Smoking Topography Study 2018

Published: 02-11-2017
Last updated: 12-04-2024

Is there a difference in natural smoking topography between Marlboro, Marlboro Prime and Marlboro Prime taped leading to a different exposure for the smoker? Is it possible to map personal smoking profiles with only 4 random cigarettes, as showed in...

Ethical review	Approved WMO
Status	Recruitment stopped
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON44391

Source
ToetsingOnline

Brief title
STS 2018

Condition

- Other condition

Synonym
Not applicable

Health condition

gedrag

Research involving
Human

Sponsors and support

Primary sponsor: Universiteit Maastricht
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Inhalation, Natural smoking behavior, Smoke toxicant exposure, Smoking topography

Outcome measures

Primary outcome

Monitoring *habitual* smoking behavior, regarding the moments during the day the cigarettes are smoked, and how they are smoked (smoking topography) differing per cigarette.

Output: a table with smoked cigarettes per participant with the associated nicotine and CO(Hb) measurement, and the smoking topography of each cigarette (puff volume, puff duration, puff interval, puff flow).

Secondary outcome

Nicotine, cotinine, COHb and leukocyte differentiation in blood per time points per participant. In addition, aldehyde levels will be determined in serum derived from whole blood collected. Also, leukocytes will be isolated from whole blood collected at these time points to assess aldehyde-induced adducts in leukocyte DNA,

Nicotine, cotinine, kreatinine and ureum as well as aldehyde metabolites in urine per time points per participant.

Smoking-related DNA adducts in saliva and mouth swaps per time points per participant.

VOCs and aldehydes in breath per time points per participant (list of compounds in Study Procedures).

Metabolic state parameters (ASAT, ALAT, bilirubin, sodium, potassium, urea,

TSH, CRP) only measured in baseline samples per participant. These parameters are measured to ensure that the participants have a healthy metabolism and can be used to interpret differences in biomarkers between participants. The values should be in the *normal* range for their age and gender as used in the Farmaceutisch Kompas .

Study description

Background summary

In 2005, the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) was established with the aim for a regulatory strategy as a response to the globalization of the tobacco epidemic. One of their non-price measures to reduce the demand for tobacco includes article 9: Regulation of the contents of tobacco products . Cigarette product regulation is currently based on tar, nicotine and carbon monoxide (TNCO) levels in cigarette smoke, which are indicated on the package. This is not sufficient, since cigarette smoke includes more than 7000 chemicals. There are aldehydes, VOCs, PAHs, nitrosamines, metals and so much more measured in cigarette, causing tobacco-related diseases .
In the future, regulation of these harmful cigarette constituents should be based on more chemical classes, as the WHO suggested. However, in order to introduce such class-based regulation, a scientific base is needed to define upper limits of allowed amounts of chemicals (groups) in cigarette smoke emissions and to ensure decreased harmful effects due to cigarette smoking. To date, the causality between human exposure to specific cigarette smoke compounds and the harmful effects is unknown. The first step in closing the gap in knowledge between cigarette smoke exposure and developing tobacco-related diseases includes a proper determination of human exposure to cigarette smoke chemicals.
Unfortunately, there is a lack of methodology to determine cigarette smoke exposure in humans .
In a prospective observational pilot study in February 2016, natural human smoking behavior was characterized: Smoking Topography Study 2016 (NL55676.068.15). The smoking topography of every smoked Marlboro cigarette was monitored through the CRESSmicro device, which records the puff length, the puff interval, the puff flow and the puff volume. We could model the individual smoking profiles per participant by using data of 4 random cigarettes. During modelling, puff volume, duration (and thus also flow) and interpuff interval were taken into account.

That we found no differences in smoking topography of cigarettes smoked over the day means that in this new study, we can invite participants for a shorter time because we only need data of 4 cigarettes to model their profile needed for exposure measurements. The smoking topography parameters are needed for the settings of a smoking machine whereby the exact exposure to cigarette smoke toxicants can be determined.

In the last study we concluded that smokers have their own individual smoking topography.
Of course, smoking is also accompanied by the inhalation of harmful chemicals, but the smoker is not aware of this during smoking and therefore does not adapt his smoking topography with respect to that exposure. However, it is unknown by what means the individual smoking topography parameters are related to toxicant exposure in the different parts of the lungs. For example, higher puff volumes with a different composition of toxicants lead to a different inhalation pattern than a small puff volume, possible followed by different exposure in the lungs.
In this new study we want to measure the respiratory parameters of breathing and inhalation over the day. Until now, inhalation risk assessment is based on human breathing patterns, while breathing and inhaling smoke are not the same due to the composition of the smoke containing harsh compounds. The current study aims at measuring respiratory parameters to identify the lung compartments exposure related to smoking topography. This can be achieved by respiratory inductive plethysmography (RIP), a non-invasive device that can be worn throughout the day. The Hexoskin is a known non-invasive device for measuring RIP, and will be worn by the smokers all day.

Literature describes that the process of smoking topography and inhalation differs per cigarette and situation . In other words, the smoker doses himself to gain nicotine, with additional production of carbon monoxide (CO) and other harmful cigarette smoke-associated chemicals.
As described before, in the future cigarettes will be changed as they are only allowed to contain a maximum of certain toxicants. One of the options to make cigarettes less addictive is to add less nicotine. It is known that smokers show compensating behavior when smoking other cigarettes than their used to, to gain the same amount of nicotine. Our machine smoking experiments show that when smoking low-TNCO cigarettes, the composition of the smoke per mg nicotine, changes under the same smoking conditions. This means that the cigarette characteristics are also responsible for part of the smoke composition. We are interested in how smoking behavior and inhalation, and thus exposure, changes when offering a Marlboro smoker another sort of cigarette.
Therefore, we are interested whether the smoking behavior changes when the smoker has to smoke the Marlboro Prime, a low TNCO cigarette. The low values of nicotine in the smoke of the Marlboro Prime are partly achieved by ventilation holes in the cigarette filter. By closing these filter vents with tape around the filter, the smoke is not diluted with sidestream air, and the cigarette design is slightly different.

The participants will smoke their *normal* brand Marlboro (day 1). After the experimental day, they receive the Marlboro Prime for smoking at home, so they get used to smoking a *new* cigarette. A week later the experimental day (day 2) is repeated with this cigarette. The participants can stay overnight, or come back the next day (day 3) to smoke the Prime cigarette while the ventilation holes of this low-TNCO cigarette are taped.

As in the STS2016, this study again is aimed at measuring smoking in a habitual rhythm without imposing it as has been done thus far. With this, the natural smoking topography per cigarette can be measured, in combination with the respiratory parameters by wearing a non-invasive RIP device. As the participants receive the Marlboro Prime so that they can smoke at home, they can get used to it and develop *natural* smoking behavior.

As during the last study, the sampling is following a sampling scheme. In summary, during the day, blood, exhaled air, urine and saliva will be sampled to measure nicotine, carbon monoxide, but also other cigarette smoke compounds, such as aldehydes and their metabolites.
In the future, the personal smoking regimes of the participants will be mimicked with machine smoking experiments, which results in the exact exposure for that person. This will be linked to the RIP parameters.

Points of attention that came out of the STS 2016, include that smokers smoked less cigarettes than expected. Reason for that is, as they mentioned, that they cannot smoke in the apartment, while they smoke inside at home. Another reason was that they have to smoke alone, while at home or work there often is a co-smoker. The participants didn*t experience difficulties or changes in smoking behavior, because of using the CRESS. They all *practiced* smoking with the CRESS the evening before the experimental day. In the present study we will invite 2 smokers at the same time. Again, smokers have to go outside for a smoke, to protect the researchers to secondhand smoke exposure. This is kept as attainable as possible.

Study objective

Is there a difference in natural smoking topography between Marlboro, Marlboro Prime and Marlboro Prime taped leading to a different exposure for the smoker?

Is it possible to map personal smoking profiles with only 4 random cigarettes, as showed in the previous Smoking Topography Study 2016?

Is a different smoking topography profile per smoker related to deviating exposure of mainstream smoke in the respiratory tract compartments, for the different cigarettes?

Can exhaled air of smokers be used as biomarker for exposure to VOCs/aldehydes?

Are nicotine and cotinine levels in blood/urine changing over the day and connected to the smoking behavior of the different cigarettes?

Study design

The Smoking Topography Study 2018 is a prospective observational study, with the duration of 3 months. Participants will visit our research apartment at Apart Hotel Randwyck, for 1 day in the first week and 2 days in the second week. An experimental day starts at 08.00hr and ends at 19.00hr. The different studydays have exactly the same set-up, only the cigarette brand smoked during the different days is different.
In this study it is important that the participants are able to smoke cigarettes *ad libitum*. Because it is impossible to monitor this smoking topography at home, we have to measure the smoking at a research location. Therefore, this study takes place in an apartment at Hotel Randwyck in a homelike atmosphere where standardized meals are served and cigarettes can be smoked when and how the participant desires. The smoking topography of every smoked cigarette will be monitored through the CRESSmicro device, which records the puff length, the puff interval, the puff flow and the puff volume .
Furthermore, the exact time point of smoking (i.e. the moment the cigarette is lit) is noted in the experiment time table.
Due to this setup, the smoking topography measurements do not take place at scheduled time points and therefore only 2 participants per day will be measured. Total duration of the study will be 3 months, including 18 smoking individuals.

Participants are their own control by measuring baseline samples (t=baseline). This sampling takes place upon arrival, before the first cigarette is smoked. Participants are asked not to smoke when waking up, but to wait upon their arrival at the research location. These baseline samplings include urine, exhaled air, blood, mouth swap and saliva.

Goal of a study day is to follow the smoker in his personal daily life smoking schedule. They can smoke when they want or feel the urge to smoke. Therefore, the sampling time points and the amount of cigarettes smoked are unknown per participant. Despite the unknown time points on forehand, smoking topography of every single cigarette within their presence at the research apartment is measured. During the whole experiment, we make use of experimental time. The start of the experiment (expected to be around 09.00hr) is the start of the experimental day, noted as timepoint 0. This is probably shortly after the baseline measurements.
All spent cigarette butts are collected in separate plastic tubes per participant with the experimental smoking time noted. Because it is very important not to interfere with the daily life smoking schedule, the experiment day is divided into timeslots for urine and a fixed time point for saliva sampling.
Urine will be collected at baseline and during 2 time periods. The first time

point includes the baseline measurement before the first cigarette is smoked. Next, all urine between t=0 and t=5 hours is collected in 1 beaker and urine between t=5 and t=10 is collected in another beaker. The participant is asked to empty his bladder just before the timeslots end. This results in 3 urine samples per participant.
Saliva and a moth swap is collected at t=baseline, and at t=0 (immediately after the first cigarette), t=5 and t=10. This results in 4 saliva samples and mouth swaps per participant.
The exhaled air and blood samples are collected before and immediately after smoking a cigarette to have the most accurate measure associated with the cigarette smoking. However, the smoking time points are uncertain due to the chosen setup of this study. However, since all smokers included smoke around 20 cigarettes a day, they will at least smoke every 2 to 2.5 hours. Therefore, we have made time periods of 2.5 hours in which the first cigarette smoked is used for sampling blood and exhaled air, immediately after finishing smoking.
At baseline, the participant is asked to exhale via the nosemouth cap of the Owlstone whereby the exhaled air passes the adsorption tubes. The exhaled air just before and after finishing smoking the first cigarette is collected (t=0).
The same is done for cigarettes smoked between t=2.5 and t=5, between t=5 and t=7.5, between t=7.5 and t=10 and the last sampling at T=10. This results in 7 exhaled air samples per participant.
To avoid multiple punctures, the participants get a peripheral venous canula at baseline, after which the baseline blood sample is withdrawn. The next blood sample is withdrawn just before and after finishing smoking the first cigarette (t=0). Then, the sampling points are just before and immediately after the first cigarette between t=0 and t=2.5, between t=2.5 and t=5, between t=5 and t=7.5, between t=7.5 and t=10 and the last sampling is at T=10. For analysis of blood aldehydes an extra blood sample will be drawn from the canula at baseline and immediately after the first cigarette as well as immediately before and after the first cigarette after t=5 and t=7.5. This results in 13 blood sampling points per participant.

Intervention

Not applicable

Study burden and risks

The participating smokers smoke according to their habitudinal smoking pattern, and are therefore not increasingly exposed to the harmful health effects of cigarette smoking. The invasive part of the study is their stay for 3 days (and 1 night when wanted) in a hotel, and the sampling of blood, saliva, urine and exhaled air.

Contacts

Public
Universiteit Maastricht

Universiteitslaan 50
Maastricht 6229ER
NL
Scientific
Universiteit Maastricht

Universiteitslaan 50
Maastricht 6229ER
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

- Male
- 25-34 years old (birth year 1981 * 1990)
- Caucasian
- At least 3 years smoking Marlboro as usual brand
- Used to smoke between 13 and 25 cigarettes a day (around a package/day)

Exclusion criteria

- Heavy smoker (minimum of 25 cigarettes/day)
- Smokes more than 1 brand on a regular base.
- Amount of cigarettes per day varies ±10, between days

- Daily medication use
- Experienced adverse effects due to smoking
- Suffering chronic illness

Study design

Design

Study type: Interventional

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	12-12-2017
Enrollment:	18
Type:	Actual

Ethics review

Approved WMO

Date:	02-11-2017
Application type:	First submission
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

Approved WMO

Date:	22-12-2017
Application type:	Amendment
Review commission:	METC academisch ziekenhuis Maastricht/Universiteit Maastricht, METC azM/UM (Maastricht)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL63420.068.17
Other	onder constructie