Environmental tobacco smoke (ETS) is recognized as a health hazard by environmental and public health authorities worldwide. Therefore, several countries have implemented legislation that prohibits smoking in the majority of public spaces. In Portugal, since 2008, legislation banned smoking in most restaurants and bars, but some exceptions remained, namely in spaces where devices for ventilation and extraction were installed. Nevertheless, whether those preventive measures are efficiently protecting the health of the workers that are continuously exposed to ETS at their workplaces is still an open question.

This pilot study aimed at investigating the association between occupational exposure to ETS and the induction of genetic damage in somatic cells from employees from the previously studied restaurants, where smoking is still permitted, considering the individual susceptibility in the response to ETS components.

**STUDY POPULATION**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of Tobacco Workers</th>
<th>Number of Non Smoking Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>11 (33.3)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>Female</td>
<td>13 (38.6)</td>
<td>10 (31.3)</td>
</tr>
</tbody>
</table>

**OBJECTIVES**

- To address this issue, a recent work by our group showed that ETS pollution was higher in Labon restaurants and bars where smoking is allowed, comparatively to smoke-free restaurants and cantines, and also that workers were indeed internally exposed to ETS at their workplaces. Major concerns with the workers' health originate from the carcinogenic effects of ETS (ARC Group 1 carcinogen).
- The use of biomarkers of early genetic damage for biomonitoring these workers can unravel genotoxic lesions that may be implicated in cancer development.

**METHODS**

- **Biomarkers of Genotoxicity**
  - Sister Chromatid Exchanges
  - Comet assay in leukocytes
  - Micronucleus

- **Cells early response to a genotoxic challenge**
  - Comet assay following an ex vivo exposure to ETS

- **Biomarkers of susceptibility**
  - Polymorphisms in genes associated to genetic damage

**RESULTS**

- The frequency of micronuclei in peripheral blood lymphocytes was significantly lower in ETS-exposed comparatively to non-exposed workers.
- No significant differences in the frequency of MN in buccal cells were observed between exposed and non-exposed workers.

- Smokers could be distinguished from non-smokers by a significantly increased proportion of HFCs.
- No significant differences in SCE and HFC between ETS-exposed and non-exposed workers.

**COMET ASSAY**

- No significant differences observed in the basal level of DNA strand breaks in ETS-exposed vs. non-exposed workers.

**DISCUSSION**

- In this pilot study, no clear association between occupational exposure to ETS and the induction of genetic damage was identified, as assessed through several biomarkers of genotoxicity.
- Interestingly, a differential response of leukocytes from ETS-exposed and non-exposed workers to an ex vivo acute genotoxic stimulus was observed, suggesting that ETS exposure positively modulates the DNA repair machinery and other cellular protection responses towards the restoration of cells stability.
- The observed response might be comparable to the adaptive response that has been mainly described for exposure to low doses of ionising radiation and may be the result of the upregulation of DNA repair functions.
- Although an adaptive response may be beneficial because it results in an enhanced capacity to deal with stress, it has been suggested that an exposure that elicits an adaptive response can also produce toxicity with longer or higher exposures.

After the implementation of the Portuguese legislation that regulates smoking in public spaces, this study was aimed at biomonitoring the genetic effects in ETS-exposed workers from restaurants where smoking is still allowed. The most relevant effect detected in those workers was a modified early response to a genotoxic challenge, compatible with an adaptive response. It remains to be determined, however, whether the induction of this kind of response might have long term consequences to the health of ETS-exposed workers.