



## Editorial

## World Health Organization Positioning. The Impact of Tobacco in the Environment: Cultivation, Curing, Manufacturing, Transport, and Third and Fourth-hand Smoking<sup>☆</sup>

### Posicionamiento de la Organización Mundial de la Salud. Impacto del tabaco en el medio ambiente: cultivo, curado, manufactura, transporte y tabaquismo de tercera y cuarta mano

 José Ignacio de Granda-Orive,<sup>a,\*</sup> Carlos Andrés Jiménez-Ruiz,<sup>b</sup> Segismundo Solano-Reina<sup>c</sup>
<sup>a</sup> Coordinación del Área de Tabaquismo de la SEPAR, Servicio de Neumología, Hospital Universitario 12 de Octubre, Universidad Complutense, Madrid, Spain

<sup>b</sup> Unidad Especializada de Tabaquismo de la Comunidad de Madrid, Madrid, Spain

<sup>c</sup> Servicio de Neumología, Hospital General Universitario Gregorio Marañón, Universidad Complutense, Madrid, Spain

The World Health Organization (WHO)<sup>1</sup> recently published their review of the third and fourth hand effects of tobacco in individuals involved in the cultivation, curing, production, transportation, and distribution of this product, and their conclusions are chilling.<sup>2,3</sup> Article 18 of the WHO Framework Convention on Tobacco Control<sup>4</sup> sets out the scope of this comprehensive report: “*In carrying out their obligations under this Convention, the Parties agree to have due regard to the protection of the environment and the health of persons in relation to the environment in respect of tobacco cultivation and manufacture within their respective territories*”.<sup>1</sup>

The cultivation and curing of tobacco have an undeniable effect on land and agriculture: tobacco is rarely rotated with other crops, so the plants and the soil are vulnerable to a variety of pests and diseases.<sup>5</sup> For optimal growth, tobacco requires significant amounts of chemicals and growth regulators that harm the environment and the health of farmers, and contribute to soil depletion.<sup>6</sup> Forests are replaced by tobacco plantations, and large quantities of wood are used for curing (an estimated 11.4 metric tons every year<sup>7</sup>), and after production, even more wood is needed for producing cigarette papers and packaging. Deforestation, in short, is contributing to an increase in CO<sub>2</sub> emissions and climate change, a loss of biodiversity, desertification, increasing soil erosion, declining soil fertility and production, and, as a consequence, changes in the water cycle. Both tobacco cultivation and curing, then, are associated with farming methods that destroy the environment in developing countries, and while it can provide profits for farmers and local communities, these societies are impoverished by the loss of resources.<sup>1</sup> Data show that farms dedicated

to tobacco cultivation are less profitable.<sup>8</sup> Chronic exposure to pesticides, such as dichlorodiphenyltrichloroethane, and another 11 persistent organic pollutants, banned in developed countries, cause health problems,<sup>5,9</sup> such as birth defects, tumors, genetic changes, and endocrine, blood, neurological and psychiatric disorders, even in individuals who do not work directly with these substances.<sup>9</sup> Sustained exposure to the tobacco plant itself and nicotine absorbed through the skin causes green tobacco sickness, characterized by nausea, vomiting, headache, muscle weakness, and vertigo.<sup>9</sup>

The manufacture and distribution of tobacco clearly contribute to environmental pollution, both as solid and chemical waste,<sup>1</sup> and tobacco companies have admitted that manufacturing and production are the processes that generate most environmental pollution.<sup>10</sup> For this reason, they are reluctant to provide further information on this topic beyond basic reports on equivalent annual CO<sub>2</sub> emissions, water use and pollution, tons of solid waste and dumping of dangerous substances, and percentage of recycled waste.<sup>1</sup> These meager data, far from showing their willingness to collaborate, effectively prevent others from evaluating the real impact of manufacturing. The manufacture of tobacco, in short, consumes large amounts of natural and human resources, uses pollutants such as pesticides, chemicals, dry ice, bleaching agents, acetates, paper, plastics, cardboard, and aluminum, and moreover, causes disease.<sup>1</sup>

Third-hand smoke, as it is called, is simply residual chemicals in a closed, second-hand smoke environment, accumulated in dust and on surfaces, objects, curtains, etc. They affect the environment and air quality when they react with oxidizing agents and other environmental components,<sup>11</sup> and this pollution can persist for up to 6 months after giving up smoking.<sup>12</sup> Components of third-hand smoke have been identified, including nitrosamines, toxic metals, alkaloids, organic products of combustion, and volatile organic compounds. They can become even more toxic over time, forming nitrosamines (NNA) that were not present in the original second-hand smoke. Nicotine can even react with nitrous acid, a

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\* Corresponding author.

E-mail address: [igo01m@gmail.com](mailto:igo01m@gmail.com) (J.I. de Granda-Orive).

common indoor and outdoor pollutant, creating new nitrosamines (NNK), or with ozone to create a secondary organic aerosol in the ultrafine particle size range.<sup>1</sup> Children are most vulnerable to third-hand smoke because of their immature immune systems, incomplete development, and time of exposure to this contaminant. An increase in cancer risk in children exposed to third-hand smoke was demonstrated in a Spanish study.<sup>13</sup> Third-hand smoke also pollutes open environments. Concern surrounding so-called emerging contaminants is growing, with the detection in leachates from landfills of prescription and non-prescription pharmaceuticals, industrial and household chemicals, steroids and plant sterols, nicotine and cotinine.<sup>14</sup> Nicotine and its degradation products are common components of domestic wastewater, and the measurement of these levels has been proposed as a marker for wastewater discharge and for tracking patterns of nicotine consumption.<sup>15</sup> Chemicals in tobacco may persist in water after it has been treated in recycling plants.<sup>14</sup>

In the case of fourth-hand smoke, up to two thirds of cigarette butts end up in the environment.<sup>1</sup> However, the problem lies not only in the volume of this waste, but also the toxic chemicals they contain. This toxic waste ends up in our streets, our drains, our water and the sea,<sup>2,3</sup> causing widespread contamination.

The WHO report provides sufficient evidence that tobacco causes significant environmental damage, but consumers and stakeholders responsible for environmental policies and even smokers fail to recognize this impact, and as a result, no sustainable or definitive strategies are implemented to combat the effect on the environment. Perhaps the most important intervention would be to make society aware of the problem. And this all adds up to yet another reason to stay active in the fight against smoking.

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