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Sources of Indoor Air Pollutants in the Occupied Palestinian Territories, Including Skunk Liquid, Household Cleaning Products, and Others

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Abstract

The air pollution's situation in the Occupied Palestinian Territories (OPT) can be simply described as 'catastrophic.' Something uniquely characterizes the indoor air pollution in this region of the world, which is the noisome substance, known as 'Skunk liquid,' used by the Israeli occupation forces against innocent, nonviolent Palestinians and their properties. Skunk liquid, with reference to the animal 'Skunk,' is an obnoxious-odor's liquid and a unique indoor and outdoor air pollution source, being used only in the OPT, where the Palestinian citizens have no control on it. Skunk liquid's odor is overpowering; it feels like the smell of a mixture of raw sewage, sulfur, and rotten animal corpses. The use of Skunk liquid is intended to cause humiliation to Palestinians, as well as health and environmental harms, including indoor pollution. In addition to the many other kinds of lethal and nonlethal weapons that Israel has been using against innocent, nonviolent Palestinians in the OPT, Skunk liquid, in particular, has become one of the efficient, remarkable nonlethal weapons that Israel has been frequently and constantly using against Palestinians since it was first used in August 2008 in the West Bank's village of Ni'lin. Since then, and according to Israeli and international civil- and human-rights organizations, Skunk liquid has been used, indiscriminately, by the Israeli occupation forces as a punitive measure against Palestinian crowds, homes, shops, schools, hospitals, hotels, restaurants, entire neighborhoods, and even at funeral processions in Palestinian cities, towns, villages, and refugee camps. After Skunk liquid makes contact with persons or objects, its putrid stench can stay for days and even weeks, causing nausea; vomiting; skin rash, irritation, and redness; eye irradiation; abdominal pain; suffocation; excessive coughing; headaches; ataxia; etc. In this paper, indoor air pollution, resulting from Skunk liquid, and other sources, including household cleaning products, smoking, etc. is investigated, analyzed, and discussed, with respect to their adverse impacts on health and the environment. However, monitoring mechanisms, including field observations, laboratory analyses, data collection (such as questionnaires and others), and computer modeling are still needed.

Keywords: Indoor Air Pollution Including Skunk Liquid Pollutant; Skunk Animal; Household Cleaning Products and Other Indoor Pollutants; Civil and Human Rights Organizations; Humiliation; Palestine (Occupied) and Israeli Occupation

List of abbreviations: ACRI: Association for Civil Rights in Israel; AHA: American Heart Association; AP: Air Pollution; CO: Carbon Monoxide; CO2: Carbon Dioxide; DNA: Deoxyribo Nucleic Acid; EPA: Environmental Protection Agency, USA; GIS: Geographic Information System; GPDM: Gaussian Plume Dispersion Model; HCPs: Household Cleaning Products; IAP: Indoor Air Pollution; INCLO: International Network of Civil Liberties Organization; MAN: Maschinenfabrik Augsburg-Nürnberg, Germany; MD: Medical Doctor; NO2: Nitrogen Dioxide; NOx: Nitrogen Oxides; OAP: Outdoor Air Pollution; OPT: Occupied Palestinian Territories; PA: Palestinian Authority; PERC: Perchloroethylene; PHR: Physicians for Human Rights; PM: Particulate Matter: PM2.5: Particulate Matter 2.5 Micrometers or Less in Diameter; PM10: Particulate Matter 10 Micrometers or Less in Diameter; PMs: All Sizes of Particulate Matter; QUATS: Quaternary Ammonium Compounds; SO2: Sulfur Dioxide; SO4: Sulfate; TVs: Televisions; VAMC: Virginia Agricultural and Mechanical College, USA; VOCs: Volatile Organic Compounds; WHO: World Health Organization, UN; WPTS: Water-Pipe Tobacco Smoke; °C: Celsius Degrees; cc: Cubic Centimeter; °F: Fahrenheit Degrees; gm: Gram; kg: Kilogram; km: Kilometer; km2: Square Kilometer; m: Meter; mm: Millimeter; ppm: Part per Million; µm: Micrometer or Micron (One-Millionth of a Meter); µg/m3: Microgram (One-Millionth of a Gram) per Cubic Meter; %: Percentage

Practical Implications

This paper aims to explore and identify the problem of indoor air pollution, in general, and the use of the Skunk liquid, in particular, that is uniquely used in the Occupied Palestinian Territories (OPT) by the Israeli occupation forces. This paper presents a very important topic, with respect to the public health, the environment, and humanitarian issues. It is the inhumane use of the Skunk liquid against innocent, nonviolent Palestinian citizens in the OPT, as it is widely used against crowds, homes, restaurants, hotels, and other places, causing outdoor and indoor air pollution at the same time. To the best of the Author's knowledge, this topic is investigated herein for the first time in such a technical, scientific, and legal manner, based on arguments made available by observers, including Israeli and international civil and human rights organizations.

However, because of the political situation, it is not easy at all to undertake field measurements and laboratory analyses, regarding the Skunk liquid used by the Israeli occupation forces against Palestinians in the OPT. Nevertheless, in view of the available information, the health and environmental impacts of the use of the Skunk liquid, as well as of other pollutants used in the OPT are investigated in this paper. In view of the outcomes of this paper, medical doctors, environmentalists, research scientist, academicians, educators, politicians, human-rights' activists, and policy-makers, as well as international organizations should collaborate for the purpose of supporting further investigations in the future, regarding the issues discussed in this paper, especially the Israeli use of the Skunk liquid against Palestinians in the OPT.

It is noteworthy to mention that what is further needed on the topic of the illegal use of the Skunk liquid by the Israelis in the OPT is assessment of the air quality. This can be done by taking some indoor measurements of the odor-type material (Skunk liquid) at several houses and in different places across the OPT, and/or by predicting them with some air-quality models (for instance, the Gaussian Plume Dispersion Model (GPDM)). Also, with the help of Geographic Information System (GIS) techniques, maps of the distribution of the Skunk liquid's concentration can be obtained, based on the measurements of air quality, indoors and outdoors. Nevertheless, in the presence of highly complicated geopolitical circumstances in the OPT and of the Israeli restrictions enforced on the Palestinian population in the OPT, it can be concluded that these techniques are out of reach at the present time.

Introduction

In this brief introduction, a background is presented on air pollution, in general, including definitions of indoor and outdoor air pollution and their sources, as well as their impacts on public health and the environment, followed by the aim of this paper.

Background

Air pollution (AP) is generally defined as "The presence in, or introduction into the air of, a substance that has harmful or poisonous effects." Outdoor air pollution (OAP) can be defined as "The presence of solids, liquids, or gases in outdoor air in amounts that are injurious or detrimental to human health and/or the environment," or as "The substance (such as smoke, dust, and obnoxious odors) that interferes with the comfortable enjoyment of life and/or property." Indoor air pollution (IAP) is defined as "The pollution that refers to chemical, biological, and physical contamination of indoor air."

AP is a concentration of foreign matter in the air that adversely affects the health and welfare of people and the environment. Air pollutants include liquid, solid, gaseous, radioactive, and microbial substances suspended in the air, which are related to man-made activities (such as industry, construction, transportation, communication, agriculture, etc.); and also to naturally-occurring activities (such as gases released from volcanoes, biological decay, and forest fires). According to a report issued in September 2016 by the World Health Organization (WHO 2016a) [1], health of more than 90% of the world's population is affected by AP (both OAP and IAP). Therefore, AP continues to rise at alarming rates, and, thus, it affects economies and people's quality of life, representing a public health emergency.

Nowadays, AP (both OAI and IAP) is considered, in many countries around the world, as one of the main sources of morbidity and mortality. Some studies (e.g., Raven-Ellison 2016) [2] indicate the following: 1) 10,000 people died as a result of AP in London, UK, in 2015 alone; 2) Alzheimer disease could be caused by toxic AP's particles found in brain tissues; and 3) One in seven children (around 15% of the children) in London, UK, did not play in a natural environment in 2015. As related to IAP, in particular, the United States' Environmental Protection Agency (EPA) found that indoor environment is 2–5 times more toxic than outdoor environment, and in some cases, the air measurements indoors have been found to be 100 times more polluted (EPA 2016).

Indoor Air Pollutants and Their Sources and Health Impacts

Different pollutants cause IAP, depending on their sources, which include: 1) Natural sources, including, for instance, radon and biological contaminants; 2) Combustion process, generating carbon monoxide (CO), carbon dioxide (CO_2) nitrogen oxides (NO_x), sulfur dioxide (SO_2), and respirable suspended particles or particulate matter (PM); and 3) Man-made sources, including, for instance, asbestos, volatile organic compounds (VOCs), formaldehyde, low-pressure mercury vapor, argon, krypton, lead, polybrominated diphenyl ethers, phthalates, phenol, toluene, 2-ethylhexanol, and styrene.

These chemical pollutants are found in/ caused by/ resulted from/ several materials, appliances, and sources, including, for example, under-buildings' soils and rocks; construction products; house dusts; infected humans and animals; beddings; poorly maintained humidifiers; dehumidifiers; air conditions; air filters; wet or moist surfaces; carpets and carpets' vacuuming; home's furnishings; heating (furnaces, water heaters, and kerosene and natural gas' heaters); charcoal grills; wood and coal stoves; fire-places; chimneys; cook tops and ovens; gasoline's and diesel's engines; tobacco's smoke (cigarettes, cigars, pipes, and water-pipes known as 'Hookah,' 'Shisha,' 'Argileh,' or 'Nargileh'); aerosol and hair sprays; perfumes; solvents; glues and adhesives; fabric's softeners; dry-cleaned clothing; household's cleaning products (bleaching and cleaning solutions, etc.); moth-balls; pesticides; paints; damaged or deteriorating ceilings and walls; exterior siding; pipe's and thermal insulations; vinyl-asbestos floor's materials; acoustic materials; fire-proof's gaskets; children's plastic toys and games; cosmetics and personal care products (such as deodorizers, perfumes, etc.); air fresheners; food's and beverage's packaging; indoor (and outdoor) fire-works; and electronic and electrical appliances (such as TVs, refrigerators, fans, computers, cell phones, etc.).

These pollutants and their sources can result in health impacts, ranging from mild to moderate, and from severe to fatal, affecting the pulmonary and cardiovascular systems and other systems in the body. The health impacts include: colds; flues; rash; irritation (burning eyes, burning nose, sore throat); chronic runny nose; sinus problems; coughing; headaches; drowsiness; dizziness; fatigue; light and noise sensitivity; sleeping disorder; lethargy; nausea; muscle and joint pain; digestive problems; allergies; asthma; breathlessness; neurological symptoms (mental confusion, neuro-developmental disorders); memory problems (forgetfulness, poor concentration); respiration system's impairment (damage to respiratory tract and lungs); damage to liver, kidneys, and brain; strokes; Alzheimer and Parkinson diseases; cancers; and even death (see, for instance, Genc *et al.* 2012) [3].

Aim of the Study

The Occupied Palestinian Territories are recognized for their environmental problems caused by the Israeli military occupation forces and the Israeli settlers. These problems include the indoor air pollution and the outdoor air pollution. This paper reviews some of the available data, regarding the indoor air pollution sources, including the Skunk liquid used by the Israeli occupation forces against innocent, nonviolent Palestinians and their properties in the OPT. The pollution resulting from the Israeli-manufactured and used Skunk liquid is treated in this paper as an indoor air pollution source. This is based on the definition of IAP, given above, as "The pollution that refers to chemical, biological, and physical contamination of indoor air." Palestinian homes and other indoor places are badly affected by chemical, biological, and physical contamination caused by the Skunk liquid sprayed at them (homes, etc.) by the Israeli occupation forces.

This paper also discusses some other indoor air pollution sources, which also affect human health and the environment. This paper is prepared with the aim of providing a reference/background for future scientific research of strategic relevance for the OPT's air quality management under a multi-pollutant framework, as well as in view of human- and civil-rights violations of the Palestinian people living under the Israeli military occupation. However, the limited publicly accessible data and the little scientific information prevent a comprehensive assessment of the local air quality in the OPT.

This awareness and eye-opening study was carried out with the focus on the OPT, including the West Bank (including East Jerusalem) and the Gaza Strip. As it is the first of its kind, this study opens eyes on the great violations of the very basic human- and civil-rights of the Palestinian people, experiencing very harsh, inhumane conditions under the Israeli military occupation of the Palestinian Territories for more than 52 years now (i.e., since June 1967). This is due to the fact that the Israeli occupation authorities (represented in the Israeli government, army, police, and settlers) have greatly endangered the public health of the Palestinian population, and the environment in the OPT. This is despite the fact that environmental pollution does not know borders, meaning that the environmental and health negative impacts caused by the Israeli occupation authorities are also reflected on the Israelis themselves at various levels.

It is worth-mentioning that it is not easy or even not possible to undertake field or laboratory work in the OPT, regarding the environmental and health-related problems investigated in this study, namely the use of the 'Skunk liquid' by the Israeli occupation forces against innocent, nonviolent Palestinians. This is due to the difficult circumstances resulting from the Israeli military occupation. However, it is still hoped that some field and laboratory measurements and analyses, as well as computer modeling can be undertaken in the future. Aside from field and laboratory measurements and analyses to investigate the pollution levels caused by the Skunk liquid and to monitor air quality in the OPT, one of the effective techniques that can be used for such purpose is the use of the Gaussian Plume Dispersion Model (GPDM). This technique requires identification of the following factors: 1) Source characteristics, such as the emission rate, and the distance of the receptor from the source; 2) Site and surrounding conditions; and 3) Meteorological/atmospheric conditions, such as the wind speed, wind direction, and the vertical temperature structure of the local atmosphere (see, for instance, Melli and Runca 1979 [4]; Miller and Hively 1987 [5]; Liu *et al.* 2001 [6]; Abdel-Rahman 2008 [7]; Oura *et al.* 2018) [8].

The GPDM uses a realistic description of pollutants' dispersion, where it represents an analytical solution to the diffusion equation for idealized circumstances. However, the GPDM assumes that the atmospheric turbulence is both stationary and homogeneous, whereas in reality none of these conditions is fully satisfied. Regarding the monitoring of the pollution caused by the Skunk liquid used by the Israeli forces, some of the factors needed to be introduced in the GPDM are not easy to obtain simultaneously, because of reasons beyond control.

Environmental Status in the Occupied Palestinian Territories (OPT)

The environmental status in the OPT, including the West Bank (including East Jerusalem) and the Gaza Strip, can be simply described as 'disastrous' (Salem 2019a) [9]. According to a study issued by the World Health Organization (WHO 2016b) [10], the Israeli factories and their solid, liquid, and gaseous waste products pose a threat to the environment and to the physical and mental health of the Palestinian population, which certainly have economic repercussions. Based on the same report (WHO 2016b) [10], the status of the environment in the OPT represents the often negative relationship between the Israeli occupation and the dramatically accelerated environmental degradation (Figure 1).

Figure 1: The relationship between environmental degradation in the Occupied Palestinian Territories (OPT) and the Israeli Occupation (Source: After Salem *et al.* 2007) [11]

The practices of the Israeli occupation in the OPT and the Israeli control over the Palestinian population and their lands and natural resources have systematically hindered sustainable development in the OPT (Salem 2019a) [9]. The Israeli practices have badly contributed to poverty increase among Palestinians, and to the damages inflicted on the environment, which have resulted in severe problems, including, for instance, the following:

1) The OPT's dense population: The OPT, with an area of only around 6,000 km2, is the area where more than 5.1 million Palestinians and around one million Jewish settlers live; 2) The OPT's high population's density: It is generally 800 persons/km2 (5,154 persons/km2 in the Gaza Strip and 519 persons/km2 in the West Bank, in mid-2016) (PCBS 2016); 3) The high rate of the annual population growth: For the Palestinians it was 2.9% in 2015 (World Bank 2016) [12], and for the Jewish settlers it was 3.6% by December 2012 (Cohen and Gordon 2012) [13]; 4) The Oslo Accords' division of the occupied West Bank into three areas (*A, B*, and *C*), which has made '*Area C*' and large parts of '*Area B*', in particular, out of reach to many of the West Bank's Palestinians, especially the farmers (Salem 2019b) [14]; 5) The land degradation: It is resulted from the non-stopping confiscation of the Palestinian lands by the Israeli government, soldiers, and settlers; 6) The depletion of water and other natural resources, as Israel has a full control over the natural resources, including, most importantly, the water resources (the Palestinians in the OPT obtain less than 15% of their rightful water resources, while more than 85% of their water resources is taken by the Israelis (Salem and Isaac 2007 [15]; IMEMCnews 2016 [16]; Salem 2019a [9]; Salem 2019b [14]); 7) The deterioration of biodiversity, along with the rapid rate of desertification (Salem 2008) [17]. Israel has uprooted over a million trees since 1967, mainly olive trees that belong to Palestinians (Chelala 2015 [18]; Salem 2019a [9]); 8) The water-, soil-, and air-pollution (Salem 2019a [9]); 9) The solid and fluid wastes (including hazardous waste) (Salem *et al.* 2007) [11]; 10) The climate change impacts (Salem 2008 [17]; Salem 2011) [19]; 11) The lack or weakness of environmental administration, represented in the lack of regulations, rules, laws, and awareness programs, etc.); and 12) The long-lasting problem of the Palestinian refugees (i.e. since 1948, where the situation in the Palestinian refugee camps (established since 1948) is really miserable. Further details on these problems are given in Salem (2019a [9]; Salem 2019b [14]).

The huge demonstrations, which have been taking place in the Gaza Strip lately, started on 30 March 2018 and are still going, reflect the wishes and hopes of the Palestinian citizens in the Gaza Strip to go back to their homes, lands, and hometowns in Historic Palestine, from where they were driven out in 1948. As a result of the demonstrations, which have been taking place peacefully, hundreds of innocent Palestinians were killed and thousands were injured at the hands of the Israeli occupation forces. As related to this, another environmental problem has been developing over there, because clouds of thick black smoke billowed across the edges of the Gaza Strip with the Israeli borders, as Palestinian protesters use burning tires in an attempt to shield themselves from the Israeli snipers' fire shot at them by heavily armed Israeli troops (Morris *et al.* 2018) [20].

Air Pollution in the Occupied Palestinian Territories (OPT)

A great deal of the Israeli pollutants ends in the OPT, because, in addition to the adverse impacts of the Israeli colonies (settlements for-Jews-only), many Israeli factories exist there, and also due to the fact that the wind blows mainly from west to east (i.e., from Israel to the OPT). Air pollution in the OPT is mainly due to the following anthropogenic sources (Salem 2015) [21]:

A) The unlawful activities of the Israeli occupation forces and settlers, including: A.1) The use of all kinds of weapons during the Israeli several wars (especially during the wars launched on the Gaza Strip), the Israeli intrusions of the Palestinian communities, and the intensive fight against public demonstrations and uprisings (known in Arabic as 'Intifadas'); and A.2) The presence of the Israeli factories in the OPT, which produce large amounts of solid-, fluid-, and volatile-pollutants (hazardous, chemical, industrial, organic, etc.) that badly affect the neighboring Palestinian communities and the environment. B) The Palestinian unlawful activities, including: B.1) The industrial activities, particularly the stone and marble (commercial name) industry that includes quarrying, cutting, polishing, crushing, transporting, etc., which badly pollutes the air, water, soil, and the vegetation's cover and, thus, badly affects the public health and the environment; B.2) The transport sector; B.3) The tires' burning which Palestinians use during demonstrations, as a tool to express their anger and opposition against the activities of the Israeli military occupation, and to shield themselves from Israeli snipers who shoot at them; B.4) The landfills' and open-air waste burning; B.5) The open-air waste dumping (hazardous, chemical, industrial, organic, etc.); B.6) The open-air animal slaughterhouses; B.7) The intensive use of chemical fertilizers, pesticides, herbicides, etc.; and B.8) The wide-use of fireworks, day and night throughout the year.

Such impacts have become even more damaging, due to the effects of other factors, such as the high temperatures, the aridity and semi-aridity climate conditions affecting the region, and the OAP's sources, including the stone and marble industry, and the sand- and dust-storms caused by the 'Khamsīn' (or 'Khamaseen'), which is a Middle-Eastern term for dry, hot winds that blow in from the desert in North Africa and that take place, generally, from March through May, and sometimes during other months of the year, as a result of climate change (Salem 2015) [21]. These conditions, along with the climate change impacts and the shortages of water due to the Israeli control over the Palestinian water resources (Salem and Isaac 2007 [15]; Salem 2019a [9]; Salem 2019b [14]), the OPT have witnessed, during the last few decades, considerable periods of draught (Yihdego *et al.* 2019), representing another environmental problem affecting the OPT.

Indoor Air Pollution in the Occupied Palestinian Territories (OPT)

Indoor air pollutants and their sources in the OPT are not much different from those in other countries and regions of the world, except the difference in the intensity and frequent use of the pollutants' sources, and, in particular, the use of the Skunk liquid by the Israeli occupation forces against Palestinian citizens. Following are some examples of the main sources that cause IAP in the OPT, starting with the Skunk liquid which will be discussed in some detail, as being the primary target of this paper:

Skunk Liquid

The Israelis (successive governments, ministries, institutions, soldiers, police, settlers, industries, etc.) have never hesitated to always invent, manufacture, and import new hazardous, toxic, and lethal and nonlethal weapons to be used against the Palestinian people in the OPT. One of the nonlethal weapons used by Israel against the Palestinian people in the OPT is the Skunk liquid, with reference to the animal 'Skunk.' The animal 'Skunk' is discussed in the following section in order to explain the scientific linkages (biologically, chemically, and physically) between the Israeli-used weapon – Skunk liquid – and the animal 'Skunk.' This is with the consideration that environmental sciences and engineering are based on understanding the biology, chemistry, and physics of things, which should help in finding solutions for environmental problems.

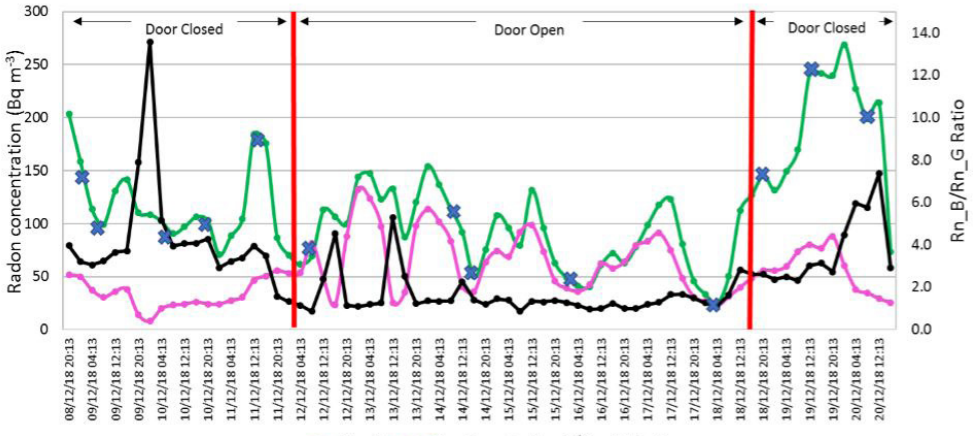

Figure 2: Left: Pictures of different kinds of the animal 'Skunk;' Middle: Skunk's skeleton; and Right: The major chemical compounds of Skunk's defensive secretion, including: (E)-2-butene-1-thiol (1); 3-methyl-1-butanethiol (2); S-(E)-2-butenyl thioacetate (3); S-3-methylbutenyl thioacetate (4); 2-phenylethanethiol (5); 2-methylquinoline (6); and 2-quinolinemethanethiol (7) (Source: After Wood 1999 [24]; Wood *et al.* 2002 [25]; Wikipedia and MoO 2019) [26].

The Animal Skunk: The term 'Skunk,' given by the Israelis for their invented weapon 'Skunk liquid,' is with reference to the secreted substance sprayed by the animal 'Skunk.' The official name for the animal Skunk family is 'Mephitidae,' which means 'stink,' belonging to the 'Mustelidae' family (Keyser 2015) [22]. After their DNA (DeoxyriboNucleic Acid) – a self-replicating material which is present in nearly all living organisms) was decoded, scientists learned that Skunks derived from a single common ancestor about 30–40 million years ago (Keyser 2015) [22]. Skunks, found in Canada, the USA, Mexico, and South America (Bradford 2016) [23], are mammals that are classified into four groups (Figure 2–Left and Middle): Stripped Skunks, Spotted Skunks, Hog-Nosed Skunks, and Hooded Skunks, which (all) are known for their ability to spray a liquid with a strong odor.

Skunks, varying in size, although most are the size of a house cat with average life span in the wild of 3 years, are omnivorous animals, eating both plant and animal materials, and changing their diets as the seasons change (NG 2019). They eat insects and larvae, earthworms, grubs, rodents, lizards, salamanders, rats, mice, snakes, frogs, birds, moles, eggs, and fish, as well as berries, roots, leaves, grasses, fungi, and nuts, and in settled areas they also eat garbage left by humans. This video (1:12 minutes) briefly gives an idea about what makes the odor of Skunk's spray so terrible. https://www.smithsonianmag.com/smithsonian-institution/ask-smithsonian-what-makes-skunk-spray-smell-so-terrible-180955553/ (Ault 2015) [27].

As powerful as it is, the spray of the animal 'Skunk' is a closely-guarded 'weapon of mass destruction,' says Kenton Kerns, a biologist at the 'Small Mammal House of the Smithsonian's National Zoo' in Washington, D.C., USA (Ault 2015) [27]. This kind of weapon is never used in skunk-on-skunk fights over territory, but it is, usually and sparingly, used only against predators that do not get the message. A single spray could almost completely deplete the liquid of the animal 'Skunk', which is produced in its anal glands. It is constantly being made in a slow process, which could take up to 10 days to refill the glands, during which time the animal 'Skunk' would be highly vulnerable to predators like wolves, badgers, coyotes, and great horned owls.

The animal 'Skunk' can even control accurately the distance between itself and predators, so as to not waste its precious liquid against them. Usually, a very small squirt is released—enough to make a predator (an animal or a curious human) stop, turn around, and run away. According to OKP (2016) [28], the animal 'Skunk' is on the top (No. 1) of the 'Ten Smelliest Animals,' using odor as a weapon (Nelson 2014) [29]. *"Because of their lack of speed, Skunks do not try to outrun their attackers.Instead, they rely on their rancid spray for protection. The pungent liquid is a mix of sulfuric chemicals which they can spray accurately at threats up to 3 m away, with the foul odor reaching up to a mile* [≈ 1.61 km] *away. Despite the power of their spray, Skunks don't really like to use it as they only carry about 15cc* [15 cubic centimeter = 15 mm] *of the chemicals in their body (enough for about 5–8 sprays), and it can take a week to replenish the supply*" (OKP 2016) [28].

In addition to its notorious odor, the spray of the animal 'Skunk' can cause even temporary blindness. Aside from the offensive smell that lingers for days or even weeks, the Skunk's spray is intensely irritating and can cause temporary blindness in anyone unfortunate enough to get caught in the stream (Keyser 2015) [22]. Even if one is nowhere near the scene of the Skunk's spray, one could still suffer the unpleasant consequences. Accordingly, people can detect the scent from anywhere up to a mile (≈ 1.61 km) away from the spraying animal 'Skunk.'

As seen in Figure 2–Right, the spray secreted by the animal 'Skunk' is composed of 7 different chemical compounds (Wood 1999 [24]; Wood *et al*. 2002 [25]). These complex compounds can be detected by the human nose at concentrations of only 10 ppm, because they have extremely obnoxious odor (Wood *et al*. 2002) [25]. The secreted chemicals of the animal 'Skunk' are composed of four chemical elements, which are: carbon (C), hydrogen (H), sulfur (S), and nitrogen (N) (Figure 2–Right). High concentrations of the spray of the animal 'Skunk' can be toxic. Hydrogen sulfide is very toxic to humans; methanethiol at concentrations of 1 part per 100 in air can kill rats (Wood 1999) [24]. Aldrich (1896) [30] made the following speculation, indicating that the toxic properties of compounds in the spray of the animal 'Skunk' might result in death: *"The substance is a powerful anaesthetic, and has also been used as an antispasmodic. When inhaled without the admixture of a large amount of air, the victim loses consciousness, the temperature falls, the pulse slackens, and, if the inhalation were prolonged, the results would doubtless prove fatal."*

The anesthetic properties of the secretion of the animal 'Skunk,' mentioned above, stems from an 1881 report by W.B. Conway, MD, at the Virginia Agricultural and Mechanical College (VAMC) in Blacksburg, Virginia, USA (Conway 1881) [31], stating: *"Sometime during the summer of 1879, two or three boys* [students at VAMC], *secured a two-ounce* [≈ 57 gm] *bottle of the perfume from the* [animal] *Skunk or pole-cat (Mephitis Americanae), and concluded to play a trick upon one of their school mates; entering his room, they held him, and administered the above nauseous fluid (in its most concentrated form), by inhalation. I could not ascertain what amount was administered. However, when I reached him I found the following symptoms: A total unconsciousness, relaxation of the muscular system, extremities cool, pupils natural, breathing normal, pulse 65, temperature 94* [94 °F = 34.4 °C]; *in which condition he remained for one hour*" (Conway 1881) [31].

The Israeli-Made Skunk Liquid Used Against Palestinians: Due to the fact that the animal 'Skunk' is widely known for its highly odoriferous defensive spray secreted to repel predators and due to its harming effects, as explained above, the Israelis have given the same name 'Skunk' to their invented weapon – Skunk liquid – to be frequently used against innocent, non-violent Palestinian citizens, including children, young boys and girls, and elderly men and women, which is also sprayed at Palestinian homes and entire neighborhoods during day- and night-times (Figure 3).

Figure 3: Left: Israeli military trucks used by the Israeli occupation forces, spraying Skunk liquid at non-violent Palestinian protestors holding the Palestinian flag; **Middle:** At a child; and **Right:** At Palestinian homes and entire neighborhood during night-time (Source: B'Tselem 2013 [32]; Shams 2014 [33]).

The Israeli weapon – Skunk liquid – probably has the same chemical compounds secreted by the animal 'Skunk' demonstrated in Figure 2–Right, in addition to other harmful manufactured chemical compounds of unknown toxicity, as discussed below. If the secretion of the animal 'Skunk' can be toxic and even fatal, though natural (Conway 1881 [31]; Aldrich 1896 [30]; Wood 1999 [24]; Wood 2002) [25], one can imagine what would be the effects of the Israeli-manufactured weapon – Skunk liquid – used against innocent Palestinians.

Skunk liquid is a substance that was used by the Israeli occupation forces for the first time in August 2008 against peaceful, non-violent Palestinian protestors in the OPT's West Bank's village of Ni'lin, near the City of Ramallah, occupied West Bank. The noisome substance Skunk liquid has not been used anywhere in the world except in the OPT against Palestinians (The Economist 2015) [34]. Recently, and according to the Israeli daily – Haaretz – Israel sold the weapon 'Skunk liquid' to the Indian government to be used against the Kashmiri demonstrators. *"After an incident that left many Kashmir protestors dead and blinded last year at the hands of Indian forces with pellet guns, the Indian government turned to Israel for a non-lethal method of crowd containment. Though Israeli security forces find it effective against Palestinians, Indian protesters prove more tolerant to sewage-stinking weapon nicknamed 'Skunk'"* (Haaretz 2017).

The Skunk liquid is manufactured (or better saying created or invented for the first time) by the Israeli research and development firm 'Odortec,' which is located near the occupied City of Jerusalem. Though 'Odortec' is owned by Israeli businessmen, the production of this weapon – Skunk liquid – involves the German mechanical engineering company MAN (Maschinenfabrik Augsburg-Nürnberg), headquartered in Munich, Germany, which provides the chassis for the military vehicles that carry the weapon (Strickland 2014 [35]; Lewis 2015) [36].

The Skunk liquid is a yellow mist, having the viscosity of water and can be sprayed over large areas and huge crowds, using water cannons (Figure 3). According to a recent study, titled: *"Israel: The Skunk – A Humiliating Weapon,"* released jointly by the 'Physicians for Human Rights' (PHR) and the 'International Network of Civil Liberties Organization' (INCLO), the Skunk liquid is described as, *"Foul-smelling chemicals, often coating not only individuals but also nearby homes and businesses in malodorous and difficult-to-remove chemicals of unknown toxicity"* (PHR and INCLO 2016) [37]. Witness testimony reveals that the Israeli police and army indiscriminately and purposely spray the Skunk liquid towards houses, people, and restaurants brimming with people and in crowded streets, causing harm to innocent residents (Figure 3).

Between July and December 2014, the Israeli police covered the narrow and crowded streets in many neighborhoods of the occupied City of East Jerusalem with 170 tons (170,000 kg) of the Skunk liquid (PHR and INCLO 2016) [37]. According to the Association for Civil Rights in Israel (ACRI), the Israeli forces use Skunk liquid arbitrarily with no apparent justification, and in the absence of any public disturbances (ACRI 2014) [38].

Inserted below are four short videos (1–2 minutes each) that clearly show the Israeli occupation forces using canons carried on armored tanker trucks, spraying the Skunk liquid at innocent, non-violent Palestinians and their homes, residential properties, cars, shops, yards, olive and other kinds of trees, and entire neighborhoods, as well as at funeral procession (Levy 2012 [39]; Levy 2013 [40]). These videos show the Israeli occupation forces using the Skunk liquid against Palestinians in the Occupied West Bank, fired at: 1) Private Palestinian homes in the occupied West Bank:https://www.youtube.com/watch?v=Jy5OwN1e-wk (ApollonianKing 2014) [41]; 2) A funeral in the City of Hebron, occupied West Bank: https://www.youtube.com/watch?v=adhGYqdjIsg (B'Tselem 2012) [42]; 3) During protests in the City of Bethlehem and in the neighborhood of the Al-Azzah refugee camp, occupied West Bank: https://www.youtube.com/watch?v=sa23LSBFkoc (ODN 2014) [43]; and 4) Targeting residents of the Abu Sneineh neighborhood in the City of Hebron, occupied West Bank, aiming directly into (inside, within) Palestinian homes and kindergarten, causing direct, effective, and harmful indoor pollution: https://www.youtube.com/watch?v=vmma62Epjrw (ISM Palestine 2015) [44].

The short videos given above clearly show that the Israeli occupation forces indiscriminately shoot Skunk liquid in a strong jet, using armed vehicles, at everything Palestinian for the purpose of causing humiliation and significant harms to the Palestinian citizens, and damage to their properties, indoors and outdoors. The odor of the Skunk liquid sprayed at Palestinians is horrendous and overpowering, similar to the odor of the spray of the animal 'Skunk' but worse than that. It smells of everything rotten, as if it has been mixed with excrement noxious gas, raw stagnant sewage, sulfur, rotten decomposing animal corpses, meat, fish, eggs, cabbage, etc. (Browning 2012) [45]. Palestinians, however, simply call the Skunk liquid 'shit' (Shams 2014) [33]. After the Skunk's filthy liquid makes contact with a person or object, the extremely putrid nauseating stench can persist for days and even weeks, causing skin and eye rash, irritation, and redness; nausea; vomiting; suffocation; headaches; breathing difficulties; excessive coughing; abdominal pain; and ataxia (ACRI 2014) [38].

Cancer Augmentation amongst Palestinians in the Occupied Palestinian Territories (OPT): Personal communications were conducted by the Author of this paper with some Palestinians who and their communities are directly affected by the Israeli Skunk liquid, as they have been frequently and constantly attacked, over many years now, by the Skunk liquid made and used by the Israeli occupation forces. According to those Palestinians, they have witnessed several cases of 'Cancer,' with different types spreading amongst various ages of males and females. These types include blood cancer (leukemia), anal cancer, bladder cancer, colon and rectal cancer, gastrointestinal carcinoid tumors, breast cancer, endometrial cancer, kidney cancer, liver cancer, lung cancer, skin cancer (melanoma), non-hodgkin lymphoma cancer, pancreatic cancer, prostate cancer, and thyroid cancer. Dramatically, in some cases several of these cancer types are found in the same persons. Though there is no single indicator of the relationship between the widespread phenomenon of the Cancer cases and the Israeli use of Skunk liquid against Palestinian citizens, it is noteworthy to mention that investigations, such as medical and laboratory tests, including blood, tissue, and otherwise analyses, are necessarily and urgently needed to prove whether such a relationship, directly or indirectly, exists or not. However, Halahleh and Gale (2018) [46] and Gale and Halahleh (2018) gave several types of cancer found in the Occupied Palestinian Territories, as shown in Figure 4, which can be attributed to different reasons.

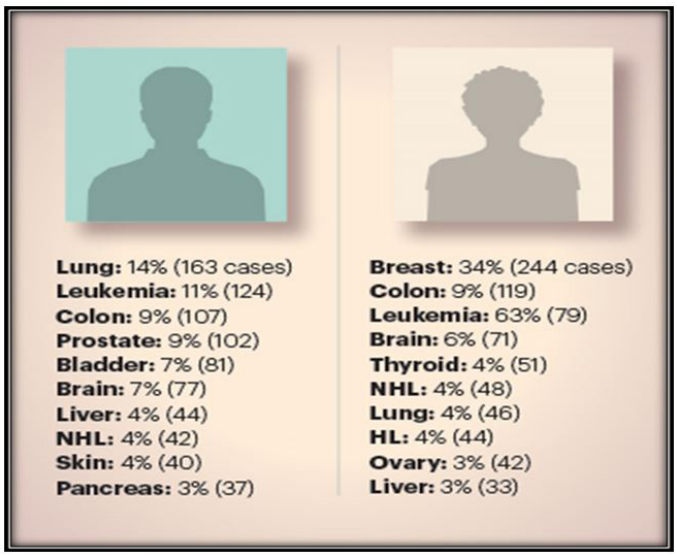

Figure 4: Top ten most common Cancer types in men and women in the Occupied Palestinian Territories (OPT) in 2015. HL = Hodgkin lymphoma; NHL = non-Hodgkin lymphoma (Source: After Halahleh and Gale 2018) [46].

Cancer, unfortunately, is the second leading cause of death in the OPT at 14%, exceeded only by heart disease at 30% (Halahleh and Gale 2018) [46]. The Cancer rates and burden in the OPT are expected to increase as the population ages, reaching levels that further challenge the financial and infrastructural resources of the current health-care system, of which financial and political uncertainty exacerbate the problem. Although several recent papers have reviewed Cancer in developing countries a few of which have focused on the OPT. There are several reasons for that, including, for instance, political sensitivities and the lack of surveys, studies, and reliable data. It is hoped, however, that investigative, analytical studies would be carried out by research scientists and physicians, with the focus on the Cancer augmentation in the OPT and their possible causes and impacts, with respect to the harsh conditions of the Israeli military occupation since June 1967, politically, economically, socially, environmentally, stress-wise, nutrition-wise, and work-wise.

Cancer care in the occupied Palestinian territories was fragmented before the year 2000, with little coordination amongst pathologists, radiologists, surgeons, and medical oncologists. Cancer patients are insured by the Palestinian government and referred to public and private hospitals within the OPT, as well as in the neighboring countries – Israel, Jordan and Egypt. However the Palestinian Authority's (PA) Health Ministry has recently stopped referring Palestinian patients in the West Bank and the Gaza Strip to Israeli hospitals (Rasgon 2019) [47]. *"We will no longer refer patients to Israeli hospitals because Israel has been overcharging us for medical services and taking funds for medical bills without our permission,"* The PA's Health Ministry spokesman Osama al-Najjar told 'The Times of Israel' (Rasgon 2019) [47].

Only about 30% of new cancer cases in the OPT are in persons older than 65 years, 60% are in persons between 15 and 64 years, and 10% are in children younger than 15 years old (Gale and Halahleh 2018) [48]. These statistics indicate that Cancer is hitting Palestinian males and females of all ages in the OPT. The three most common Cancer types in children are leukemia (30%), brain and other central nervous system Cancers (20%), and lymphomas (14%). Breast Cancer is the most common Cancer in women (34%), meanwhile lung Cancer is the most common Cancer in men, accounting for 14% of male Cancers (Gale and Halahleh 2018) [48]. However, many reasons stand behind these high rates of Cancer amongst males and females in the OPT. These, for instance, include smoking; adoption of Western lifestyle, including consumption of processed food; reducing the healthy Mediterranean diet; and decreasing physical activity. However, the Israeli inhumane practices against the Palestinian citizens in the OPT since June 1967 should be always considered and, thus, investigated.

According to Gale and Halahleh (2018) [48], more than any intervention, a satisfactory political resolution will have the greatest impact on improving Cancer care for the Palestinian citizens in the OPT, who live under the Israeli military occupation for more than half a century now (i.e. since June 1997). Therefore, what urgently needed, as regarded to the Israeli use of the Skunk liquid and the widespread of Cancer cases in the areas which are frequently attacked by the Israelis using Skunk liquid, is frequent monitoring, associated with field work, experimental work, laboratory measurements, and data collection to find out if there were direct or indirect relationship between the use of Skunk liquid by the Israeli occupation forces and the scary phenomenon of Cancer that is widely spreading, like wildfire.

Legal Perspectives of the Israeli-Made and Used Skunk Liquid against Palestinians: While evidence on the health impacts of the Skunk liquid illustrates the medical concern for serious injury and 'probably' serious illnesses like Cancer and others, there are also significant economic loss, as well as practical, legal, and human-rights concerns, as related to collective punishment, surreptitious identification, and targeting of innocent Palestinian citizens and peaceful protestors. Palestinian citizens reported feeling deep humiliation, as the stench of the Skunk liquid covered their homes (in and out) and streets, shutting down their businesses, and causing stigma.

In support of the many examples on the use of the Skunk liquid by the Israeli army and police in the OPT (West Bank, including East Jerusalem, and the Gaza Strip) against innocent Palestinians and their entire neighborhoods and properties in different areas of the OPT, B'Tselem (an Israeli human rights organization) reported, *"Israeli forces regularly hose down Palestinian homes with Skunk, raising suspicions that the practice is used as a punitive measure against Palestinian protestors"* (B'Tselem 2013) [32]. To this connection, Anne Suciu – an Israeli Attorney from the 'Association for Civil Rights in Israel' (ACRI) faxed a letter, dated November 24, 2014, to the 'Chief Commission of the Israeli Police,' in which she wrote:

"Re: Ending the Use of Skunk Spray in [Occupied] *East Jerusalem. I am contacting you regarding the police force's unprecedented use of Skunk spray in the heart of residential neighborhoods in* [occupied] *East Jerusalem over the last several months as a riot dispersal method. From first-hand accounts, it appears that the use of this measure* [spraying the Skunk liquid against Palestinian citizens] *in the midst of densely populated neighborhoods causes severe, lasting, and extensive harm to the lives of all neighborhood residents. There is a disproportionate relationship between the intended use of the spray—for public disturbances—and the way it is being used—causing property damage and harming innocent bystanders"* (Suciu 2014) [49]. The Attorney mentioned in her letter some examples on real cases related to persons and localities (homes, schools, restaurants, hospitals, hotels, etc.) on how the Skunk liquid has caused harms to them and damages to their properties.

The Attorney's letter concluded, *"The use of Skunk liquid in dense residential neighborhoods results in untold and long lasting destruction, which harms the daily life of the entire population of the area. The use of Skunk liquid in densely constructed residential areas is likely to harm small children, sick people, elderly people, and pregnant women"* (Suciu 2014) [49].

In the end of the letter, the Attorney presented the following requests: *"Immediate cessation of the use of Skunk liquid as a riot dispersal method in the densely populated neighborhoods of* [occupied] *East Jerusalem; Explicitly forbids the use of this measure* [spraying the Skunk liquid against Palestinian citizens] *in crowded residential areas; and Investigation of the claims* [described in the letter] *regarding illegal use of Skunk liquid"* (Suciu 2014) [49].

As a result of the letter, Attorney Anne Suciu mentioned, *"The Police Freedom of Information Commissioner decided, in response to our request for the procedure governing the use of Skunk liquid, not to provide to us 'Appendix A' of the procedure which includes the expert opinion of the Chief Medical Officer on the grounds that it is an internal opinion, and to censor the part of the procedure which described the composition of Skunk liquid on the grounds that exposing this information may disrupt the Government's work"* (Suciu 2014) [49].

Household Cleaning Products (HCPs)

The household cleaning products (HCPs) are known as 'chemical hazards' or 'hidden toxins.' Figure 5–Left is a diagram of air quality at homes, with the fact that most of the Palestinian homes are affected by the same sources of IAP illustrated in this Figure. Figure 5–Right shows some examples of the HCPs, which (same and/or other brands) are widely used in Palestinian homes for different cleaning purposes.

Figure 5: Left: Air quality at homes (several sources of indoor air pollution (IAP)); **Right**: Some examples of the household cleaning products (HCPs, with similar or other brands) used in Palestinian homes for different cleaning purposes (After SLH 2014 (Left); and Indiamart 2016 (Right)).

The agents found in these HCPs (Table 1) are hazardous, which can cause considerable health problems, and have also negative impacts on the environment. Some examples of these harmful chemical compounds and their sources, as well as their adverse impacts on human health and the environment are given in Table 1.

Agent	Source (found in)	Health and Environmental Impacts
Phthalates: Indicated on the product's label by the word 'fragrance.' Exposure to this compound occurs through inhalation or skin contact.	• Many fragranced household products, such as air fresheners, dish soap, and even toilet paper.	¶ Reduction of sperm counts in men ¶ Skin irritation ¶ Possible migraine and asthma triggers.
Perchloroethylene (PERC): Through inhalation as it smells on clothes when they return from the dry cleaner, or the fumes that linger after cleaning carpets.	• Dry-cleaning solutions • Spot removers • Carpet and upholstery cleaners	¶ A neuro-toxin that may cause some troubles with the nervous system ¶ Possible carcinogen that can cause cancer in living tissues ¶ Dizziness and loss of coordination.
Triclosan: Indicated on the product's label by the word 'antibacterial.'	• Most liquid dishwashing detergents• Hand soaps • Sanitizers.	¶ It is an aggressive antibacterial agent that can promote the growth of drug-resistant bacteria ¶ Toxic to algae in rivers and streams ¶ Disrupt endocrine (hormonal) functions ¶ A probable carcinogen.
Quaternary Ammonium Compounds (QUATS): Indicated on the product's label with the word 'antibacterial.'	• Fabric softener liquids and sheets.	¶ Antimicrobial, and thus, pose the same problem as Triclosan by helping breed antibiotic-resistant bacteria ¶ Skin irritant ¶ Culprit for respiratory disorders.
2-Butoxyethanol: Classified as 'Glycol Ethers.'	• Multipurpose cleaners (used for windows, mirrors, kitchens, etc.).	¶ Sore throat when inhaled ¶ At high levels glycol ethers can contribute to narcosis, pulmonary edema, and severe liver and kidney damage.
Ammonia: It evaporates and does not leave streaks.	• Polishing agents for bathroom fixtures, sinks, jewelry, and glass.	¶ Powerful irritant (it irritates the respiratory system and mucous membranes if inhaled) ¶ Can cause chemical burns if spilled on the skin ¶ Mostly affected are those who have asthma, and elderly people with lung and breathing problems ¶ Those who get a lot of ammonia exposure, like housekeepers, will often develop chronic bronchitis and asthma ¶ Can create a poisonous gas if mixed with bleach.
Chlorine: A highly efficient disinfectant.	• Scouring powders • Toilet bowl cleaners • Mold and mildew removers • Laundry whiteners • Household tap water to kill disease-causing pathogens, such as bacteria, viruses, and protozoans that commonly grow in water supply reservoirs, on the walls of water mains, and in storage tanks	¶ Respiratory irritant ¶ It may be a serious thyroid disrupter.
Sodium Hydroxide: Extremely corrosive	• Oven cleaners • Drain openers.	¶ Can cause sore throat that lasts for days.

Table 1: Chemical agents found in some of the household cleaning products (HCPs), their sources, and their impacts on public health and the environment (modified after Sholl 2011).

As many people around the world have already switched from eating genetically modified foods to organic foods, it is suggested in this paper that people who frequently use such HCPs (Figure 5–Right; Table 1) are asked to switch from using them to 'natural (green) cleaning substances' that have no adverse impacts on public health and the environment, and, at the same time, they are much cheaper than the HCPs. These are some examples of the green cleaning substances: 1) Baking soda ($NaHCO_3$); 2) Hydrogen peroxide (H_2O_2); 3) Borax powder (Sodium Borate: $Na_2B_4O_7$); 4) Vinegar (a liquid composed of about 5%–20% acetic acid (CH_3COOH) and water); 5) Olive oil and essential oils (naturally occurring, volatile aromatic compounds, found in seeds, bark, stems, roots, flowers, and other parts of plants); 6) Citrus (lemon juice and peel); 7) Simple detergents and soaps (like those made from olive oil); 8) Hot water; and 9) A combination of some of the above-mentioned natural substances. In addition, opening windows to let fresh air and sunshine get into homes and offices is a simple and highly efficient way to freshen the air indoors. However, further research must be done in the OPT, regarding the HCPs' adverse impacts on people's health and the environment, in order to encourage people to stop using HCPs or, at least, reduce their frequent usages.

Moisture, Mold, Mildew, and Strong Odors

These are microbial (or biological) sources, known as pathogens, which release disease-causing toxins and allergens into the air (Figure 5–Left), and, thus, they trigger sneezing, watery eyes, coughing, and even asthma attacks. Mold and mildew thrive and reproduce by the presence of moisture and, thus, the control of moisture is a key factor for eliminating the mold and mildew occurrence. In the OPT, many homes and public places (like some schools, mosques, markets, etc., especially old buildings) suffer from this phenomenon, which badly affects the public health.A case study of asthma in the OPT, involving participants in cities, villages, and refugee camps, showed that 62 out of 110 homes (forming around 56%) have visible mold on the walls and ceilings. The magnitude and prevalence of the homes characterized as damp with visible mold are highest in the OPT's refugee camps, whereby an estimated 50%–75% of the homes are affected (Heseltine and Rosen 2009) [50]. Awareness and monitoring programs, regarding this phenomenon, should be undertaken by the institutions concerned, such as the Ministry of Health, municipalities, and others.

Tobacco's Smoke (Cigarettes, Pipes, Water Pipes, etc.)

Tobacco's smoke, including 'second-hand smoking' (passive smoking), is a major source of IAP. Tobacco's smoke contains a number of toxicologically significant chemicals and groups of chemicals, as well as some radioactive elements. As related to the OPT, the number of smokers is dramatically high. Every year there are more than 1,400 people who are killed by tobacco-caused diseases, while more than 42,600 children and more than 581,000 adults continue to use tobacco each day. In 2010, 14.2% of men and 3.9% of women of those who died in the OPT, died as a result of smoking (Eriksen *et al*. 2015) [51]. Remarkably, the water-pipe tobacco smoke (WPTS) – known as 'Hookah' or 'Shisha' (as mentioned above) – is widely spreading in the OPT, among all ages of males and females, especially the young (Tucktuck *et al*. 2018) [52]. This kind of smoke can be more harmful on individual smokers and public health than regular tobacco smoke (cigarettes). According to the American Heart Association (AHA), the WPTS is not safer than cigarettes, it often contains more toxic chemicals, and their use may harm heart and blood vessels (Carne 2019) [53]. In the last few years, electronic cigarettes (e-cigarettes) have been used by some smokers in the OPT, who switched from tobacco cigarettes' smoking to e-cigarettes' smoking, or some of whom are smoking both kinds of cigarettes at the same time.E-cigarettes use a battery-powered device that heats a liquid to form vapors — or, more accurately, aerosol — that the user can inhale, thus 'vaping.' These devices heat up various flavorings, nicotine, marijuana, or other potentially harmful substances. Nicotine in e-cigarettes, addictive of course, replaces the nicotine found in tobacco cigarettes. In addition to lung and heart diseases caused by smoking in general, some substances found in e-cigarettes' vapor have been linked to an increased risk of various diseases, including Cancer (Schubert 2018 [54]; Shmerling 2019) [55].

Carbon Monoxide (CO), Carbon Dioxide (CO2), Nitrogen Oxides (NOx), Sulfur Dioxide (SO2), and Particulate Matter (PM):

These substances are produced from burning of fossil fuels, tobacco's smoke, and human and animal respiration. CO is an odorless, colorless, highly toxic, and deadly poison. It adversely affects human health at only a few parts per million (ppm), and can cause death at only 250 ppm, by reducing the oxygen supply in the body (Greiner 1991) [55]. Though CO_2 is a non-toxic gas and has beneficial uses, as being the 'fizz' in carbonated beverages, it can be harmful. At concentrations of 2,500–5,000 ppm, CO_2 can cause headaches; at extremely high levels (100,000 ppm), it becomes harmful, causing loss of consciousness in ten minutes; and at 200,000 ppm, it causes partial or complete closure of the glottis (Greiner 1991) [56].

The NO_x (including NO_2) are formed in reactions between atmospheric nitrogen and oxygen during the combustion process, particularly at higher combustion temperatures. NO2 has adverse respiratory health effects in adults and children, including inflammation, asthma, and reduced immune defenses that lead to exacerbation of, or susceptibility to, existing or new respiratory infections (Lam *et al*. 2012) [57]. The majority of sulfur emitted indoors exists as SO2, but is later converted to secondary sulfur-containing compounds in the atmosphere (e.g. sulfate 'SO_4'). Acute effects, attributed to SO2 exposure, include changes in pulmonary function and respiratory symptoms, while chronic exposures at even low levels (less than 20 μg/m3) have been associated with increases in all-age mortality and childhood respiratory diseases (Lam *et al*. 2012) [57].

Regarding the particulate matter (PM), in particular, it is a major cause of AP (both OAP and IAP), as being generated from stone quarrying, cutting, and crushing operations, forming a large industry in the OPT. This industry heavily pollutes the environment and causes considerable damage to the public health.The median aerodynamic diameter of PM emitted from this industry is mainly below 10 μm (known as PM_{10}) and below 2.5 μm (known as $PM_{2.5}$). Also, tobacco smoking, with its consequences, as discussed above, releases $PM_{2.5.}$ Across three Indiana cities in the Indiana State, USA, the level of indoor air pollution, as measured by average $PM_{2.5}$ level was 94% lower in the venues that were required to be smoke-free compared to those where smoking was permitted (ITPC 2005). In addition, the PM generated from fuel combustion is typically well-below 2.5 μm ($PM_{2.5}$). The particulate matter's majority of $PM_{2.5}$ usually deposits in deep parts of the lungs. People in the OPT widely use in winter times heating appliances that need wood or derivate of fossil fuel, like kerosene and natural gas, and because of the lack of good ventilation systems (no refreshment or circulation of indoor air), the consequences, in some cases, are disastrous, resulting in poisoning, fires, explosions, suffocation, and even death. Accordingly, because the stone industry has major impacts on the Palestinian economy, on the one hand, and because of the rising prices of electricity so that people will continue using fossil fuel for heating, on the other hand, these two sources will stay for a long time as major causes of IAP and OAP in the OPT, generating all sizes of particulate matter (PM_s). In conclusion, PM is greatly polluting the air in the OPT, as being generated from several sources, including tobacco smoking; fuel combustion; stone quarrying, cutting, and crushing; and other sources as well.

Use of Pesticides

The use of pesticides (including insecticides (for insects), fungicides (for fungi), herbicides (for plants), rodenticides (for rodents: rats and mice), bactericides (for bacteria), and larvicides (for larvae, an active immature form of insects) is a serious health concern, and can cause severe air pollution (both IAP and OAP), reflected badly on public health (especially elderly people and children) and the environment. The pesticides can easily be absorbed by furniture, children's toys, and other surfaces at homes, and they can remain actively airborne for days, weeks, or even longer.The immediate health effects, resulting from inhaling some commonly used household's pesticides, include breathing difficulties, nausea, coughing, dizziness, blurred vision, and headaches. Long-term exposure from repeated use and lingering residues of pesticides can damage the liver, kidneys, and nervous system, and even may cause Cancers. In the OPT, pesticides are widely used, despite the following facts: 1) Some of them are expired; 2) Some others are extremely toxic and hazardous; 3) Some are totally banned, internationally; 4) Some farmers store them in their homes; and 5) All of the above. Furthermore, because of the difficult situations in the OPT, politically, socio-economically, etc., some Palestinians (especially young) committed suicide by using various kinds of pesticides – some of whom died immediately and some others have suffered from severe damages to their nervous systems, liver, kidneys, etc. Accordingly, these pesticides should not be easily available and sold at stores and, thus, restrictions on selling them should be properly applied.

Conclusions

Outdoor air pollution (OIA) and indoor air pollution (IAP) go hand in hand, meaning if one is the cause, the other is the result; and if one is controlled, the other can be easily tackled and stabilized. The IAP – the core subject of this paper – has become a big concern for many people around the world, as it is a primary cause of chronic diseases (among them various kinds of Cancer) and even death.

To maintain a good quality of the air that people breathe indoors, people need to fight against IAP. Accordingly, people need to adapt 'green-life styles' to sustain healthy air quality.It is high time that people should develop indigenous methods to purify indoor air, by using green (natural) substances, technologies, and techniques. People need to go green to control IAP, and they also need to develop air-quality monitoring systems. However, the lack of awareness, scientific research, professionals, plans, strategies, laws, and regulations have deteriorated the situation and, thus, created more problems resulting from air pollution, in general, and from IAP, in particular.

The Occupied Palestinian Territories suffer from substantial pollution (air, water, soil, and noise), resulting from anthropogenic and natural sources. The anthropogenic air pollution is mainly due to: 1) The geopolitical situation of the region, considering the long-standing Israeli occupation of the Palestinian Territories since June 1967; 2) The Israeli wars, assaults, aggressions, intrusions, invasions, sanctions, and restrictions launched and imposed by Israel on the Palestinian people in the OPT; 3) The wide-use of a variety of weapons against Palestinians living under the Israeli occupation; 4) The hundreds of the Israeli colonies (for-Jews-only) and the Israeli Segregation (Apartheid) Wall constructed illegally in the OPT, with a total length exceeding 700 km; 5) The expansion of the Israeli industrial zones and the lack of monitoring systems on them within the OPT; 6) The dumping of Israeli wastes of all kinds in the OPT; 7) The lack of educational and awareness programs; and 8) The lack of regulations, rules, and laws that need to be implemented to protect health of people and well-being of the environment.

In this study, several sources of indoor air pollution are investigated, analyzed, and discussed, which mainly include: 1) The Skunk liquid sprayed by the Israeli occupation forces at innocent Palestinians and their properties all over the OPT (West Bank, including East Jerusalem, and Gaza Strip); 2) The wide-use of household cleaning products; 3) Fossil fuels' combustion; 4) Tobacco's smoke; 5) Homes' mold, mildew, and moisture (especially in refugee camps and in old buildings); and 6) The wide-use of pesticides.

The Skunk liquid, invented by the Israeli firm 'Odortec,' is given in this paper a special attention, because it is only used in the OPT

and it is beyond the control of Palestinians living in the OPT. The Skunk liquid is a substance made of unknown ingredients, having obnoxious odor and smelling like a mixture of raw sewage, rotten materials, decomposing animal corpses, and sulfur, which is simply called by Palestinians 'shit.' The Skunk liquid is frequently and constantly used by the Israeli occupation forces against Palestinian crowds, homes, hospitals, hotels, schools, mosques, shops, restaurants, yards, trees, entire neighborhoods, and even funeral procession, as witnessed, reported, and documented by highly respected Israeli and international civil- and human-rights' organizations, and as also shown in the videos provided in this paper. The Israeli use of Skunk liquid against Palestinians causes, not only air pollution (indoors and outdoors) resulted in bad health and environmental impacts, but also humiliation to people, and damage to their properties.

The Skunk liquid has been integrated into the Israeli army arsenal, along with other fatal weapons (lethal and nonlethal), used in the OPT at close distances against innocent, non-violent Palestinians, allegedly killing them, or inflicting serious and permanent injuries, and sometimes rendering them maimed and disfigured. These weapons, used against the OPT's Palestinian citizens on a daily basis, include, besides Skunk liquid, tear-gas canisters, rubber-coated steel bullets, live ammunition, focused noise beam called 'scream,' etc. The Israeli reckless use of these weapons is in breach of international laws and human rights' treaties and agreements, as it represents a strong violation of numerous basic human rights of the Palestinian people living under the Israeli military occupation since June 1967, and in some cases, it may rise to the level of war crimes as defined by international law (Strickland 2014) [35].

It is noteworthy to mention that this research paper is the first of its kind that tickles the issue of the Skunk liquid used by the Israeli occupation forces against innocent, non-violent Palestinians in the Occupied Palestinian Territories. Thus, it is highly recommended that support is needed to undertake further research, including field work, laboratory analyses, surveys, data collection, computer modeling, GIS mapping, etc. This will be certainly of great importance and impact, with respect to the Skunk liquid and other weapons that are illegally used by the Israeli occupation forces against the Palestinian people in the Occupied Palestinian Territories (OPT).

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Declaration

The Author of this paper declares the following: 1) Compliance with Ethical Standards, including: The research presented herein does not involve human participants and/or animals; 2) Informed consent: There is no potential of conflict of interest of any kind (financial or otherwise); and 3) Funding: The research presented in this paper did not receive funding from any individuals or organizations.

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