of clinically significant OSA (a so called Inspiratory "Flow Limitation" (IFL) cohort) and whether PTT indices differ when compared to OSAS subjects and with a "control" group exhibiting no evidence of OSAS or IFL ("Non-Flow Limited" or NFL cohort).

Methodology 20 subjects meeting criteria for the IFL cohort (mean AHI = 3.84/hr; RDI = 17.71/hr) were aged (± 2 yrs) and gender matched with 20 OSAS subjects (mean AHI = 48.93 hr) and 20 control "NFL" subjects (no sleep disordered breathing; mean AHI = 1.01/hr; RDI = 2.63/hr) underwent respiratory limited polysomnography, including pulse oximetry and ECG monitoring. PTT was defined as interval between the electrocardiographic R wave and point corresponding to 50% height of the ascending plethysmographic (pulse) waveform; PTT arousal (deceleration) defined by decline in PTT signal of ≥15 ms, lasting 5 seconds; PTT Deceleration index (PTT Di) defined by number of PTT arousals per hour.

Results Table 1 outlines key demographics in the cohorts. Of the NFL cohort, 14 presented with snoring in absence of sleepiness. 72% and 84% were deemed "responders" to CPAP within the IFL and OSAS cohorts respectively. The PTT DI in the IFL cohort (33.67 ± (23.34)/hr) was significantly higher than that measured in the control NFL cohort (23.89 ± (18.88)/hr) but significantly lower than that measured in the OSAS cohort (55.21 ± (29.30)/hr; 3-way ANOVA; $F = 8.76$; $p < 0.001$). PTT Di was positively correlated with AHI within the whole study population (CC = 0.46; $p < 0.001$). Within the IFL cohort, PTT Di was positively correlated with age (CC = 0.501; $p = 0.024$) but not with gender and BMI.

Conclusion The PTT Deceleration Index increased proportionately with SDB, with significantly higher markers of arousal in sleepy subjects exhibiting nocturnal IFL in comparison to control subjects, but not as high as those with clinically significant OSA. These findings support the relevance of IFL as a potentially significant pathogenic entity in the development of daytime sleepiness. The utility of PTT Deceleration Index as a therapeutic target for CPAP Titration in OSAS requires further evaluation.

S25 SURVEY OF THE NEW DRIVER AND VEHICLE LICENSING AUTHORITY (DVLA) GUIDANCE FOR OBSTRUCTIVE SLEEP APNOEA (OSA): UK SLEEP CENTRES OPINION

EL Palmer, S West. *Freeman Hospital, Newcastle upon Tyne, UK*

10.1136/thoraxjnl-2016-209333.31

Introduction and objectives The DVLA produced new guidelines 'Assessing Fitness to Drive – a guide for medical professionals' in March 2016. An online survey was designed to seek opinion about the guidance relating to patients with OSA, which was completed in May 2016.

Methods An anonymous online survey was designed and the survey link emailed to staff at UK sleep centres, identified from addresses held by the ARTP, BSS and SATA. It could be completed by any member of the sleep team, or more than one member. Responses were collated centrally.

Results There were 204 survey respondents, representing sleep centres of different sizes (<500 CPAP users to >10,000). They included physiologists, consultants and nurses. 77% were aware the DVLA had produced new guidelines. Only 2% stated they had received communication from the DVLA about the changes. 75% did not find the new guidance for OSA easy to follow.

62% of responders said the guidelines will cause confusion for patients and potentially stop them coming forward for treatment. 33% were unclear what advice to give to their patients.

The majority defined 'excessive sleepiness' based on symptoms (80%), including Epworth Sleepiness Score (ESS) >9 (28%) or >12 (56%). Only 19 people (10%) felt that apnoea-hypopnea index (AHI) >5 or oxygen desaturation index (ODI) >5 contributed to their assessment of patients' sleepiness. 87% did not think AHI or ODI was a good way to assess a patient's ability to drive.

72% of responders said the suggested frequency of follow-up appointments would increase their workload. 41% said their service did not have sufficient capacity to meet guidance for confirming adherence to treatment in group 2 drivers. 45% said their service could not meet the guidelines for reviewing symptoms and treatment compliance in patients with moderate/severe OSA with excessive sleepiness.

Conclusions The new DVLA guidelines for OSA are difficult to follow for the majority of sleep professionals. These guidelines may prevent patients coming forward for assessment and treatment and will stretch the capacity of many already overworked sleep services. The guidelines require urgent further review by the DVLA and discussion with sleep experts in the UK.

S26 FEASIBILITY AND PATIENT TOLERABILITY OF TRANSCUTANEOUS ELECTRICAL STIMULATION IN OBSTRUCTIVE SLEEP APNOEA

[1]KI Reed, [1]MF Pengo, [1]S Xiao, [1]C Ratneswaran, [1]N Shah, [1]T Chen, [1]A Douiri, [1]N Hart, [2]Y Luo, [1]GF Rafferty, [2]GP Rossi, [1]A Williams, [3]MI Polkey, [1]J Moxham, [1]J Steier. *[1]King's College London, London, UK; [2]Department of Medicine, Padua, Italy; [3]Imperial College London, London, UK*

10.1136/thoraxjnl-2016-209333.32

Introduction Transcutaneous electrical stimulation (TES) provides neuromuscular tone to the pharyngeal dilator muscles of the upper airway (UA) while asleep, but feasibility of this method to treat obstructive sleep apnoea (OSA) throughout the whole night has not been tested.

Patients and methods We conducted a phase two double-blind, sham-controlled, randomised controlled trial using TES of the UA muscles in 36 patients with confirmed OSA to assess patients' device acceptance and the side effect profile. Patients were studied using polysomnography during randomly assigned nights of sham-stimulation and active treatment following titration of the current while awake. Assessment of patients' device acceptance and experience of side effects was measured using a visual analogue scale (0–10 points) where high scores indicated better outcomes.

Abstract S26 Table 1 Device acceptance and side effect profile of TES and polysomnography data. Variables presented as median and interquartilerange. p-value derived from the Wilcoxon test.

Parameters	Sham- Stimulation	Active treatment	p-value
Feeling refreshed	5.7 (2.7–7.2)	6.6 (2.2–8.5)	0.40
Skin discomfort	9.9 (9.5–10.0)	9.9 (9.7–10.0)	0.95
Tongue unpleasant sensation	9.9 (9.4–10.0)	9.9 (9.4–10.0)	0.63
Sleep quality	5.6 (2.9–7.1)	6.4 (2.4–8.0)	0.28
Morning headache	9.4 (6.3–10.0)	9.9 (8.1–10.0)	0.27
Mouth dryness	4.4 (2.2–8.5)	7.4 (4.9–9.7)	0.007

Results We included 36 patients (age mean 50.8 (SD 11.2) years, male/female 30/6, body mass index median 29.6 (IQR 26.9–34.9) kg/m^2, Epworth Sleepiness Scale 10.5 (4.6) points, oxygen desaturation index median 25.7 (16.0–49.1)/hour, apnoea-hypopnoea index median 28.1 (19.0–57.0)/hour). None of the patients reported skin discomfort, unpleasant tongue sensations or morning headache. There was no difference in patients' perceived sleep quality. There was a 59% reduction in mouth dryness after active treatment compared to sham-stimulation. There were no severe adverse events (Table).
Conclusion TES of the UA dilator muscles in OSA can be delivered throughout the night with few side effects and does not lead to arousal from sleep, if appropriately titrated.

Cough Sensation

S27 THE EFFECT OF P2X3 ANTAGONISM (AF–219) ON EXPERIMENTALLY EVOKED COUGH IN HEALTHY VOLUNTEERS AND CHRONIC COUGH PATIENTS

[1]JA Smith, [2]M Kitt, [2]P Butera, [2]A Ford. *[1]University of Manchester, Manchester, UK; [2]Afferent Pharmaceuticals Inc., Sam Mateo, USA*

10.1136/thoraxjnl-2016-209333.33

Introduction and objectives Effective therapies for chronic cough are a significant unmet need. Recently a P2X3 antagonist (AF-219), markedly reduced cough frequency in two phase 2 trials, but the role of P2X3 receptors and their ligand (adenosine triphosphate, ATP) in chronic cough is not well-understood. This study assessed the effect of P2X3 antagonism on cough evoked by capsaicin and ATP in healthy volunteers and chronic cough patients.
Method We performed a double-blind, placebo-controlled, randomised, 4-period crossover study. During each period (≥48 h apart), cough challenges were performed 2h after single doses of study medication [capsaicin (0.48–1000 μM) periods 1/2 and ATP (0.227–929 μmol/mL) periods 3/4]. Two cohorts were enrolled; cohort (1) 14 healthy volunteers (HV, mean age 37.5 yrs, 100% male) and 12 chronic cough (CC, mean age 60.3 yrs, 17% male) received AF-219 300mg/placebo and cohort (2) 12 HV (mean age 34.8 yrs, 100% male) and 12 CC (mean age 57.8 yrs, 25% male) received AF-219 50 mg/placebo. Cough challenges consisted of four inhalations of each doubling concentration of tussive agent, from a dosimeter 30s apart. Coughs in the first 15s were counted and challenges continued to the maximum tolerated dose. The concentrations evoking at least 2 and 5 coughs, C2 and C5 (from inhalation 1) were analysed using mixed effect models; pharmacodynamic modelling was used to estimate Emax/ED50.
Results AF-219 had no effect on capsaicin C2 or C5 at 300 mg or 50 mg in HV or CC (all $p > 0.05$). For ATP challenges, AF-219 300 mg significantly increased C2 in CC (AF-219 10.8 μmol/mL vs. placebo 2.3 μmol/mL, $p = 0.005$) but not HV ($p = 0.135$), whereas AF-219 50mg significantly increased C2 in both groups (CC 40.4 μmol/mL vs. 2.8 μmol/mL, $p = 0.002$ and HV 114.4 μmol/mL vs. 20.7 μmol/mL, $p = 0.046$). AF-219 had no significant effect on ATP C5 at either dose in HV (all $p > 0.05$), but in CC patients 50mg AF-219 (but not 300mg) increased C5 (70.1 μmol/mL vs. 17.1 μmol/mL, $p = 0.027$). Of note, ATP inhalation evoked less coughing than capsaicin, limiting the utility of the C5 endpoint.
Conclusions P2X3 antagonism reduced cough responses to ATP, particularly in patients with CC, but did not alter cough responses to an off-target tussive agent.

S28 DETERMINANTS OF COUGH FREQUENCY IN ADULT HEALTHY VOLUNTEERS

K Holt, C Gibbard, JA Smith. *University of Manchester, Manchester, UK*

10.1136/thoraxjnl-2016-209333.34

Introduction Objective cough monitoring is a useful tool to investigate patterns of cough frequency and to evaluate novel cough treatments. The VitaloJAKTM (Vitalograph Ltd, UK) ambulatory cough monitor is a validated semi-automated system for the quantification of cough over 24 hours. Objective cough rates have yet to be quantified in large groups of healthy controls and the influences of subject factors are unclear.
Objective To assess objective cough frequency in a large group of healthy adults across a range of ages.
Method Objective 24 hour cough monitoring was performed using the VitaloJAKTM in adult healthy volunteers; those with a smoking history of >20 pack years and <6 months abstinence were excluded. The recordings were compressed using custom-written software and cough counted manually by trained cough counters and the daytime, night-time and total cough rates calculated. Daytime and total cough rates were log transformed for analysis. Independent t-tests (daytime and total) and Mann-Whitney U test (night-time) assessed the effect of gender and previous smoking. Spearmans correlation coefficients evaluated the relationships between cough frequency, age, BMI, and pulmonary function.
Results Sixty healthy volunteers were recruited; 27 (45%) males, median age 40 yrs (range 20–74), median FEV_1 103.0% predicted (81–141), median FVC 105.5% predicted (82–151), median BMI 24.6 kg/m2 (16.8–39.8), 48 (80%) of subjects had never smoked, median smoking history in the ex-smokers 2.9 (0.1–17) pack years. Median (IQR) 24 h cough rate was 0.17 c/h (0.05–0.87) with daytime rate of 0.26 c/h (0.63–1.35) and night-time rate of 0.00 c/h (0.00–0.12). Males coughed significantly more than females over 24hours [median 0.42 c/h (IQR 0.13–1.21) vs. 0.13 c/h (0.04–0.59), $p = 0.038$] and during the day [0.37 c/h (0.11–1.42) vs. 0.19 c/h (0.0–0.91), $p = 0.036$], but not during the night ($p = 0.852$). Cough frequency was not significantly correlated with age, BMI, FEV_1 or FVC. Cough frequency was no different between never and ex-smokers for daytime or 24 h ($p = 0.46$ and $p = 0.20$) but overnight was slightly lower for ex- than never smokers [median 0.00 c/h (0.00–0.09) vs. 0.12 c/h (0.0–0.64), $p = 0.037$].
Conclusions In healthy adults, spontaneous cough frequency is unaffected by age, BMI, and pulmonary function. Interestingly, males coughed more frequently than females, in contrast to our current knowledge of gender differences in cough reflex sensitivity.

S29 A RANDOMISED CONTROLLED TRIAL OF OVER THE COUNTER MEDICINE CS1002 FOR ACUTE COUGH

[1]SS Birring, [2]J Brew, [2]T Kilbourn, [3]AH Morice. *[1]Division of Asthma, Allergy and Lung Biology, King's College, London, UK; [2]Infirst Healthcare Limited, London, UK; [3]Hull York Medical School, Castle Hill Hospital, Hull, UK*

10.1136/thoraxjnl-2016-209333.35