

THE HEALTH EFFECTS OF CONTRABAND CIGARETTES

The following material consists of excerpts from the peer reviewed literature discussing health related issues specific to contraband cigarettes.

Study: “*Smokers of illicit tobacco report significantly worse health than other smokers*” by Campbell K. Aitken, Tim R. L. Fry, Lisa Farrell, & Breanna Pellegrini, Nicotine & Tobacco Research, Vol., No. 8 (Aug. 2009), pp. 996-1001.

- ▶ “Current and lifetime users of chop-chop report significantly worse health than smokers of licit tobacco.” p. 996.
- ▶ “In particular, chop-chop in Australia is similar to contraband tobacco in Canada sourced from domestic production by illegal manufacturers (Luk et al.)” p. 997.
- ▶ “The illicit tobacco trade is regularly described as a critical public health issue because lower prices enable greater consumption and more damage to health and simultaneously decrease the money available for state-funded health care (Arnott et al., 2008; Lee & Collin, 2006). The public health significance of increased consumption of a substance with known health hazards is unarguable, but almost nothing is known about the relative health risks of smoking tobacco obtained illicitly. Illicit tobacco can be adulterated by producers and sellers to increase weight and therefore profits (Bittoun, 2002 , 2004), grown using techniques that elevate concentrations of heavy metals and other toxic substances (Pappas, Polzin, Watson, & Ashley, 2007; Stephens, Calder, & Newton, 2005), or simply mishandled in ways that increase the potential for damage to consumers’ health (Bittoun, 2004). p. 997 [Emphasis added].
- ▶ “In multivariate analysis, relative to smokers of licit tobacco, current users of illicit tobacco had significantly greater odds of beginning smoking at younger than legal age, 60% greater odds of reporting below-average social functioning on the SF-8, and nearly twice the odds of reporting a measurable disability.” p. 998 [Emphasis added].
- ▶ “Our results imply the existence of a relationship between illicit tobacco smoking and decreased mental and physical health. Due to the cross-sectional design of our survey, we are unable to attribute any causality to the relationship; the concurrent and independent significant associations between illicit tobacco smoking, high cigarette consumption, and younger age of smoking onset are also plausible explanations for reduced health, or may be markers for other important variables we did not measure. Nevertheless, the lack of influence of socioeconomic variables such as income, education level, and employment status suggests that illicit tobacco use is not simply a marker for lower socioeconomic status and its well-established association with relatively poor health (Marmot, 2003).” pp. 998 -9 [Emphasis added].

- ▶ “The public health message that emerges from our data is that people who smoke or have smoked illicit tobacco report significantly worse health than smokers of licit tobacco (who, of course, already have worse health than nonsmokers — Begg et al., 2007).” p. 999 [Emphasis added].

Study: *“Source and Health Implications of High Toxic Metal Concentrations in Illicit Tobacco Products”* by W. Edryd Stephens, Angus Calder, and Jason Newton, Environmental Science & Technology Vol. 39, No. 2, 2005, pp. 479-488.

- ▶ “A review of the health effects of heavy metal transfer from tobacco via smoke to the lungs indicates that habitual smokers of counterfeits may be risking additional harm from high levels of cadmium and possibly other metals.” Abstract.
- ▶ “Notwithstanding, it has been known for a few decades that tobacco combustion has the potential to deliver dangerous quantities of heavy metals to the lungs if the tobacco being combusted has high initial concentrations (6), some of which is then transferred to other organs of the body (16). In this regard it is noteworthy that the tobacco plant *Nicotiana tabacum* is well-known for its capacity to concentrate heavy metals from its growing environment (17-19), in particular as an accumulator of Cd in the leaf (20).” p. 479.
- ▶ “Any investigation of the harmful effects of commercial tobacco products must take into account potential differences between genuine bona fide brands and the illicit market, especially in countries where the latter has a significant market share.” p. 479.
- ▶ “There is evidence that counterfeit sales have grown both proportionately and in absolute terms and may now exceed the best-selling brands. Given their substantial market share and the fact that they evade all statutory controls, it is in the interests of public health to determine whether these counterfeits have any characteristics that render them more harmful than their genuine equivalents.” p. 479. [Emphasis added].
- ▶ “We identify potential harmful consequences to human health from these heavy metals and **conclude that the typical counterfeit product adds significantly to the risks normally associated with smoking cigarettes.**” p. 479.
- ▶ “Even taking into account analytical errors Cd and Pb are clearly significantly richer in almost all counterfeits, but this is less certain for As. Fe and Zn also show significant enrichment in counterfeits and both elements enter the smoke phase, primarily into sidestream smoke (3, 28). The significance of this enrichment of heavy metals in counterfeits is underlined by the fact that the mean values obtained exceed all values in a global compilation of cigarette tobaccos for the elements As, Cd, Cu, Pb, and Zn (Table 3 in Jung et al.; 5).” p. 480.

- ▶ **“Health Implications for Smokers of Heavy Metal-Enriched Counterfeit Cigarettes.** Such heavy metal enrichment would be of little concern if there was no transfer to the lungs and to other organs via the bloodstream. However, experiments on the partitioning of heavy metals between smoke (both mainstream and sidestream), ash, and filters indicate that a substantial proportion of some metals in tobacco reaches the lungs of smokers during the smoking process. Cadmium has been found in several studies consistently to transfer into the smoke phase (6, 18, 25, 26, 28, 60-67), which coupled with the fact that the tobacco plant is particularly efficient in accumulating Cd from the soil and translocating most of the metal to the leaves (68) makes this element the prime focus for particular investigation for any potential toxic effects. This is not intended to diminish the importance of other elements; lead and others merit further assessment.” p. 486. [Emphasis in original].
- ▶ “The main purchasers of counterfeit cigarettes are dominantly those on low incomes, either young people who then become addicted to smoking or the socially disadvantaged for whom so many other factors impact negatively on their state of health that the addition of another factor is potentially very serious. The extent of the U.K. market share now claimed by counterfeits means that an issue once considered marginal is rapidly becoming a major problem. The health risks described above as well as social implications means that early awareness of these issues is important if remedial action is to have significant impact.” p. 486. [Emphasis added].

Study: *“Cadmium, lead, and thallium in smoke particulate from counterfeit cigarettes compared to authentic US brands”* by R.S. Pappas, G.M. Polzin, C.H. Watson, D.L. Ashley, Food and Chemical Toxicology 45 (2007) 202–209, pp. 202-209.

- ▶ “We compared mainstream smoke cadmium, thallium, and lead deliveries from counterfeit and authentic brands. Mainstream smoke levels of all three metals were far greater for counterfeit than the authentic brands, in some cases by an order of magnitude. Significant differences still existed even after normalizing mainstream smoke metal levels with nicotine delivery; the counterfeits typically delivered much higher levels of all three analytes. Our findings, based on 21 different counterfeit samples, suggest that counterfeit cigarettes potentially result in a markedly greater exposure to toxic heavy metals than authentic brands, even after correcting for differences in nicotine intake.” Abstract. [Emphasis added].
- ▶ “Some of these, such as tobacco-specific nitrosamines and polycyclic aromatic hydrocarbons, have been carefully studied, contributing to a strong weight of evidence for associated health risks (Hecht, 1999), while toxic metals and metalloids constitute one of the more understudied major carcinogenic chemical classes in tobacco smoke. Cadmium and lead are present in tobacco smoke and contribute substantially to cancer risk indices (Fowles and Dybing, 2003). Cadmium is a Group I carcinogen and lead has recently been

elevated from a Group IIB to a Group IIA carcinogen (IARC, 2004; Smith et al., 1997, 2003). Several metals, including cadmium, are also significant contributors to toxicological noncancer indices of health risks for respiratory and cardiovascular diseases such as peripheral artery disease (Fowles and Dybing, 2003; Navas-Acien et al., 2004). Thallium may be teratogenic at high levels (Hall, 1985; Leonard and Gerber, 1997; Mulkey and Oehme, 1993; Parker and Scheck, 1981). Monovalent thallium is known for its neurotoxicity (Mulkey and Oehme, 1993).” pp. 202-03. [Emphasis added].

- ▶ “We therefore studied how selected toxic metal levels in mainstream smoke particulate from counterfeit cigarettes confiscated in the US compared to the corresponding authentic brands.” p. 203.
- ▶ “All counterfeit brands contained higher levels of cadmium in the mainstream smoke particulate than the authentic brands (Fig. 1).” p. 204.
- ▶ “Mean smoke particulate cadmium levels from counterfeit cigarettes were 2.0–6.5 times higher than the authentic brands and the differences were all statistically significant ($p < 0.05$). Mean smoke particulate thallium levels from counterfeit cigarettes were 1.4–4.9 times higher than the authentic cigarettes. The thallium level differences between counterfeits and the corresponding authentic cigarette brands were statistically significant for all but the two lowest delivery counterfeit Marlboro light brands ($p = 0.1$, $p = 0.06$), which also had much larger relative standard deviations. Mean smoke particulate lead levels from counterfeit cigarettes were 3.0–13.8 times higher than the authentic brand cigarettes. Particulate lead levels also showed statistically significant differences from the respective authentic cigarettes.” p. 205. [Emphasis added].
- ▶ “Mainstream particulate cadmium, lead and thallium levels from counterfeit cigarettes were significantly higher than the corresponding levels from authentic commercial cigarettes of the same brand and variety using a standardized machine smoking protocol. In most cases, these findings remained statistically significant when the levels were normalized against nicotine delivery. Compared to authentic brands, the differences in mean smoke particulate cadmium, thallium, and lead levels from the counterfeit cigarettes were significantly larger than any differences we have encountered from authentic US cigarettes manufactured across multiple years and brands (Pappas et al., 2006). In some cases, these counterfeit brands deliver quantities of heavy metals more than an order of magnitude higher than the comparable authentic brands. These data suggest that smokers could receive significantly higher exposures to various toxic and carcinogenic metals from counterfeit cigarettes than from the comparable authentic cigarettes, even when accounting for possible nicotine compensation habits among smokers of different tar delivery group cigarettes (Kozlowski and O’Connor, 2002).” p. 207. [Emphasis added].
- ▶ “The potential health impact from smoking cigarettes that deliver high levels of toxic metal is not limited to active smokers. In indoor environments, cadmium, lead, and other metals

from sidestream smoke are readily available from passive exposure (Chang et al., 2005; Landsberger and Wu, 1995; Wagner et al., 2001).” p. 207.

- ▶ “Thus, it is probable that **exposure of children or adults to tobacco smoke with higher particulate levels of cadmium and lead such as those found in these counterfeit cigarettes could translate to higher heavy metal blood levels.**” p. 207.[Emphasis added].
- ▶ “Chronic exposure to and accumulation of heavy metals from any source, including tobacco smoke, has a high potential to adversely impact health.” p. 207.
- ▶ “Whether resorbed from bone or simply present at elevated circulating levels from chronic tobacco smoke inhalation, 7–49% higher lead concentrations were found in the cord blood of infants born to mothers who smoke than to those who are nonsmokers (Rhainds and Levallois, 1997; Rhainds et al., 1999).” p. 207.

Study: “*Trace Metals Analysis of Legal and Counterfeit Cigarette Tobacco Samples Using Inductively Coupled Plasma Mass Spectrometry and Cold Vapor Atomic Absorption Spectrometry*” by Kamal Swamia, Christopher D. Judda, John Orsinia, Spectroscopy Letters 42:479–490, 2009.

- ▶ “Trace elements have important effects on many life processes. Some of these elements are toxic for humans, even at very low levels of intake. Tobacco smoking delivers the stored trace elements to the lungs.^[6] The fraction of a particular metal that is transferred to the smoke phase varies substantially, depending on the volatility and other properties of the element.^[7–10] For example, 4–6% of the tobacco Cd is transferred to MSS smoke, while about 40% ends up in SS smoke; 16–22% of Pb is transferred to MSS smoke and 18–30% into SS smoke.^[7,10] Some of these readily pass into the bloodstream and are accumulated, cause damage to the organs (mainly kidney and liver), and act as tumor promoters in conjunction with carcinogens.^{[11,12]”} p. 480.
- ▶ “Table 8a shows that the amounts of Be, As, Mo, Cd, Sb, Tl, Pb, and Hg are higher in counterfeit cigarettes, while the amounts of V, Cr, Mn, Co, Cu, Zn, Se, and Ba, are comparable among legal and counterfeit cigarettes; unexpectedly, Ni is several-fold (mean 2.7-fold) higher in the legal ones.” p. 488.
- ▶ “The elements Be, Cd, and Tl are all toxic at low concentrations, and their amounts were higher in the counterfeit cigarettes than in the legal cigarettes with mean values 0.028 versus 0.016, 0.049 versus 0.017, and 0.127 versus 0.058 μgg^{-1} , respectively. According to the International Agency for Research on Cancer, beryllium and beryllium compounds are group 1 carcinogens in both animals and humans.^[43] p. 489.

- ▶ “As, Mo, and Sb are all toxic elements and their amounts were about two to three times higher in the counterfeit cigarettes than in the legal cigarettes with mean values 0.620 versus 0.250, 0.646 versus 0.382, and 0.117 versus 0.045 μgg^{-1} , respectively. Tobacco may contain a substantial amount of As if arsenical insecticides have been used in the growing process. Arsenic and many of its compounds are especially potent poisons. Overexposure to As has been associated with increased risk of skin, liver, bladder, kidney, and lung cancers. Prolonged exposure to Mo dust can cause irritation to the eyes, nose, throat, and skin.^[44] Sb poisoning is clinically very similar to As poisoning. Sb and its compounds have been reported to cause dermatitis, keratitis, conjunctivitis, and nasal septal ulceration by direct contact, or inhalation of fumes or dust.^[45]” p. 489. [Emphasis added].
- ▶ “Hg and Pb are heavy metals that have both acute and cumulative toxicities. Exposure to either of these elements can cause neurological damage, especially in young children, who can develop learning disabilities at very low exposure levels. The mean Hg concentration in the counterfeit cigarettes was much higher than in the legal ones, 0.049 versus 0.020 μgg^{-1} . Hg and most of its compounds are extremely toxic. It can be inhaled and absorbed through the skin and mucous membranes. Of all the elements analyzed, Pb showed the greatest enhancement in counterfeit cigarettes relative to the legal ones. The amount of Pb in counterfeits was nearly 10 times higher than in legal cigarettes with a mean value of 5.69 versus 0.606 μgg^{-1} .” [Emphasis added].