every patient visit. A flare was defined as a PGA score increase of 1 point or more compared to the previous visit. Environmental and atmospheric data was obtained from the EPA, including PM_{2.5} and ozone concentration, temperature, residual wind, relative humidity, and barometric pressure. The average values of each factor 10 days prior to patient visit was calculated. Univariate and multivariate models were built in order to study the association of these variables with lupus disease activity. The models were adjusted for age, sex, income, racial distribution, and rural vs. urban patient residence. Multivariate logistic regression was used to identify significant determinants associated with lupus flares. Regression was performed for each organ flare outcome. Regression inference was based on generalized estimating equations (GEE) to account for the time repeated outcomes. Standard regression techniques on model building and evaluation were followed, including but not limited to performing both univariate and multivariate regressions, coefficient significance, collinearity, confounding, variable interactions and reductions in model AIC.

Results: Rash, serositis, hematologic, and joint flares were statistically significantly associated ($p<0.05$) with an increase in temperature in univariate and multivariate analysis. Renal flares were negatively associated with increases in temperature ($p<0.05$) in univariate and multivariate analysis.

PM_{2.5} concentration was significantly associated ($p<0.001$) with rash, joints, serositis, neurologic, pulmonary, and hematologic flares in univariate and multivariate analysis.

Ozone concentration, residual wind, and relative humidity were significantly associated with lupus flares in univariate analysis only, while barometric pressure had no associations.

Conclusion: There is a strong association between changes in PM_{2.5} concentration and temperature 10 days prior to patient visit and organ specific lupus activity at the visit. These data could add an important aspect to lupus trials, the outcomes of which may be affected by so far unrecognized environmental factors, and ultimately it could allow predictive modelling of lupus flares which would revolutionize the approach to treatment.

Disclosure of Interests: George Stojan: None declared, Frank Curriero: None declared, Anton Kvit: None declared, Michelle A Petri Shareholder of: Pfizer, Merck, Grant/research support from: AstraZeneca, Exagen, Consultant for: Eli Lilly, GSK, Merck EMD Serono, Janssen, Amgen, Novartis, Quintiles, Exagen, Inova Diagnostics, AstraZeneca, Blackrock, Glenmark, UCB, and the Annenberg Center for Health Sciences

DOI: 10.1136/annrheumdis-2019-eular.5962

FRI0657

METABOLIC SYNDROME PRECEDES THE ONSET OF HIP AND KNEE PAIN AND THE RISK IS NOT MODIFIED BY DIET OR CHANGES IN BMI

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Background: Excess weight and components of the metabolic syndrome have been associated with knee osteoarthritis (OA). However, the precise timing of when this risk operates in the natural history of the disease is unknown. An understanding of the sequence in which risk factors operate in OA is important for delivering effective preventative interventions.

Objectives: We examined longitudinal data from a large prospective population-based cohort to assess the association between metabolic syndrome components and the subsequent development of either knee or hip over 10 years of follow-up.

Methods: Known risk factors data were obtained at enrolment to the EPIC-Norfolk cohort between 1993 and 1997. Data were available on anthropometric variables, smoking status and lipid metabolites. Knee and hip pain were self-reported at 18 months, 3 and 10 years when respondents answered whether they had had pain in their knee or hip on most days in the preceding month. Metabolic syndrome components were defined in line with the Alberti formula. Logistic regression was used to investigate metabolic syndrome components: waist circumference (men >102cm, women >88cm), low HDL (men <1mmol/L, women <1.3mmol/L), high triglycerides (>1.7mmol/L) and their association to incident pain and any effect-modification of dietary patterns and changes in BMI over time.

Results: Amongst 20,517 respondents (age at enrolment 59.7 years (SD 9.2), 56.5% female) there were 3,886 who reported knee pain and 2,467 who reported hip pain at 18 months. By the end of follow-up there were 2619 who had developed incident knee pain and 1752 who had

developed incident hip pain. In a logistic model adjusted for age and sex, significant associations were seen for incident pain for ever-smoking (knee: odds ratio 1.22, 95% CI 1.11, 1.33 $p<0.001$), (hip: odds ratio 1.21, 95% CI 1.08, 1.35 $p=0.001$) and obesity (knee: OR = 1.70 95% CI 1.51, 1.91 $p<0.001$), (hip: OR = 1.68 95% CI 1.47, 1.92 $p<0.001$). After adjustment for obesity, components of the metabolic syndrome associated with pain included waist circumference (knee: OR = 1.17 95% CI 1.03, 1.33 $p=0.019$), (hip: OR = 1.37 95% CI 1.17, 1.59 $p<0.001$) and for knee pain, low HDL (OR = 1.15 95% CI 1.05, 1.27 $p=0.003$) and high triglycerides (OR = 1.10 95% CI 1.00, 1.21 $p=0.043$). These association were not modified by dietary patterns nor changes in weight over the follow-up interval.

Conclusion: This longitudinal analysis shows that metabolic syndrome is a predictor for the future onset of hip and knee pain over an interval of 10 years and the risk is not modified by diet or subsequent weight change. These data suggest that preventative strategies need to be targeted early in the disease course, and should include a range of measures including smoking cessation and those that prevent the onset of metabolic syndrome.

Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2019-eular.7363

FRI0658

INCIDENCE AND PREVALENCE OF VACCINE PREVENTABLE INFECTIONS IN ADULT PATIENTS WITH AUTOIMMUNE INFLAMMATORY RHEUMATIC DISEASES (AIIRD): A SYSTEMIC LITERATURE REVIEW INFORMING THE 2019 UPDATE OF THE EULAR RECOMMENDATIONS FOR VACCINATION IN ADULT PATIENTS WITH AIIRD

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Background: Despite the well-established fact of a high burden of infections among patients with autoimmune inflammatory rheumatic diseases (AIIRD)¹, little evidence is available regarding the real incidence and prevalence of vaccine preventable infections (VPI) in this population.

Objectives: To update the evidence on the incidence and prevalence rates of VPI in patients with AIIRD and compare the data to the general population when available.

Methods: A systematic literature review was performed using Medline, Embase, and Cochrane library, from October 2009 to August 2018. Search terms were defined for AIIRD and VPI. Observational studies including cohort studies for incidence rates and cross-sectional studies for prevalence rates were included, as well as systematic reviews of cohort studies and meta-analyses. The primary outcome was the incidence or prevalence of VPI in the adult AIIRD population. Meta-analysis was performed when appropriate.

Results: The search identified 3876 records, out of which 63 met the inclusion criteria. Data on the following VPI rates was retrieved and analyzed: influenza (incidence; $n=4$), pneumococcal disease (incidence; $n=7$), hepatitis B virus (HBV) (incidence and prevalence; $n=10$), herpes zoster (HZ) (incidence; $n=29$), human papilloma virus (HPV) (incidence and prevalence; $n=13$). For influenza, limited data pointed to an increased incidence (409.33 vs 306.12 cases per 100,000 patient-years in patients with rheumatoid arthritis (RA) vs controls, respectively) and influenza-related complications in patients with AIIRD. Data on pneumococcal disease, available mainly for patients with systemic lupus erythematosus (SLE), showed a substantially increased risk in all age groups compared to controls (incidence rate ratio (IRR) 4.7, 95% confidence interval (CI) 3.7-6.0). For HZ, an increased risk was observed across all patients with AIIRD in comparison to the general population: pooled incidence rate ratio 2.4, 95% CI 2.05-2.76, with the highest incidence rate (IR) observed in inflammatory myositis (pooled IR 35.98, 95% CI 32.33-39.64), followed by SLE (pooled IR 18.87, 95% CI 8.7-29.64), and RA (pooled IR 11.64, 95% CI 9.37-13.91). Studies on HPV mainly investigated the SLE population in the Latin America and Asia: HPV pooled prevalence 26%, 95% CI 17%-36% and pooled prevalence ratio 1.58, 95% CI 0.74-3.36 in comparison with the general population. In RA, limited data showed a similar prevalence of HPV in patients and controls: pooled prevalence ratio 0.72, 95% CI 0.46-1.12. For hepatitis B virus, pooled prevalence of hepatitis B surface antigen in patients with AIIRD was similar to the general population, 3%, 95% CI 1%-5%.

Conclusion: Current evidence shows an increased risk of vaccine-preventable infections in patients with AIIRD, emphasizing that prevention of infections is essential in these patients.

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Disclosure of Interests: Victoria Furer: None declared, Christien Rondaan: None declared, Marloes W. Heijstek: None declared, Ulf Müller-Ladner Grant/research support from: Projekt supported by an unrestricted educational grant from Celgene GmbH., Sander van Assen: None declared, Jacob M. van Laar Grant/research support from: Genentech, Consultant for: F. Hoffmann-La Roche, Marc Bijl: None declared, Ori Elkayam: None declared

DOI: 10.1136/annrheumdis-2019-eular.7706

FRI0659

REMISSION PERSISTENCE IN RHEUMATOID ARTHRITIS, PSORIATIC ARTHRITIS AND AXIAL SPONDYLOARTHRITIS UNDER BIOLOGIC TREATMENT

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Background: Patients with rheumatoid arthritis (RA), psoriatic arthritis (PsA) and axial spondyloarthritis (axSpA) under biologic treatment are increasingly achieving prolonged remission and tapering treatment is becoming standard practice. However, the optimal timing to start tapering remains unclear and predictors of loss of remission (LOR) are missing. Guidelines disagree on whether to wait for 6 or 12 months of sustained remission before tapering.

Objectives: To determine whether longer sustained remission (6 versus 12 months) influences subsequent LOR rates and to identify predictors of LOR.

Methods: We used the Rheumatic Diseases Portuguese Register (Reuma.pt), to identify RA, PsA and axSpA patients on stable biologic treatment in a single center and retrospectively analyze those who achieved sustained remission for at least 6 and 12 months. Survival analysis was used to characterize stability of remission and identify predictors of LOR. The Cox proportional hazards regression was stratified by diagnosis and adjusted for age, gender, smoking, baseline disease activity, type of biologic, previous switches and starting year of biologic treatment.

Results: 195 patients (100 RA, 51 PsA and 44 AxSpA) of 1078 patients (785 RA, 116 PsA, 177 axSpA) registered in Reuma.pt at a single center and treated with biologics between 1999 and 2018, had at least one remission period with a minimal duration of 6 months. This corresponded to 310 individual remission periods longer than 6 months, 232 of which (74.8%) were longer than 12 months. Median remission time (since the start of remission period) was 78.6 weeks overall vs. 99.0 weeks for patients with a minimum 12 months remission (difference in median survival: 20.4 weeks). PsA patients showed significantly longer remission periods ($p<0.0001$), followed by axSpA and RA. We identified active smoking (HR 1.96, $p=0.008$ for the total population; HR 1.53, $p=0.20$; HR 7.42, $p=0.01$, HR 0.74, $p=0.79$ for RA, PsA and axSpA, respectively), and infliximab use (HR 2.23, $p=0.005$ for the total population; HR 4.07, $p<0.001$, HR 3.20, $p=0.36$, HR 0.62, $p=0.62$ for RA, PsA and axSpA, respectively; subcutaneous TNF inhibitors (TNFi) used as index category) to be significantly associated with LOR. A sensitivity analysis excluding infliximab patients further suggested female gender (HR 3.21, $p=0.005$) and duration of disease until first biologic (HR 1.05, $p=0.031$) as important co-variables.

a)

b)

Figure 1. – time to loss of remission considering a single flare (a) vs. persistent flare (b), all patients (minimum 150 days in remission). Number of failure events indicated in parenthesis

a)

b)

Figure 2. – time to loss of remission considering a single flare (a) vs. persistent flare (b), only patients with minimum 320 days in remission. Number of failure events indicated in parenthesis.