1. No.
   2021G035

2. Title
   Assessment of the Effects of Tobacco Smoke Exposure on Stress and Relaxation based on Biomarker Analysis

3. Period
   2021-2024

4. Summary

In order to objectively evaluate the mental health of passive smokers, we developed a sensitive method for simultaneously analyzing tobacco smoke exposure markers, stress-related and relaxation-related biomarkers. In addition, we conducted heart rate variability (HRV) and electroencephalogram (EEG) measurements, lifestyle questionnaires to analyze the actual state of stress in passive smoking and the effects of stress relief. Analysis of nicotine and metabolites in saliva and urine showed that tobacco smoke is absorbed not only through breathing but also through the skin. In addition, analysis of saliva biomarkers showed that exposure to tobacco smoke sustained stress relief in smokers, while in non-smokers, the stress relief immediately after exposure was transient and then turned to a stressful state. Hair analysis also showed a positive correlation between nicotine concentration and cortisol concentration, a stress marker. These results indicate that passive smoking is a factor in short-term and long-term stress. Furthermore, analysis of saliva biomarkers and HRV confirmed the stressrelieving effects of aromas and music, and revealed that these also relieve stress that is enhanced by tobacco smoke exposure. In addition, EEG analysis showed that exposure to tobacco smoke reduces relaxation levels. A questionnaire survey of non-smokers showed that people who feel stressed or find tobacco smoke unpleasant have higher stress levels.

From the above results, it can be seen that saliva is useful for assessing the effects of short-term exposure, while hair is useful for assessing the effects of long-term exposure, and that the combined use of HRV and EEG measurement is effective for clearly assessing the reality of passive smoking. In conclusion, since passive smoking is a stressor, it is important to thoroughly implement measures to prevent exposure to tobacco smoke and make efforts to maintain and improve mental health.