)	50	50	50
Intranasal (AH)	5	60	30
Intranasal (MT)	10	50	15
Sublingual (AH)	10	124	50
Sublingual (MT)	50	70	60
Rectal (AH)	30	350	50
Rectal (MT)	20	100	60
Injecting (AH)	8	100	45

**Table 1:** The reported doses and routes of administration.

The onset of the effects varied depending on the route of administration: “Within 5 min it kicked in” (inhalation) (AH) or “in a gel cap, it took nearly 2 h before I began feeling the full effects, taken on a nearly-empty stomach” (oral) (MT). The duration of effects also varied with the route of administration. For example, inhalation appeared to have much shorter duration (“+2 h: back to baseline” (MT)) than oral administration (“It seems to last over 12 h, especially in higher doses” (MT)). It seemed like the use of AH-7921 had longer duration than MT-45: “The 2 × 50 mg were pretty strong and long-lasting, I even felt them 18-22 h after ingestion, not that strong anymore for sure, but there was still something going on” (AH).

Several more or less severe and acute side effects related to administrations were frequently reported. Oral administration was regarded as the least harmful while other ways could entail adverse effects such as blisters or skin corrosion: “Eating it had no undesired effects at all” (AH) // “burns like fuck! Nasal, rectal, sublingual, injection, I would avoid. Eating seems the only option” (AH). Sublingual use of AH-7921 was in most cases associated with some form of impact on the sublingual mucosa: “just a few mgs leaving me with a blister under my tongue where I placed it” (AH) // “the whole underside of my tongue was coated in a white layer of what I assume to be dead skin” (AH). It was also stated that intranasal administration could result in a burning sensation, as well as causing wounds in the throat: “look like a wound now without blood, think if it gets irritated it will start bleed again” (AH). Rectal use of AH-9721 reportedly gave rise to a burning sensation: “I got unpleasant sore in my rectum” (AH).

### Well-being and energy

This theme comprises different positive aspects of both physical and psychological well-being. The feelings of well-being were described in terms of arousal, pleasant stimulation and tranquil feelings of pleasure and enjoyment. The mood enhancing effects, which sometimes verged into euphoria, were pointed out as typical effects of the two opioids.

The intensity of these feelings ranged from slight to very intense. The users appeared to remain aware of and in interaction with the surroundings during these pleasant and enjoyable conditions.

The positive and stimulating effects were described in different ways, such as increased energy for everyday activities: “now I’ve got the energy to go buy some heating for my place!” (AH), or in terms of a general bodily stimulation: “You get a very nice body buzz” (MT) // “Energizing” (AH). Another aspect of this experienced stimulation was a simultaneous enjoyable mental excitement, often described as “trippy” or “high”. Everyday activities were portrayed as more enjoyable than otherwise.

Further signs of well-being were described in terms of relaxation, warmth and tranquillity: “Experienced feelings of warmth” (AH) // “I did feel fairly comfy and relaxed” (MT) // “a great feeling of relaxation” (AH). There were also many general statements about well-being: “Feeling really good” (MT) or just “I feel great” (AH). The mood enhancing effects were also highlighted as, e.g., “heightened mood” (MT) // “positive mood” (AH) // “I feel huge mood boost” (AH). The mood enhancing effects occasionally verged into “subtle but warm euphoria” (MT).

Another aspect of the well-being experience incorporated a mental clarity and peace of mind and thought, such as “quietness of the mind” (MT) // “Clear- and calmness” (AH) // “very clear-headed” (MT) // “clarity of thought” (AH).

### Sedation and reduced here-and-now awareness

The experience of reduced alertness was described on a continuum from slightly tired and drowsy (“I start feeling a wave of drowsiness” (MT) // “feel mild sedative effects” (AH)), to a gradually decreased awareness and loss of focus and the surroundings (“I see myself zoning out and losing any focus” (AH)), to a dreamy and inattentive state (“got me nodding like crazy” (AH) // “Significant nodding” (MT)), and

eventually a complete withdrawal of consciousness and falling asleep ("I fall asleep if I close my eyes" (MT)). The milder drowsy states purportedly implied a decreased ability to focus and concentrate although a preserved ability to interact with others remained. Also, impairments of cognitive functions were depicted during drowsiness ("horrible short-time memory" (MT) // "I forgot what happened" (AH)).

General descriptions of dissociative states, without closer detailed descriptions, were abundant ("caused a spaced out, dissociative feeling" (AH) // "transient dissociative state for about one hour" (MT)). In the most sedated states, the users withdrew completely and fell asleep ("knock's you right out" (MT)). Vivid dream images were described, but it was not clear if these occurred during wakeful states or during dream stages in sleep.

### Tolerance and withdrawal effects

Most users described themselves as opioid-naïve without earlier experience or tolerance to opioids, but with an interest in trying AH-7921 or MT-45. The tolerance to these opioids seemed to develop quickly: "I think tolerance develops fast with this one even if you skip more days in between" // "Tolerance to the recreational effects occurred pretty quick". In general, increased tolerance was mostly described when higher doses were needed for achieving the desired effect.

Only a few users explicitly reported of an opioid dependency. However, there was a plethora of descriptions of severe withdrawal effects such as profound sweating, diarrhoea, aches, sleeplessness or a very unpleasant general feeling of malaise: "Waking up several times during the night drenched in sweat" // "constant hot-cold sweats and feeling like a shit" // "Diarrhea" // "I cold turkeyed when I ran out of it, 4 days of physical w/d. Bleakest emptiest depression I can remember and I had to source more opiates". All the descriptions about withdrawal effects concerned AH-9721.

A few users described themselves as opioid addicts, and they used the novel opioids to alleviate withdrawal symptoms from other opioids: "all signs and symptom of withdrawal from oxycodone subsided with AH-7921" // "MT-45 took away almost all symptoms of withdrawal (heroin)".

### Side effects

This theme summarizes the descriptions of various side effects ascribed to the use of AH-7921 and MT-45. Experiences of unwanted side effects were common among the user descriptions. The data revealed a variety of side effects which were stated to influence both psychological states and organ systems and functions. The side effect ranged from milder symptoms (e.g. stomach upsets, light headache) to more severe conditions (e.g. anxiety and panic). There were also some differences in side effects between the two substances (pointed out below).

The most common side effects, especially reported by users of AH-7921, were nausea and vomiting. These effects were described on a continuum from feeling slightly ill ("A bit of nausea, but easily suppressed" (MT) // "a tinsy bit of nausea" (AH)), to more severe experiences: "I got severe nausea from AH-7921 if I take over 100 mg; no other opioid get me nauseous" // "had to vomit" (MT) // "made me throwing up for the last 20 h" (AH). Other complications with the stomach and gastro-intestinal system were also described: "felt a little

discomfort in my stomach" (AH) // "Constipation" (AH) // "a strange and ominous stomach ache quite unlike anything I have experienced before" (AH).

Another common side effect was itching, which was usually mentioned as a histamine-induced effect: "The histamine release is HUGE. I've never been so itchy. I scratch my balls endlessly and my skin broke out pretty badly, even with an antihistamine combo" (AH) // "within 1,5 h I scratched myself up" (MT). Besides itching, other forms of skin irritation were present among the AH-user descriptions ("I broke out in weeping eczema around my eyes and my hands ended up looking like crocodile skin" // "skin irritations in the face, mainly in the area around the mouth"). The users of AH-9721, in particular, reported about occurrences of numbing of different parts of the body: "the numb hand thing happened to me twice" (AH) // "sometimes the hand and lower arm go numb" (AH).

Furthermore, a reduced ability to move around and loss of motor skills were depicted: "felt quite slow and heavy" (AH) // "got quite disorientated and walked like I was drunk" (MT). According to the users, the walking difficulties were related to feelings of "light-headedness" (AH) or described as "everything felt slight dizzy when I got up and started to walk around" (MT). They also referred to experiences of being disorientated: "a sense of looping/spinning" (AH). Occasional problems with muscle spasms were described: "occasional muscle twitches" (MT) // "got twitches and I am shaking" (AH) // "both of us experienced some hand tremors" (AH).

Experiences of headache some hours into the intoxication were stated by users of AH-9721 but not by users of MT-45. These headaches ranged in intensity from "a bit of headache" to "I have the most insane headache" or "I developed a headache part way through the experience, and that increased in severity when the drug fully worse off".

Another side effect pointed out by a few users of AH-7921 was the inability to empty the bladder: "urinary retention was noticeable" // "seem to be a little bit of urinary retention".

A few persons experienced some degree of respiratory depression, but apparently not to a life-threatening degree: "slowed my breathing a lot" (AH) // "I found it worked as a potent depressant of my respiratory system" (MT).

Some notes on side effects related to the sensory organs were present. The classic opioid sign of "pupillary constriction" was noted by some persons. Other eye-related descriptions consisted of "blurred vision" (MT) or "I found it hard to focus with my eyes (which felt kind of wobbly)" (AH). Concerning the ears, two persons reported temporary hearing loss: "caused me to completely lose hearing in my left ears while on MT-45; it persisted for days after I stopped using it" and "temporary mild deafness and muffling of sounds, as well as some high pitched whining". The issues with hearing were only reported by MT-45 users.

Psychological side effects, mostly manifested as restlessness, were reported: "experiencing some agitation" (AH) or "could not find anything to settle down with as was very restless" (MT). There were also a few reports about general unpleasant feelings and irritability: "find myself more easily irritated and frustrated". Sometimes the unpleasantness intensified into "anxiety", or got overwhelmingly worse, which resulted in "a few anxiety attacks" (AH) or "ultimate panic attack" (MT). Also the experience of getting overheated was described

by some: “profusely sweating” (MT) // “It does make me kind a hot and sweaty” (AH).

### Evaluations of the effects

Several reflections about the effects of MT-45 and AH-7921 were made retrospectively. The reflections mostly incorporated evaluations of the experienced usefulness of the substances, if the effects were to the users liking or not, and if they were worthwhile taking again. The users also evaluated the substances by comparing them to other opioids. In general, the users who experienced the effects were satisfied and appreciated both substances. Quotations that highlights such opinions were: “The high was really nice” (AH) // “it has fewer negative side-effects than most RCs I have tried” (AH) // “I definitely want to try this again” (MT) // “It was a lot better than I expected” (MT).

The less pleased users were in general dissatisfied with the effects being either too weak or completely absent: “It is pretty boring” (MT) // “not much happened” (AH) // “there were some moments I thought there was something there, but it wasn’t” (MT) // “no mood lift whatsoever” (MT). Two statements indicated dissatisfaction due to negative or unexpected negative effects: “MT-45 is an extremely bizarre and sketchy feeling opioid” // “The high is weird and somewhat ‘dirty’” (AH).

Several statements which compared MT-45 and AH-9721 with other opiates were made. A common view was that the novel opioids induced some of the classical opiate effects: “slight opiate feeling” (MT) // “has some familiar opiate feelings, and some strange sensations that are hard to pinpoint” (AH). A few users described the effects of MT-45 as ‘colder’ and in lack of the warm opiate feeling they were used to (“seemed colder than other opiates”). A common view was that both substances lacked some part of the expected opioid effects (“opiate feel to it, but with something missing” (MH) // “not quite feeling like a full opiate” (AH)).

### Increased appreciation, sociableness and intimacy

The opioid experience appeared to induce a state of increased sociableness and intimacy. The urges for social relations and activities, as well as the facilitation of social abilities, were ascribed to a greater feeling of openness and less inhibition than in ordinary life: “I was more open than usual” // “boosted my social skills” (AH). The users also described how they became more talkative in an intimate and empathic manner: “more talkative” (MT) // “I enjoyed lying in bed with my partner; we had a deep conversation about our past, present and future” (MT). On the whole, increased feelings of empathy towards self and others were commonly described.

The desire for closeness with others appeared to extend into sexual attraction. The experience of sexual intercourse was depicted as sensually enhanced, and with an increased endurance “fantastic sex, skin felt super sensitive!” (MT) // “the best part of the whole experience was the comfyness of it all, provided I didn’t move too much (got dizzy fast on it), and the sexual endurance it allows” (AH).

The users also described a greater than normal appreciation of relationships and everyday activities. The experience of listening to music under the influence (“sounded blissful”) was “greatly appreciated” by many users. On the whole, the users appeared to be released from exaggerated ambition and drive to achieve things. Instead, they appeared to be more appreciative and satisfied with life:

“just chill in a quiet mellow space” (AH) or “did not really want to do anything much, just felt fine” (MT).

### Self-medication

This theme summarizes the users’ attempts to suppress unpleasant symptoms and cope with life challenges with the help of the novel opioids. Physical pain was the most common condition for which the users sought relief. The act of self-medicating most often targeted acute pains although chronic pains were also a stated issue of concern. Specific examples of pains included backaches, dental conditions or muscle issues in the feet or shoulders. Both opioids were regarded as effective pain relievers although more enthusiastic statements were given for AH-7921: “The painkiller qualities are however...Amazing!” (AH) // “effective long lasting pain killer” (AH). The statements about MT-45 were also positive, but a bit more modestly portrayed: “seems to work well for pain, my headache has been dulled a bit” (MT) // “some pain relief was felt” (MT). However, no entries about doses were available in the data set, which prevented a proper comparison. The pain relieving efficacy was experienced on a spectrum from “slight pain relief” and “some relief”, to “my pain is completely non-existing”.

There were a few statements about the experienced suppression of coughing or reduction of anxiety or depression: “somewhat antidepressant opioid effect” // “anxiolytic properties”. Both opioids were described as effective cough suppressants: “I can confirm that MT-45 is an effective antitussive” // “I am kind of sick with a cough/ chest thing going on and I found it works well as cough suppressant” (AH).

### Discussion

The aim of the present study was to characterize the experiences of the novel synthetic opioids AH-7921 and MT-45 as described by the users on Internet based drug discussion forums. Both substances seemed to induce many of the classic opioid effects such as analgesia, euphoria and cough suppression. Also, characteristic opioid side effects such as fatigue, constipation, itching, involuntary muscle spasm, nausea, and pupillary constriction (miosis) were reported. Most of the effects were similar for both substances, but there were also some dissimilarities and unique features.

An interesting finding was that the users of both AH-7921 and MT-45 reported experiences of increased energy, which is noteworthy considering that opioids usually have a more dampening and fatigue inducing effect on the central nervous system. There are some anecdotal reports about other opioids (e.g. tramadol) which indicate a rise in energy. If this is due to some sympathomimetic effect, or to psychological effects (e.g. relief from anxiety or depression) is unclear.

The most typically reported effects of AH-7921 and MT45 were various forms of increased pleasure and well-being, which is in line with the expected effects of opioids in general. The users’ emphasis on the pleasurable effects is important to acknowledge from a prevention perspective, especially since a previous study has revealed that the main incentive for use of Novel Psychoactive Substances (NPS) in general, and for novel opioids in particular, was “pleasure and enjoyment” [21]. The present study found frequently occurring descriptions of a pleasant, relaxed and tranquil state in which the persons felt very content with “just being”. Also, the novel opioids appeared to facilitate social situations, which were attributed to decreased social inhibitions, i.e., making the user more talkative or empathic. Some users described a state of simultaneously being serene

and energized, which could indicate a sympathetic and parasympathetic activation. All in all, the positive experiences recounted on the discussion forums, e.g. clarity of thought, relaxation and mood enhancing effects, probably constitute a strong driving force for use of these substances.

The monitoring of drug discussion forums can provide legislators, physicians, and the users with helpful information about previously unknown side effects. For example, the present study revealed auditory symptoms related to the use of MT-45. Two users reported temporary hearing loss: "caused me to completely lose hearing in my left ears while on MT-45; it persisted for days after I stopped using it" and "temporary mild deafness and muffling of sounds, as well as some high pitched whining". These issues were only reported for MT-45, and may strengthen the suggested link between MT-45 and its ototoxic properties. These results are consistent with the alerts of hearing loss and transient tinnitus among nine cases of MT-45 intoxications admitted to Swedish intensive care units in 2014 [9].

Two users of AH-7921 described a numbing of the hand and lower arm; an effect we would like to acknowledge but have no further explanation for. Another interesting finding was the plethora of experienced side effects directly related to the different ways of administration, such as blisters and skin corrosion. For instance, intranasal use of MT-45 ("snorting") could entail a strong burning sensation, and it was also pointed out that the taste was so unpleasant that some users were unable to administer it neither intranasally, sublingually nor by inhalation.

AH-7921 was perceived to have corrosive properties, and the users reported about blisters under the tongue, pain in the mouth, and a sore throat if sublingual or intranasal administration had been used. Similarly, both rectal administration and injection caused a burning sensation at the site of administration. User to user advice about the experientially optimum route of administration is an example of how users assist each other in order to minimize harm. The most common route of administration for both substances was oral intake, since that was experienced as having the least acute side effects.

Most persons in the present study seemed to be more or less opioid-naïve, and many of them tried MT-45 or AH-9721 for recreational purposes. They appeared, at least in most cases, to be concerned with the reduction of harm and avoiding unnecessary risks.

The experience reports did not seem to be written in a drug-romanticising spirit or to recruit new users, but rather to help and alert each other about possible harms. This is in line with an earlier study [22] about online drug discussion communities, which concluded that users not only supported each other but exchanged an extensive and cumulative amount of knowledge about NPS and how to use them safely. This indicates the possibility and importance of using these forums for drug prevention and harm reduction activities. Nevertheless, it must be remembered that all data from this analysis is based on "the voices of the users" from an uncontrolled setting; there exist no information from controlled randomized clinical trials.

The users frequently described an increased tolerance towards the desired effects, as well as withdrawal symptoms similar to other opioids. It has earlier been elucidated that "habit and addiction" constituted a considerable incentive for use of novel opioids [21]. A few persons in the present study explicitly described themselves as opioid dependant, and they reported use of MT-45 or AH-9721 as a means to cope with withdrawal effects from other opioids like oxycodone or heroin. This can be defined as self-medicating behaviour,

which also applies to those who used the opioids for pain relief (e.g. back pain, head ache, dental pain). In addition, a few persons stated use of AH-9721 as an antidepressant or anxiolytic. The fact that people buy and self-medicate with unknown novel opioids from the Internet needs to be considered by health care personal and public health agencies in order to prevent further harmful effects.

Many different effects and degrees of effects were reported by the users. The dose did not always appear to determine the degree of drug effect. In other words, high doses did not necessarily induce strong experiences just as low doses could produce powerful effects for some persons. Hence, individual tolerance, drug batch purity differences, or set and setting effects can be assumed to influence the experience of novel opioids.

Although it is impossible to fully assert that AH-7921 had a more extensive side effect profile compared to MT-45, we are under the impression that the number of reported side effects was larger for AH-7921 than for MT-45, which could indicate a greater harm potential. Furthermore, every side effect that may occur is probably not reported in our study. Therefore, further research is of utmost importance to minimize the knowledge gap pertaining to the novel opioids and their user community. According to EMCDDA [6] there are no human studies investigating the pharmacological or behavioural effects of MT-45. Nor are there studies on toxicological or pharmacological actions of AH-7921 on humans [5]. Even though our study was limited by the fact that there was no reliable data on doses or substance purity, we believe that the knowledge derived from online resources (e.g. drug discussion forum) can constitute an important source of information in a field where scientific documentation is scarce or lacking [22]. Moreover, analysing online drug discussion forums is also important since they constitute a reality "out there", especially for adolescents who are known to prefer the Internet as source of sensitive and health or drug-related information.

The spread of novel opioids constitutes a public health concern as the number of compounds is increasing and their side effects can be unpredictable and even life threatening. The potency of the opioids investigated in the present study is assumed to be quite similar to morphine, but next generation of synthetic opioids are considerably more potent (e.g. W-18, estimated to be 10,000 times stronger than morphine), and may induce effects with substantially more severe consequences. The quest for opioid induced well-being and pleasure can, in contrast to the users' intention, in worst case become a harmful endeavour. Further studies may preferably focus on investigating the motivations for using novel opioids, as well as keeping track of new trends of the rapidly changing market for NPS.

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