Review of the British Thoracic Society Winter Meeting 2018, 5–7 December 2018, London, UK

Amanda T Goodwin [1], Aran Singanayagam,[2] Gisli Jenkins [1]

[1]Nottingham NIHR Respiratory Biomedical Research Centre, University of Nottingham, Nottingham, UK
[2]COPD and Asthma Section, National Heart and Lung Institute, Imperial College London, London, UK

Correspondence to
Dr Amanda T Goodwin, Nottingham NIHR Respiratory Biomedical Research Centre, University of Nottingham, Nottingham NG7 2RD, UK; Amanda.Goodwin@nottingham.ac.uk

Received 6 June 2019
Revised 16 July 2019
Accepted 17 July 2019
Published Online First 5 August 2019

ABSTRACT

Introduction The Winter Meeting of the British Thoracic Society (BTS) is a platform for the latest clinical and scientific research in respiratory medicine. This review summarises some key symposia and presentations from the BTS Winter Meeting 2018.

Methods Key symposia and research presentations from the BTS Winter Meeting 2018 were attended and reviewed by the authors.

Results The seminal messages from the latest clinical and scientific research covering a range of respiratory diseases, including asthma, interstitial lung disease, infection, cystic fibrosis, pulmonary vascular disease, pleural disease and occupational lung disease were summarised in this review.

Discussion The BTS Winter Meeting 2018 brought the very best of respiratory research to an audience of scientists, physicians, nurses and allied health professionals. The Winter Meeting continues to be a highlight of the UK respiratory research calendar, and we look forward to the next meeting in December 2019.

INTRODUCTION

December 2018 saw a record-breaking number of delegates attend the British Thoracic Society (BTS) Winter Meeting, where the latest innovations in clinical and translational research in respiratory medicine were showcased. This review summarises some of the exciting research developments presented at the BTS Winter Meeting 2018.

BTS/BLF/British Association of Lung Research Early Career Investigators Symposium

This session featured six emerging early career academics and provided a glimpse into the bright future of UK academic respiratory medicine. Neelam Kumar (London, UK) won the BTS award for her research using in vitro and in vivo models to investigate the effects of loss of function of BRCA-associated protein 1 (BAP1) on sensitivity to tumour necrosis factor-related apoptosis-inducing ligand (TRAIL) in malignant mesothelioma.[1] Given that loss of BAP1 function is observed in up to 67% of malignant mesothelioma tumours, this could provide a novel biomarker-based approach to therapy. The runner-up for this award was Matthew Pavitt (London), who presented data from a randomised controlled trial of oral dietary nitrate supplementation in chronic obstructive pulmonary disease (COPD).[2] In combination with pulmonary rehabilitation, this intervention can enhance gains in exercise capacity and could provide a useful adjunct to improving functional outcomes in these patients.

Adam Braithwaite (Sheffield) was awarded the British Lung Foundation (BLF) prize for his in vitro and in vivo studies showing that vascular smooth muscle cell-derived TRAIL drives pulmonary vascular remodelling in models of pulmonary arterial hypertension (PAH).[3] This work opens up novel therapeutic opportunities for targeting TRAIL in PAH. Tracie Plant (Edinburgh) received the highly commended BLF award for work on the role of semaphorins in the regulation of neutrophil function.[4] The class 3 semaphorin Sema3F is expressed on inflammatory neutrophils and can regulate neutrophil chemotaxis and respiratory burst, suggesting that it could be targeted in conditions associated with pathological neutrophilic inflammation such as acute lung injury.

The British Association for Lung Research (BALR) award was given to Helena Lund-Palau (London) for her work investigating a novel gene therapy-based approach to treatment of pulmonary alveolar proteinosis (PAP) using lentivirus-delivered granulocyte-macrophage colony-stimulating factor (GM-CSF) complementary DNA (cDNA).[5] In preclinical in vitro models, she showed that sustained increases in GM-CSF levels could be induced and that these effects were associated with reduced bronchoalveolar lavage fluid turgidity and surfactant protein-D levels in a mouse model. Further work in this area could lead to novel alternatives to whole lung lavage therapy for patients with PAP. The runner-up for the BALR award was Lauren Davison (Newcastle), who presented in vivo and ex vivo work showing that pulmonary inflammation and fibrosis can be attenuated by selective depletion of interleukin 1 receptor type 1 on fibroblasts in a bleomycin mouse model.[6] This work highlights the central role played by fibroblasts in the pathogenesis of fibrotic lung diseases.

Highlights from *Journal of the American Medical Association* (*JAMA*) and *Thorax*

In an exciting first for the Winter Meeting, three cutting-edge papers published in the *JAMA* and *Thorax* were presented in a joint symposium.

Preclinical data suggest that low-dose theophylline augments the anti-inflammatory effects of corticosteroids[7–12]; however, clinical studies have not consistently demonstrated a benefit.[13–15] The Theophylline With Inhaled Corticosteroids (TWICs) study was a multicentre randomised, placebo-controlled trial of low-dose theophylline alongside inhaled corticosteroids (ICS) in patients with COPD at a high risk of exacerbation. Low-dose theophylline did not reduce COPD exacerbations compared with placebo at 1 year[16] and thus should not be used in this scenario.

Check for updates

© Author(s) (or their employer(s)) 2019. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Goodwin AT, Singanayagam A, Jenkins G. *Thorax* 2019;**74**:1168–1173.

Thorax: first published as 10.1136/thoraxjnl-2019-213680 on 5 August 2019. Downloaded from http://thorax.bmj.com/ on April 23, 2024 by guest. Protected by copyright.

Aboumatar *et al* took a non-pharmacological approach to reducing COPD exacerbations in their single-centre randomised trial.[17] Patients hospitalised with COPD exacerbations were randomised to the Better Respiratory Education and Treatment Help Empower (BREATHE) programme, an approach combining transitional care and long-term disease management support for 3 months, or usual care. Patients receiving the intervention had fewer COPD-related hospital attendances and better quality of life than those receiving usual care at 6 months. The intervention's success was attributed to the predischarge initiation, continuing contact with COPD nurses and individualisation of the programme. While requiring validation in other settings, these results could have potential implications for COPD service organisation.

E-cigarette use is increasing, but the long-term effects of e-cigarette liquid (ECL) on the lungs are unknown. Scott *et al* developed a novel method for condensing ECL vapour and exposed alveolar macrophages to unvaped ECL and e-cigarette vapour condensate (ECVC).[18] Both ECL and ECVC induced cell death, but ECVC induced greater cytotoxicity. ECVC inhibited phagocytosis and induced an inflammatory state in alveolar macrophages, demonstrated by increased production of reactive oxygen species, and proinflammatory cytokines, chemokines and proteases. These results suggest that vaping enhances the toxic effects of ECL, and that ECVC has profound effects on key lung innate immune cell functions. While the exact mechanisms by which vaping affects macrophage function are unclear, this study challenges the commonly held perception that e-cigarettes are safe.

BTS clinical lecture

Professor Dame Sally Davies (Chief Medical Officer for England) delivered an inspiring lecture on the threat to global health posed by antimicrobial resistance (AMR). Professor Dame Davies highlighted that around 20% of prescribed antibiotics in healthcare are unnecessary and also focused on the less well-recognised contribution of antibiotic use as growth promotion agents in agriculture. The burden of AMR continues to rise in the UK, and it is an issue that remains on the government risk register. Current and future strategies to combat this potentially devastating problem were also discussed. These included efforts by Public Health England to educate the public and support judicious antibiotic prescribing, and the Fleming Fund, which helps low-income countries to set up AMR surveillance and improve antibiotic stewardship. Longer term, there is an urgent need for further investment in new antibiotics from the pharmaceutical industry. This talk empowered the audience to play its part in reducing inappropriate antibiotic prescriptions within hospital and community based healthcare settings.

BTS keynote lecture

Neutrophils are essential for the clearance of pulmonary infections, however dysfunctional neutrophil-driven inflammation is central to the pathogenesis of several respiratory diseases.[19] Professor Moira Whyte (Edinburgh) gave a fascinating insight into recent advances in our understanding of lung inflammation. Prof Whyte discussed how host factors at the systemic and tissue level, such as hypoxia and nutrient availability, and pathogenic adaptations to this host environment influence neutrophil activity in the lungs.[20 21] Central to this is the hypoxia-inducible factor–hydroxylase (HIF–hydroxylase) pathway, which regulates acute inflammatory responses and survival of innate immune cells including neutrophils.[19 22] The HIF–hydroxylase pathway is oxygen-sensitive, and also links the intrinsic regulation of glycolysis and glycogen stores to neutrophil-mediated inflammatory responses.[19] In future, tailored therapeutics may modify these inflammatory pathways to optimise effective host defence, with important implications for respiratory disease.

BTS scientific lecture

Professor Brigid Hogan (Duke, North Carolina) gave a stimulating lecture highlighting recent discoveries on stem cell-driven repair and regenerative processes in the lung.

Professor Hogan described the recent discoveries of lung cell lineages through innovative techniques such as single-cell RNA sequencing and in vivo lineage tracing. The rare forkhead box I1 positive (Foxi1+) 'pulmonary ionocyte' is a major source of the cystic fibrosis (CF) transmembrane conductance regulator in the conducting airway epithelium[23 24] and is thus a valuable tool in CF research. In addition, myoepithelial cells originating from submucosal glands act as a stem cell population for the repair of injured airway epithelium.[25 26] Further study of these cell lineages in the context of lung development and regeneration could open numerous new treatment opportunities across both developmental and acquired lung diseases.

The derivation of 3D organoids from alveolar epithelial or tracheal basal precursor cells, termed 'alveolospheres' or 'tracheospheres', respectively, has widespread applications for the study of lung development, homeostasis, regeneration and disease in vitro.[27 28] The possibilities include high-throughput testing of cytokines, growth factors, genetic knockouts or drugs relevant to physiological and pathophysiological models, as well as investigation of the role of individual cell types in lung development and repair.[29] While the methods involved are challenging, organoids are likely to become invaluable tools for lung research.

Plenary scientific

The Plenary Scientific session showcased some of the rising stars of UK respiratory academia.

Dr Charlotte Dean (London) presented her work addressing the question of whether factors involved in normal lung regeneration could be harnessed to repair damaged lungs. She focused on the transmembrane protein Vang-like protein 2 (Vangl2) that has been shown to be important in human studies, where single nucleotide polymorphisms (SNPs) in the encoding gene are associated with accelerated lung function decline in smokers, and in animal studies, where mice with *Vangl2* gene-targeted deletion have aberrant lung development.[30] Dr Dean highlighted her work in this area with some fascinating video images of studies using precision cut lung slices to evaluate alveologenesis ex vivo.

Professor Jim Wild (Sheffield) described how novel imaging methods are showing promise for more sensitive diagnosis and disease mapping. Hyperpolarised ventilation MRI allows a more accurate quantitative analysis of lung ventilation in different parts of the lung. Professor Wild demonstrated that this modality has shown early promise for detection of ventilatory defects in children with CF who otherwise have normal measurements on routine lung function testing.[31] These approaches could allow earlier detection of subclinical disease.

Dr Rahul Bhatnagar (Bristol) presented data from the UK pleural research community on the management of malignant pleural effusion. The Thoracoscopy and Talc Poudrage versus Pleurodesis Study (TAPPS) compared medical thoracoscopy with talc poudrage to chest drain insertion with instillation of talc slurry and found no difference in rates of successful pleurodesis.[32] The IPC-Plus study indicated a large benefit for a

Thorax: first published as 10.1136/thoraxjnl-2019-213680 on 5 August 2019. Downloaded from http://thorax.bmj.com/ on April 23, 2024 by guest. Protected by copyright.

combination of indwelling pleural catheter (IPC) insertion with instillation of talc versus IPC with instillation of placebo.[33] These findings are practice changing and suggest that IPC with talc instillation should be considered as standard of care.

Finally, Professor Tim Harrison (Nottingham) presented data from the FourFold Asthma (FAST) trial, a UK-wide study that evaluated the effects of quadrupling the dose of ICS at the point of asthma symptom worsening.[34] This intervention led to a significant reduction in the occurrence of severe exacerbations and presented a novel approach towards better prevention of these devastating episodes in asthmatic patients.

Occupational lung disease

The occupational lung disease (OLD) symposium consisted of three important talks describing modern-day causes of supposedly 'old' conditions.

Professor Paul Cullinan (Imperial, London) presented an investigation into a hypersensitivity pneumonitis (HP) outbreak in a factory that utilised metal working fluid (MWF). A blinded, molecular-based microbiological investigation of MWF samples in the outbreak area was conducted. A mycobacterial contamination was found in machines fed by a central sump, with a close relationship between the abundance of organism and the work location of the affected employees.[35] MWF is the the most common cause of occupational HP in the UK.[36] HP is thought to occur secondary to inhalation of contaminated MWF[37] but this is the first report of a direct relationship with a microbial contaminant. Similar MWF screening approaches could be applied to the early detection and prevention of MWF-related HP.

In the aftermath of the 9/11 World Trade Centre (WTC) terror attacks, firefighters were exposed to unprecedented quantities of aerosolised caustic dust. Professor Michael Weiden (New York) presented data from the longest ever follow-up of rescue workers following a major disaster. WTC exposure is associated with impaired lung function, continuing throughout the 15-year follow up,[38 39] and bronchial hyper-reactivity,[40] which were associated with bronchial wall thickening on CT.[41] Raised serum neutrophils and eosinophils within 6 months of 9/11 indicated future forced expiratory volume in one second (FEV1) decline,[38 42] which may reflect biological pathways that predispose individuals to exaggerated inflammation.[42] These studies provide a unique insight into the respiratory sequelae and appropriate monitoring of individuals with massive inorganic dust exposure.

Dr Ryan Hoy (Melbourne) presented data on artificial stone silicosis, a condition that affects workers who cut or grind high-silica content artificial stone. While first reported recently, in 2010,[43] there is growing concern about this condition due to its increasing frequency, and shorter latency and more rapid lung function decline than in chronic silicosis.[44] Moreover, the majority (6/7) of the cases in one series had radiological evidence of progressive massive fibrosis.[44] These findings have implications for health and safety standards, and emphasise the urgent need for effective dust control measures and health surveillance to protect workers in this industry.

Asthma

With the updated BTS/SIGN asthma guidelines imminent, asthma was a hot topic at the winter meeting.

Professor Catherine Nelson-Piercy (London) gave an expert presentation on the management of asthma during pregnancy. Most asthma medications, including short-acting and long-acting beta agonists, corticosteroids and theophyllines, can be used as normal during pregnancy and lactation.[45] Furthermore, the management of acute asthma is the same in pregnant as in non-pregnant patients. Data are lacking for the use of biologics in pregnancy, but good asthma control is paramount to optimise maternal and foetal outcomes.[45]

Allergic and autoimmune disease has dramatically increased since the mid-20th century, and interactions between the diet, intestinal microbiota and respiratory inflammation have been proposed.[46] Dr Niki Ubags (Lausanne) described how metabolites generated by gut microbiota have been implicated in lung inflammation.[47] Dietary fibre alters the microbial composition of the gut, and these micro-organisms metabolise fibre, resulting in increased circulating short-chain fatty acids (SCFAs). SCFAs enhance the generation of macrophage and dendritic cell precursors in the bone marrow, which are recruited to the lung, altering the allergic airway response.[46 47] Further research could inform the dietary advice given to asthmatic patients.

Monoclonal antibodies (mAbs) have transformed the management of severe asthma, reducing exacerbations and oral corticosteroids while improving quality of life in selected patients.[48] Dr Rekha Choudhuri (Glasgow) summarised the existing evidence for the growing pool of mAbs in asthma, including the currently available omalizumab (anti-IgE), mepolizumab (anti-IL-5) and resiluzumab (anti-IL-5), and the emerging benralizumab (anti-IL-5) and dupilumab (anti IL-4/IL-13).[48] The hypothetical 'Fabulizumab' would reduce corticosteroid doses, enhance quality of life, be cost-effective and be personalised according to an individual's endotype. However, extensive work is required to develop this ideal mAb.

Professor Chris Brightling (Leicester) updated delegates on the role of bronchial thermoplasty (BT) in severe asthma management. Recent work demonstrated that BT reduces airway smooth muscle (ASM) mass, improves epithelial integrity and reduces the myofibroblast population in the airway lamina propria,[49] important factors for reducing pathological airway remodelling. Importantly, current biological therapies do not reduce ASM mass, an advantage of BT in severe asthma. Hyperpolarised gas MRI can identify the location where BT is most required, as areas of ventilation heterogeneity may indicate regions of smooth muscle dysfunction.[50] While currently only recommended in the context of an independent systematic registry or clinical study,[51] the role of BT in the management of severe asthma is likely to be clarified with ongoing research.

COPD

Professor Mona Bafadhel (Oxford) highlighted novel approaches to phenotyping COPD, in particular focussing on identification of treatable traits. The evidence for use of blood eosinophils as a routinely available biomarker to identify patients with corticosteroid-responsive disease and guide treatment was presented, although with the caveat that biomarkers should always be used in conjunction with clinical judgement.

Professor Tom Wilkinson (Southampton) built on this concept of eosinophilic COPD by discussing the evolving role of ICS in COPD. The association with pneumonia has led to greater consideration of the risk versus benefit ratio for these inhalers and recent real-world data would suggest that ICS use is falling in the UK.[52] Prof Wilkinson drew on the latest studies to provide an overview of when to start and how to withdraw ICS in COPD and how blood eosinophil levels can help to stratify therapy.

MeiLan Han (Michigan) discussed the concept of 'early COPD' and showed data that such patients can still have CT abnormalities and exacerbation-like events despite having no

Thorax: first published as 10.1136/thoraxjnl-2019-213680 on 5 August 2019. Downloaded from http://thorax.bmj.com/ on April 23, 2024 by guest. Protected by copyright.

airflow obstruction on spirometry. Data were presented from the SubPopulations and InteRmediate OUTCOME Measures in COPD Study cohort showing that these patients have increased mucus hypersecretion/mucin glycoprotein concentrations, which could provide a novel target for future disease modification strategies.

Finally, Dr Nick Hopkinson provided an update on the new National Institute of Health and Clinical Excellence guidelines for COPD.[53] Aspects discussed included definitions for asthma/COPD overlap syndromes, new approaches to dual long-acting β agonist/long-acting muscarinic antagonist (LABA/LAMA) and ICS therapy, and the role of non-pharmacological interventions including pulmonary rehabilitation and smoking cessation.

Interstitial Lung Disease

Professor Rachel Chambers (London) presented novel insights into the metabolic reprogramming in pulmonary fibrosis. Mammalian target of rapamycin complex 1-dependent signalling drives collagen expression in mesenchymal cells[54] and mediates the profibrotic effects of transforming growth factor-β (TGFβ), a key driver of pulmonary fibrosis.[55] Furthermore, mammalian target of rapamycin signalling regulates lung fibroblast metabolism during TGFβ-induced collagen syntheses by increasing the synthesis of glycine from glucose.[56] These data have revealed key molecular pathways relevant to pulmonary fibrosis, which may reveal targets for novel antifibrotic molecules.

Professor Kerri Johannson (Calgary) described the diagnostic challenges in chronic hypersensitivity pneumonitis (CHP), which are perpetuated by a paucity of diagnostic guidelines. A consensus of international experts identified a history of antigen exposure, mosaic attenuation on imaging, a temporal relationship between antigen exposure and symptoms, and non-necrotising granulomas as key indicative factors for CHP.[57] The primary treatment of CHP is antigen removal, but corticosteroids may be required. Mycophenolate mofetil and azathioprine have been reported to be safe steroid-sparing agents associated with improved diffusing capacity for carbon monoxide (DLCO) in retrospective studies.[58 59] Prospective clinical trials are lacking and are urgently needed to guide the management of CHP.

Professor Matthew Hunninghake (Boston) presented research on interstitial lung abnormalities (ILAs), which are areas of increased lung density on imaging without diagnostic features of interstitial lung disease (ILD).[60] Evidence suggesting that ILAs represent preclinical ILD include their association with poor exercise tolerance,[61] increased mortality,[62] higher risk of acute respiratory distress syndrome,[63] shared genetic risk factors with idiopathic pulmonary fibrosis[64] and histopathological fibrosis.[65] As the focus of ILD management shifts towards early detection and prevention, research assessing the clinical implications of ILAs is essential.

Dr Marlies Wijsenbeek (Rotterdam) emphasised the importance of addressing patient perceptions and choice when planning palliative treatment of advanced pulmonary fibrosis. The multidisciplinary team should integrate pharmacological and psychosocial interventions to maximise quality of life.[66] Patient-centred models of palliative care require validation in pulmonary fibrosis, and appropriate outcome measures for future clinical trials are required.[67]

Infection

The role of macrolides in management of respiratory diseases was the focus of a dedicated symposium.

Dr Lena Uller (Lund) highlighted the evolving role of macrolides in management of inflammatory airway diseases. Clinical data were presented from the Asthma and Macrolides: The Azithromycin Efficacy and Safety study showing a large effect of azithromycin therapy on reduction of acute asthma exacerbations.[68] This was complemented by a discussion of experimental studies showing potentially beneficial effects of macrolides on anti-viral immunity and inflammation.

Dr Aran Singanayagam (London) discussed the role of macrolides in community-acquired pneumonia (CAP), focusing on how current approaches using severity scores to guide prescribing of these commonly used agents could be inappropriate. Alternative approaches to antibiotic prescribing are urgently needed to ensure that these antibiotics are targeted appropriately to patients with CAP that will derive benefit from them and to prevent further development of macrolide-resistant bacterial strains.

Dr Michael Loebinger (London) discussed the potential risks of long-term macrolide use in patients with chronic lung disease. He focused on the need for consideration of possible ototoxicity and cardiac side-effects that may occur with these agents and also discussed experimental and clinical evidence for the association with drug-resistant non-tuberculous mycobacterial (NTM) infection.

Finally, Dr David Smith provided a timely update on the upcoming BTS Long Term Macrolide Guideline, an eagerly anticipated document that will help to standardise clinical use of macrolides in patients with asthma, COPD and bronchiectasis.

Cystic fibrosis

Professor Andrew Jones (Manchester) discussed the impact of *Mycobacterium abscessus* (*M. abscessus*) on patients with CF, the the most common form of NTM in adults and children with CF in the UK. *M. abscessus* is associated with poorer lung transplantation outcomes,[69 70] and individualised and often aggressive antimicrobial therapy is important when managing this condition.

Professor Pradeep Singh (Washington) then presented two models of lung infection in CF, the 'established' infection model of progression from uninfected to early and subsequently late infection with classical 'CF pathogens', and a newer model where decreasing lung microbiota diversity results in disease.[71] Significant challenges, particularly upper airway contaminants, exist for the sampling and analytical methods used to assess lung microbial biodiversity and burden,[72] and work is ongoing in this area.

Finally, Professor Andrew Fisher (Newcastle) provided an update on lung transplantation for CF. While the survival of CF patients post lung transplantation is improving, the demand for donor lungs greatly exceeds the number of donor organs available,[73] emphasising the importance of careful patient selection. Postoperative outcomes can be improved by improving nutritional status, perioperative antibiotics, for example, in the case of *M. abscessus abscessus*,[74] and thorough psychological assessment.

Pleural disease

Imaging in pleural disease was a hot topic at the Winter Meeting. Bedawi *et al*'s (Oxford) systematic review found limited evidence for the common belief that sonographic septations are a certain indication for surgical drainage of pleural infection.[75] In a single-centre study by De Fonseka *et al* (Bristol), the presence of pleural pointillism on MRI was the most accurate

Thorax: first published as 10.1136/thoraxjnl-2019-213680 on 5 August 2019. Downloaded from http://thorax.bmj.com/ on April 23, 2024 by guest. Protected by copyright.

method of differentiating between benign and malignant pleural thickening judged to be of an 'indeterminate' nature on CT.[76] Finally, Halifax *et al* (Oxford) found that reductions in ventilation observed using hyperpolarised ^{129}Xenon MRI post primary spontaneous pneumothorax could indicate emphysema-like changes not evident on pulmonary function testing.[77] Further evaluation of these methods in prospective studies is required to confirm the findings of these early studies.

Pulmonary vascular disease

Chronic thromboembolic pulmonary hypertension (CTEPH) is a potentially curable cause of pulmonary arterial hypertension, however it is thought to be underdiagnosed. Suntharalingam *et al* (Bath) reported a retrospective analysis which found that developing a specialist PAH service in their area increased the local diagnosis rates of CTEPH above those seen nationally.[78] These findings have important implications for PAH service development.

The management of PAH was a subject of considerable discussion at the 2018 Meeting. Mackenzie *et al* (Glasgow) reported that exercise therapy in PAH patients was feasible and improved exercise tolerance and quality of life in their single centre study.[79] Nashat *et al* (London) reported real world data demonstrating that the endothelin receptor antagonist macitentan led to significant improvements in exercise capacity, function and haemodynamic parameters in patients with PAH secondary to several aetiologies.[80] Finally, Coghlan (London) *et al* reported long-term data from the Prostacyclin (PGI_2) Receptor Agonist In Pulmonary Arterial HypertensiON (GRIPHON) double blind study and open label extension, which showed that selexipag, an oral selective prostacyclin receptor antagonist, has good long-term safety and tolerability profiles, with up to 5 years of data available.[81] While these new data augment previous reports that selexipag is effective in reducing adverse outcomes in PAH,[82] it still not clear whether selexipag can improve survival in these patients.[83] It is hoped that larger trials and real-world registry data may clarify the position of selexipag,[83] and other drugs, in the management of PAH.

CONCLUSION

The BTS Winter Meeting 2018 brought the very best of respiratory research to an audience of scientists, physicians, nurses and allied health professionals. If you were not able to attend, look to Twitter (#BTSWinter2018) and follow @thoraxbmj for all of the latest on respiratory research. We look forward to #BTSWinter2019!

Contributors All authors contributed to the preparation of the manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None.

Patient consent for publication Not required.

Provenance and peer review Commissioned; externally peer reviewed.

ORCID iDs
Amanda T Goodwin http://orcid.org/0000-0002-1488-6549
Gisli Jenkins http://orcid.org/0000-0002-7929-2119

REFERENCES

1 Kumar N, Kolluri K, Alifrangis C, *et al*. Loss of BAP1 function leads to TRAIL sensitivity in mesothelioma. *Thorax* 2018;73:A1.
2 Pavitt MJ, Tanner RJ, Lewis AP, *et al*. Oral dietary nitrate supplementation to enhance pulmonary rehabilitation in chronic obstructive pulmonary disease: a multi-centre double blind placebo-controlled parallel group study. *Thorax* 2018:A3.
3 Braithwaite AT, Pickworth JA, Arnold ND, *et al*. Vascular smooth muscle derived TRAIL underlies pulmonary vascular remodelling in Sugen 5416 / hypoxia mice. *Thorax* 2018;(Suppl4):A3.
4 Plant TM, Carlin L, Ellett FEJ, *et al*. Sema3F is an autocrine neutrophil retention signal regulating neutrophil transit and effector functions in acute lung injury. *Thorax* 2018:A2.
5 Lund-Palau H, Meng C, Pilou A, *et al*. Lentivirus GM-CSF gene therapy ameliorates autoimmune pulmonary alveolar proteinosis. *Thorax* 2018:A1.
6 Davison LE, Barksby BS, Paish HL, *et al*. Il-1R1 expression on mesenchymal cells drives inflammation and fibrosis in response to epithelial damage in the lung. *Thorax* 2018:A3.
7 Ito K, Lim S, Caramori G, *et al*. A molecular mechanism of action of theophylline: induction of histone deacetylase activity to decrease inflammatory gene expression. *Proc Natl Acad Sci U S A* 2002;99:8921–6.
8 Cosio BG, Tsaprouni L, Ito K, *et al*. Theophylline restores histone deacetylase activity and steroid responses in COPD macrophages. *J Exp Med* 2004;200:689–95.
9 Marwick JA, Caramori G, Stevenson CS, *et al*. Inhibition of PI3Kδ restores glucocorticoid function in smoking-induced airway inflammation in mice. *Am J Respir Crit Care Med* 2009;179:542–8.
10 To Y, Ito K, Kizawa Y, *et al*. Targeting Phosphoinositide-3-Kinase-δ with theophylline reverses corticosteroid insensitivity in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2010;182:897–904.
11 Cosio BG, Iglesias A, Rios A, *et al*. Low-Dose theophylline enhances the anti-inflammatory effects of steroids during exacerbations of COPD. *Thorax* 2009;64:424–9.
12 Ford PA, Durham AL, Russell REK, *et al*. Treatment effects of low-dose theophylline combined with an inhaled corticosteroid in COPD. *Chest* 2010;137:1338–44.
13 Zhou Y, Wang X, Zeng X, *et al*. Positive benefits of theophylline in a randomized, double-blind, parallel-group, placebo-controlled study of low-dose, slow-release theophylline in the treatment of COPD for 1 year. *Respirology* 2006;11:603–10.
14 Cosío BG, Shafiek H, Iglesias A, *et al*. Oral low-dose theophylline on top of inhaled Fluticasone-Salmeterol does not reduce exacerbations in patients with severe COPD. *Chest* 2016;150:123–30.
15 Subramanian R, Jindal A, *et al*. The study of efficacy, tolerability and safety of theophylline given along with formoterol plus budesonide in COPD. *JCDR* 2015;9:10–13.
16 Devereux G, Cotton S, Fielding S, *et al*. Effect of theophylline as adjunct to inhaled corticosteroids on exacerbations in patients with COPD. *JAMA* 2018;320:1548–59.
17 Aboumatar H, Naqibuddin M, Chung S, *et al*. Effect of a program combining transitional care and long-term self-management support on outcomes of hospitalized patients with chronic obstructive pulmonary disease. *JAMA* 2018;320:2335–43.
18 Scott A, Lugg ST, Aldridge K, *et al*. Pro-Inflammatory effects of e-cigarette vapour condensate on human alveolar macrophages. *Thorax* 2018;73:1161–9.
19 Sadiku P, Willson JA, Dickinson RS, *et al*. Prolyl hydroxylase 2 inactivation enhances glycogen storage and promotes excessive neutrophilic responses. *J Clin Invest* 2017;127:3407–20.
20 Thompson AAR, Dickinson RS, Murphy F, *et al*. Hypoxia determines survival outcomes of bacterial infection through HIF-1α–dependent reprogramming of leukocyte metabolism. *Science Immunology* 2017;2.
21 Dickinson RS, Murphy F, Doherty C, *et al*. Pseudomonas expression of an oxygen sensing prolyl hydroxylase homologue regulates neutrophil host responses *in vitro* and *in vivo*. *Wellcome Open Res* 2017;2.
22 Whyte MKB, Walmsley SR. The regulation of pulmonary inflammation by the hypoxia-inducible Factor–Hydroxylase oxygen-sensing pathway. *Ann Am Thorac Soc* 2014;11(Supplement 5):S271–S276.
23 Montoro DT, Haber AL, Biton M, *et al*. A revised airway epithelial hierarchy includes CFTR-expressing ionocytes. *Nature* 2018;560:319–24.
24 Plasschaert LW, Žilionis R, Choo-Wing R, *et al*. A single-cell atlas of the airway epithelium reveals the CFTR-rich pulmonary ionocyte. *Nature* 2018;560:377–81.
25 Lynch TJ, Anderson PJ, Rotti PG, *et al*. Submucosal gland myoepithelial cells are reserve stem cells that can regenerate mouse tracheal epithelium. *Cell Stem Cell* 2018;22:653–67.
26 Tata A, Kobayashi Y, Chow RD, *et al*. Myoepithelial cells of submucosal glands can function as reserve stem cells to regenerate airways after injury. *Cell Stem Cell* 2018;22:668–83.
27 Barkauskas CE, Cronce MJ, Rackley CR, *et al*. Type 2 alveolar cells are stem cells in adult lung. *J Clin Invest* 2013;123:3025–36.
28 Tadokoro T, Gao X, Hong CC, *et al*. Bmp signaling and cellular dynamics during regeneration of airway epithelium from basal progenitors. *Development* 2016;143:764–73.
29 Barkauskas CE, Chung M-I, Fioret B, *et al*. Lung organoids: current uses and future promise. *Development* 2017;144:986–97.
30 Poobalasingam T, Yates LL, Walker SA, *et al*. Heterozygous *Vangl2* ^{Looptail} mice reveal novel roles for the planar cell polarity pathway in adult lung homeostasis and repair. *Dis Model Mech* 2017;10:409–23.
31 Marshall H, Horsley A, Taylor CJ, *et al*. Detection of early subclinical lung disease in children with cystic fibrosis by lung ventilation imaging with hyperpolarised gas MRI. *Thorax* 2017;72:760–2.

Thorax: first published as 10.1136/thoraxjnl-2019-213680 on 5 August 2019. Downloaded from http://thorax.bmj.com/ on April 23, 2024 by guest. Protected by copyright.

32 Bhatnagar R, Laskawiec-Szkonter M, Piotrowska HEG, *et al*. Evaluating the efficacy of thoracoscopy and talc poudrage versus pleurodesis using talc slurry (TAPPS trial): protocol of an open-label randomised controlled trial. *BMJ Open* 2014;4:e007045.
33 Bhatnagar R, Keenan EK, Morley AJ, *et al*. Outpatient talc administration by indwelling pleural catheter for malignant effusion. *N Engl J Med* 2018;378:1313–22.
34 McKeever T, Mortimer K, Wilson A, *et al*. Quadrupling inhaled glucocorticoid dose to abort asthma exacerbations. *N Engl J Med* 2018;378:902–10.
35 James PL, Cannon J, Barber CM, *et al*. Metal worker's lung: spatial association with *Mycobacterium avium*. *Thorax* 2018;73:151–6.
36 Barber CM, Wiggans RE, Carder M, *et al*. Epidemiology of occupational hypersensitivity pneumonitis; reports from the SWORD scheme in the UK from 1996 to 2015. *Occup Environ Med* 2017;74:528–30.
37 Murat J-B, Grenouillet F, Reboux G, *et al*. Factors influencing the microbial composition of metalworking fluids and potential implications for machine operator's lung. *Appl Environ Microbiol* 2012;78:34–41.
38 Zeig-Owens R, Singh A, Aldrich TK, *et al*. Blood Leukocyte Concentrations, FEV_1 Decline, and Airflow Limitation. A 15-Year Longitudinal Study of World Trade Center–exposed Firefighters. *Ann Am Thorac Soc* 2018;15:173–83.
39 Aldrich TK, Vossbrinck M, Zeig-Owens R, *et al*. Lung function trajectories in world trade Center-Exposed New York City firefighters over 13 years: the roles of smoking and smoking cessation. *Chest* 2016;149:1419–27.
40 Aldrich TK, Weakley J, Dhar S, *et al*. Bronchial reactivity and lung function after world Trade center exposure. *Chest* 2016;150:1333–40.
41 Weiden MD, Ferrier N, Nolan A, *et al*. Obstructive airways disease with air trapping among firefighters exposed to world Trade center dust. *Chest* 2010;137:566–74.
42 Singh A, Liu C, Putman B, *et al*. Predictors of Asthma/COPD overlap in FDNY firefighters with world Trade center dust exposure. *Chest* 2018;154:1301–10.
43 Martínez C, Prieto A, García L, *et al*. Silicosis: a disease with an active present. *Archivos de Bronconeumología* 2010;46:97–100.
44 Hoy RF, Baird T, Hammerschlag G, *et al*. Artificial stone-associated silicosis: a rapidly emerging occupational lung disease. *Occup Environ Med* 2018;75:3–5.
45 British Guideline on the Management of Asthma; A National Clinical Guideline. British Thoracic Society and Scottish Intercollegiate Guidelines Network.; 2016 [.[British Guideline on the Management of Asthma; A National Clinical Guideline], 2016. Available: https://www.brit-thoracic.org.uk/document-library/clinical-information/asthma/btssign-asthma-guideline-2016/ [Accessed 4th January 2019 2019].
46 Wypych TP, Marsland BJ, Ubags NDJ. The impact of diet on immunity and respiratory diseases. *Ann Am Thorac Soc* 2017;14(Supplement_5):S339–S347.
47 Trompette A, Gollwitzer ES, Yadava K, *et al*. Gut microbiota metabolism of dietary fiber influences allergic airway disease and hematopoiesis. *Nat Med* 2014;20:159–66.
48 McGregor MC, Krings JG, Nair P, *et al*. Role of biologics in asthma. *Am J Resp Crit Care Med* 2018 (published Online First: 2018/12/12).
49 Chernyavsky IL, Russell RJ, Saunders RM, *et al*. *In vitro*, *in silico* and *in vivo* study challenges the impact of bronchial thermoplasty on acute airway smooth muscle mass loss. *Eur Respir J* 2018;51. doi:10.1183/13993003.01680-2017.
50 Svenningsen S, Eddy RL, Lim HF, *et al*. Sputum eosinophilia and magnetic resonance imaging ventilation heterogeneity in severe asthma. *Am J Respir Crit Care Med* 2018;197:876–84.
51 Chung KF, Wenzel SE, Brozek JL, *et al*. International ERS/ATS guidelines on definition, evaluation and treatment of severe asthma. *Eur Respir J* 2014;43:343–73.
52 Chalmers JD, Tebboth A, Gayle A, *et al*. Determinants of initial inhaled corticosteroid use in patients with gold a/b COPD: a retrospective study of UK general practice. *npj Prim Care Resp Med* 2017;27.
53 National Institute of Health and Clinical Excellence. Chronic obstructive pulmonary disease, 2018. Available: www.nice.org.uk/guidance/conditions-and-diseases/respiratory-conditions/chronic-obstructive-pulmonary-disease [Accessed 2/2/2019].
54 Walker NM, Belloli EA, Stuckey L, *et al*. Mechanistic target of rapamycin complex 1 (mTORC1) and mTORC2 as key signaling intermediates in mesenchymal cell activation. *J Biol Chem* 2016;291:6262–71.
55 Woodcock HV, Eley JD, Guillotin D, *et al*. The mTORC1/4E-BP1 axis represents a critical signaling node during fibrogenesis. *Nat Commun* 2019;10:6.
56 Azuelos I, Selvarajah B, Plate M, *et al*. Mtor regulates TGFß-induced collagen synthesis via increased glycine biosynthesis. *Eur Resp J* 2018;52.
57 Morisset J, Johannson KA, Jones KD, *et al*. Identification of diagnostic criteria for chronic hypersensitivity pneumonitis: an international modified Delphi survey. *Am J Respir Crit Care Med* 2018;197:1036-1044.
58 Morisset J, Johannson KA, Vittinghoff E, *et al*. Use of mycophenolate mofetil or azathioprine for the management of chronic hypersensitivity pneumonitis. *Chest* 2017;151:619–25.
59 Adegunsoye A, Oldham JM, Fernández Pérez ER, *et al*. Outcomes of immunosuppressive therapy in chronic hypersensitivity pneumonitis. *ERJ Open Research* 2017;3.
60 Putman RK, Rosas IO, Hunninghake GM. Genetics and early detection in idiopathic pulmonary fibrosis. *Am J Respir Crit Care Med* 2014;189:770–8.
61 Doyle TJ, Washko GR, Fernandez IE, *et al*. Interstitial lung abnormalities and reduced exercise capacity. *Am J Respir Crit Care Med* 2012;185:756–62.
62 Putman RK, Hatabu H, Araki T, *et al*. Association between interstitial lung abnormalities and all-cause mortality. *JAMA* 2016;315:672–81.
63 Putman RK, Hunninghake GM, Dieffenbach PB, *et al*. Interstitial lung abnormalities are associated with acute respiratory distress syndrome. *Am J Respir Crit Care Med* 2017;195:138–41.
64 Putman RK, Gudmundsson G, Araki T, *et al*. The *MUC5B* promoter polymorphism is associated with specific interstitial lung abnormality subtypes. *Eur Respir J* 2017;50. doi:10.1183/13993003.00537-2017.
65 Miller ER, Putman RK, Vivero M, *et al*. Histopathology of interstitial lung abnormalities in the context of lung nodule resections. *Am J Respir Crit Care Med* 2018;197:955–8.
66 Moor CC, Heukels P, Kool M, *et al*. Integrating patient perspectives into personalized medicine in idiopathic pulmonary fibrosis. *Front. Med.* 2017;4.
67 Kreuter M, Bendstrup E, Russell A-M, *et al*. Palliative care in interstitial lung disease: living well. *Lancet Respir Med* 2017;5:968–80.
68 Gibson PG, Yang IA, Upham JW, *et al*. Effect of azithromycin on asthma exacerbations and quality of life in adults with persistent uncontrolled asthma (AMAZES): a randomised, double-blind, placebo-controlled trial. *The Lancet* 2017;390:659–68.
69 Gilljam M, Scherstén H, Silverborn M, *et al*. Lung transplantation in patients with cystic fibrosis and Mycobacterium abscessus infection. *J Cyst Fibros* 2010;9:272–6.
70 Gilljam M, Nystrom U, Dellgren G, *et al*. Survival after lung transplantation for cystic fibrosis in Sweden. *Eur J Cardiothorac Surg* 2017;51:571–6.
71 Jorth P, Ehsan Z, Rezayat A, *et al*. Direct lung sampling indicates that established pathogens dominate early infections in children with cystic fibrosis. *Cell Rep* 2019;27:1190–204.
72 Goddard AF, Staudinger BJ, Dowd SE, *et al*. Direct sampling of cystic fibrosis lungs indicates that DNA-based analyses of upper-airway specimens can misrepresent lung microbiota. *Proc Natl Acad Sci U S A* 2012;109:13769–74.
73 Kourliouros A, Hogg R, Mehew J, *et al*. Patient outcomes from time of listing for lung transplantation in the UK: are there disease-specific differences? *Thorax* 2019;74:60–8.
74 Tissot A, Thomas MF, Corris PA, *et al*. Nontuberculous mycobacteria infection and lung transplantation in cystic fibrosis: a worldwide survey of clinical practice. *BMC Pulm Med* 2018;18:86.
75 Bedawi EO HM, Harriss A, McCracken D, *et al*. Sonographic septations in pleural infection - what do they actualy mean? *Thorax* 2018;73:A35.
76 de Fonseka DWS, Maskell N, Edey A. Role of MRI in characterising equivocal pleural thickening on CT. *Thorax* 2018;73:A35–6.
77 Halifax RJ SN, Talbot NP, Petousi N, *et al*. Non-Invasive measurement of lung inhomogeneity following recovery from primary spontaneous pneumothorax. *Thorax* 2018;73:A37–8.
78 Suntharalingham J, Robinson G, Hall T, *et al*. Chronic thromboembolic pulmonary hypertension (CTEPH) - is it chronically underdiagnosed? *Thorax* 2018;73:A73–4.
79 MacKenzie A, McCaughy P, Jayasekera G, *et al*. Efficacy and feasibility of pulmonary hypertension specific exercise rehabilitation in a UK setting. *Thorax* 2018;73:A74–5.
80 Nashat HBJ, Harries C, Price L, *et al*. Efficacy of macitentan in a large, real life population of patients with pulmonary arterial hypertension. *Thorax* 2018;73:A76.
81 Coghlan JG GN, Gaine S, Channick R, *et al*. Long-Term survival and safety with selexipag in patients with pulmonary arterial hypertension: results from the GRIPHON study and its open-label extension. *Thorax* 2018;73:A76–7.
82 Sitbon O, Channick R, Chin KM, *et al*. Selexipag for the treatment of pulmonary arterial hypertension. *N Engl J Med* 2015;373:2522–33.
83 Barnes H, Yeoh H-L, Fothergill T, *et al*. Prostacyclin for pulmonary arterial hypertension. *Cochrane Database Syst Rev* 2019;9.

Thorax: first published as 10.1136/thoraxjnl-2019-213680 on 5 August 2019. Downloaded from http://thorax.bmj.com/ on April 23, 2024 by guest. Protected by copyright.