Adulterants in Heroin seized in the Canton Bern (Switzerland)

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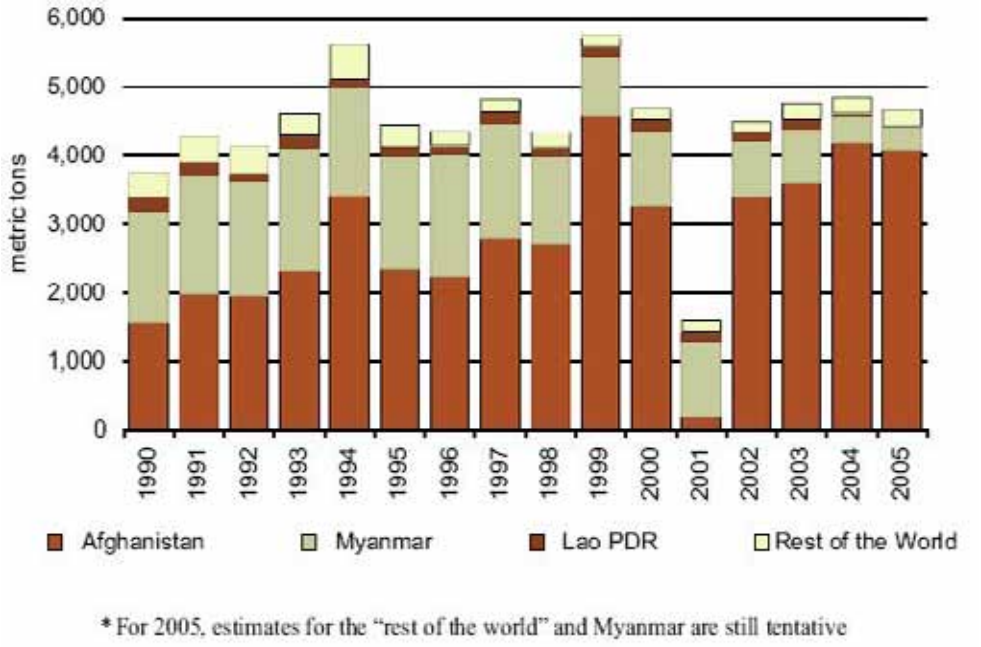
INTRODUCTION

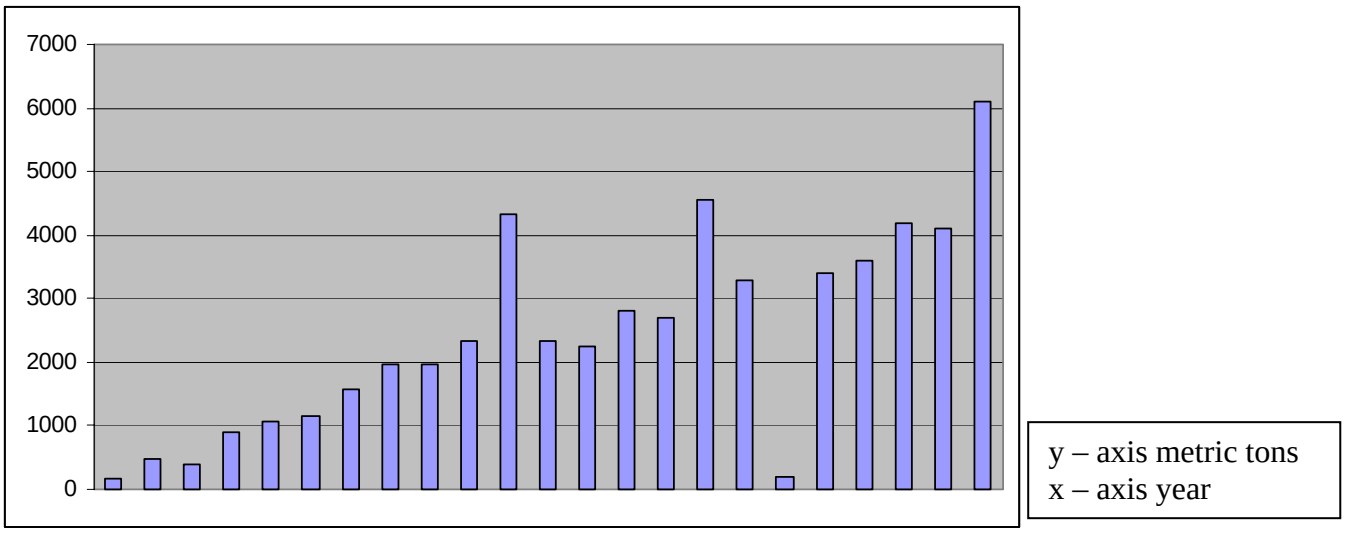
Opium cultivation in Afghanistan has hit record levels 2006 -- up by more than 65 percent from 2005 -- despite hundreds of millions in counternarcotics money [1]. According to the United Nations Afghanistan Opium Winter Rapid Assessment Survey [2] about 165,000 hectares of opium poppy was cultivated the growing season 2006 -- up from 104,000 hectares in 2005. The previous highest recorded figure was 131,000 hectares in 2004, according to the U.N. Office on Drugs and Crime [2, 3]. Opium cultivation has surged since the ouster of the Taliban in late 2000. The former regime enforced an effective ban on poppy growing by threatening to jail farmers -- virtually eradicating the crop in 2001, see Fig 1a and 1b [3, 4].

Fig. 1a: Global opium production 1990 – 2005 (metric tons) [2**]**



The 2006 Afghan poppy harvest accounted for 92% of the global opium supply (6100 metric tons), see Fig. 1b. It was enough to make 610 tons of heroin.
The heroin seized on the illicit Swiss drug market derives mainly from opium produced in Afghanistan (South West Asian SWA heroin).

Fig. 1b: Afghan opium production, years 1984 – 2006 (metric tons) [4]



According to the references [5 – 9] South West Asian heroin (SWA) contains noscapine in much higher amounts than South East Asian (SEA), South American (SA) and Mexican (Mex) heroin, see table 1.

Table 1: Typical contents of alkaloids according the references [5 - 9]

	SWA [5]	SWA[6]	SWA [8]	SEA [6]	SEA [7]	SA [8]	Mex [8,9]
heroin	60 %	70–78 %	40-60 %	80-83 %	55-76 %	> 90 %	30-60 %
6-acetyl-morphine	3 %	2-9 %	5-9 %	1-2 %	0.2-0.5 %	< 5 %	0-19 %
noscapine	10 %	0.5-10 %	20-30 %	-	0 - 0.9 %	0.5 %	1-4 %
acetyl-codeine	5 %	3.5-6 %	5-9 %	5-7 %	8-27 %	< 3 %	1-6 %
papaverine	4 %	0.2-2 %	2-6 %	-	-	0.5 %	0.5-3 %

MATERIAL AND METHODS

In order to establish a database for chemical profiling and sample comparison, the content of heroin, 6-acetylmorphine, acetylcodeine, noscapine, papaverine, paracetamol and caffeine in seized samples were determined.
All illicit drug samples were subjected to screening analysis to detect heroin by ion mobility spectrometry (IMS). Confirmation analyses were performed by gas chromatography-mass spectrometry (GC-MS). The quantitative results were obtained by high performance liquid chromatography with diode array detection (HPLC-DAD).
Sample weight for analysis: 80mg powder
Solvent: 20 mL methanol
HPLC-DAD: Waters 2695 Separations Module / 2996 PAD
Injection volume: 10 µL and 5 µL; Column: Xterra RP8 5µm
Calibration range heroin: 1 – 25 % (linear, r > 0.995)

Mobile phase A: 1000 mL ultra pure water + 400 µL saturated ammoniumcarbonate solution, B: acetonitril C: ultra pure water

Gradient: start 50 % A + 50 % C
14.4 min. 70 % A + 30 % B
12.0 min. 50 % A + 50 % B
16.0 min. 50 % A + 50 % C

Retention times: 4.1 min. paracetamol, 4.4 min. caffeine, 7.5 min. 6-acetylmorphine, 10.4 min. heroin, 11.2 min. acetylcodeine, 13.1 min. papaverine, 16.4 min. noscapine.

RESULTS

Number of chemical analyses

During 2003, 2004, and 2005, in order to analyze 650 cases the total number of 788 illicit heroin samples were quantitatively analyzed (Fig. 2a) in our special testing laboratory. The results of opium alkaloids heroin analyses 2003, 2004 and 2005 are listed in table 2.

Fig. 2a: y-axis: Number of analyses during 2003 (283), 2004 (333), and 2005 (172); x-axis: weight of the packages in gram

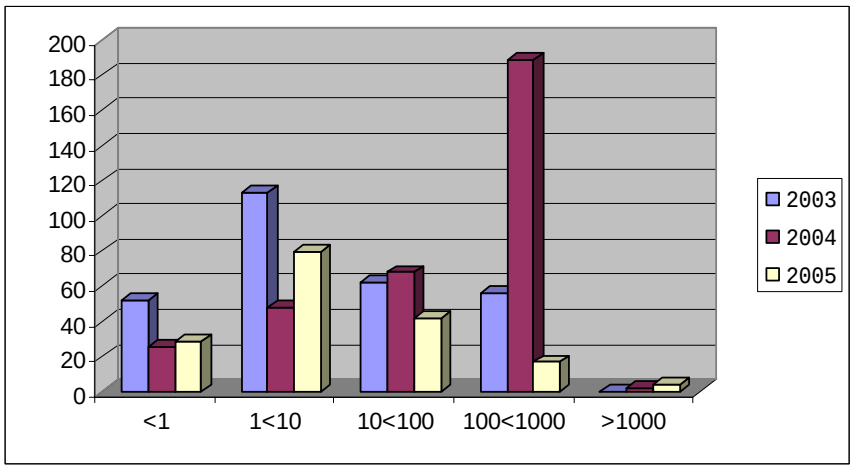
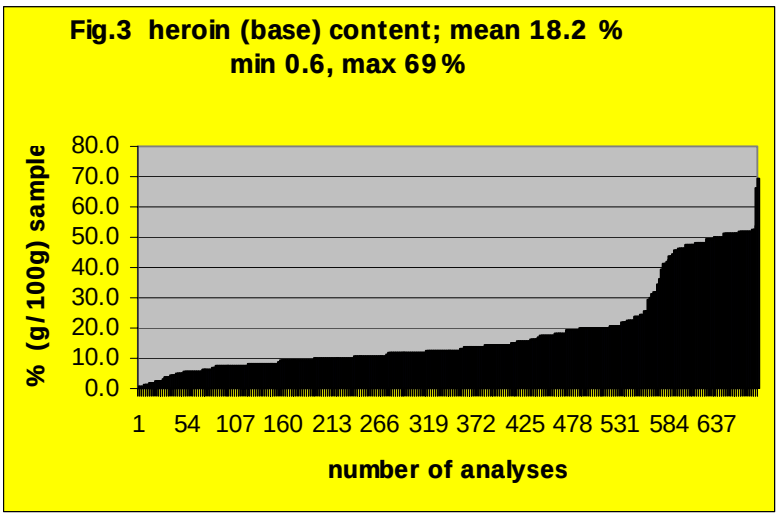


Table 2: The Contents of alkaloids found in samples analyzed in Bern in years 2003, 2004, 2005.

Found contents of alkaloids in samples analyzed in Bern, years 2003, 2004, 2005	Heroin seized in Switzerland
Heroin free base	0.7 – 69.2 % mean 18.2 %
6-acetylmorphine	0 – 18.6 % mean 1.7 %
Noscapine	0 - 60 % mean 14.1 %
Acetylcodeine	0 - 6 % mean 1.5 %
Papaverine	0 – 19.5 % mean 1.4 %

For a graphical representation of the found heroin content see Fig3. X – axis shows the number of analyses ordered according to the heroin content and y – axis the heroin (base) content.



The results of noscapine analyses in 2003, 2004, 2005, are: mean 14 %; min. 0 %; max. 60 %. Figure 4 shows :x-axis: the number of analyses ordered according to the noscapine content and y – axis: noscapine content).

Figure 4: Content of noscapine in samples versus the number of analyses ordered

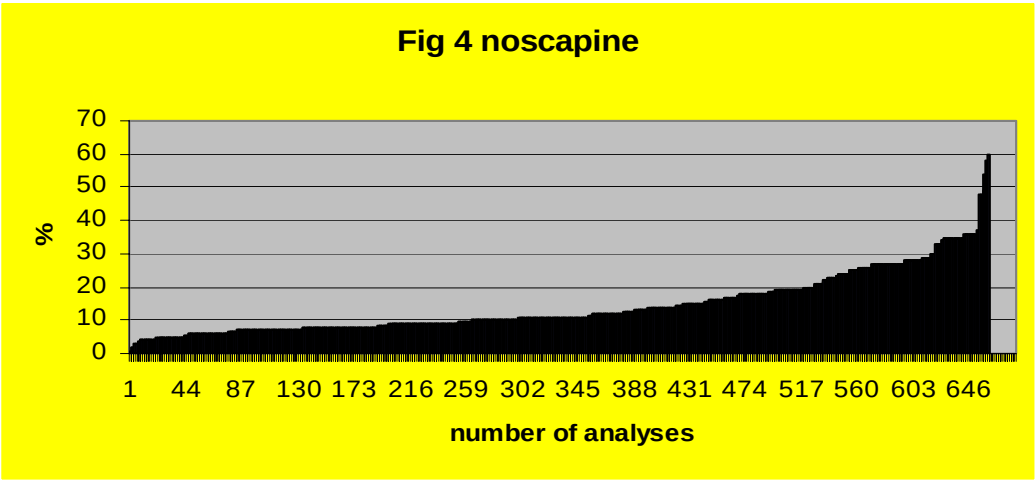


Fig. 5: Paracetamol / caffeine ratio

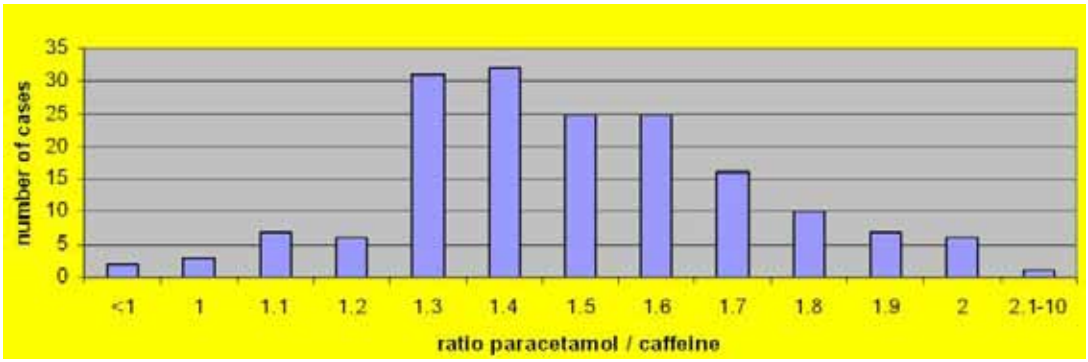
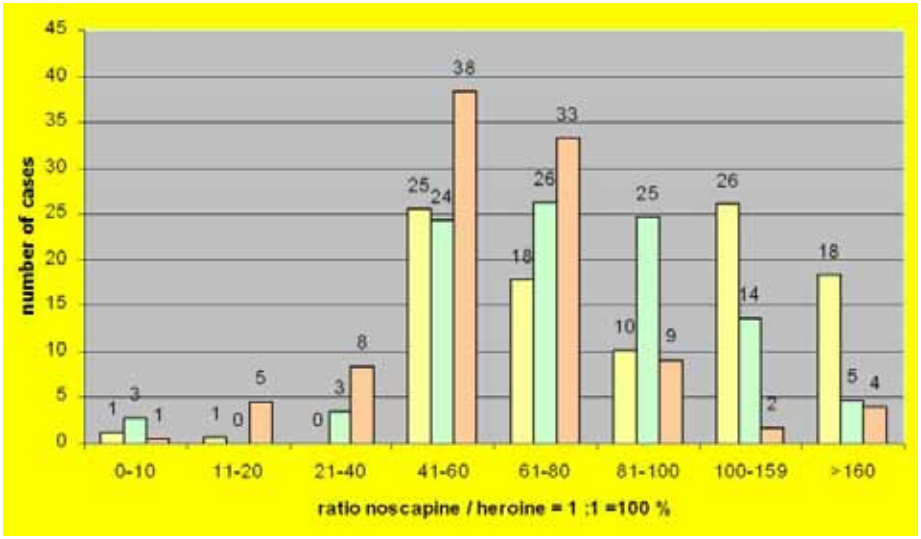


Fig. 6: Noscapine / heroin ratio



DISCUSSION

All the analyzed heroin samples contain paracetamol and caffeine most often in a ratio between 1.3 and 1.7 (see Fig. 5). Elevated ratios noscapine / heroin indicates, that most of the samples contain noscapine as adulterant (see Fig. 6). Noscapine is added to the heroin at the source of production. Our results confirm the conclusions of the short report of Klemenc, in which the evidence is given (based on the results of 22 case samples) that noscapine can be used as an adulterant in illicit heroin samples [10]. In the report of Klemenc, the appearance of illicit heroin samples characterised by high noscapine content (up to 61%) and high noscapine/whole morphine ratio (up to 3.5) was highlighted. All the 132 samples analysed by Klemenc where seized in Slovenia in the period from 1997 to 1999.
The composition of the heroin smuggled from Afghanistan to Switzerland remained the same before and after the Afghanistan war. This indicates that the manufacture procedure remained the same as before the war. The Swiss results disprove the conclusions of Guéniat and Esseiva that noscapine is not used as an adulterant to dilute illicit heroin [11]. In conclusion noscapine must be considered as an adulterant in order to interpret heroin profiling analyses.

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