Cigarette smoking is strongly associated with bacterial vaginosis (BV) and a low-Lactobacillus vaginal community state type (CST). Metabolite profiles have previously been shown to delineate BV and non-BV women and appear to be influenced by microbial composition. Therefore, we sought to determine if vaginal metabolites varied between smokers and non-smokers within each stratum of CST.

Methods Forty reproductive-aged women (20 smokers/20 non-smokers) were recruited. Vaginal bacterial composition was characterised by 16S rRNA gene analysis. Metabolic profiles were determined by GC/MS and LC/MS and compared to libraries of known metabolites. Data were analysed with Random Forests, a method that uses decision trees to rank metabolite importance.

Results We identified 619 metabolites from mid-vaginal swab eluates – three-fold more than previously described in the vagina. Women were categorised into CST-I (L. crispatus-dominated), CST-III (L. iners-dominated) and CST-IV (low-Lactobacillus/high anaerobes). Metabolites were strongly separated by CST ($P_{FDR} = 0.0001$). Within each CST, significant differences in metabolic profiles of smokers and non-smokers were evident. Nicotine and the breakdown metabolite cotinine was higher in smokers versus non-smokers from all CSTs. Smokers in CST-I had higher concentrations of xanthosine and paraxanthine. Smokers in CST-III were reduced in their relative concentrations of N-stearoyltaurine and 4-methylcatechol sulfate. Biogenic amines agmatine, cadaverine and spermidine and paraxanthine. Smokers in CST-III were reduced in their relative concentrations of N-stearoyltaurine and 4-methylcatechol sulfate. Biogenic amines agmatine, cadaverine and spermidine and paraxanthine. Smokers in CST-III were reduced in their relative concentrations of N-stearoyltaurine and 4-methylcatechol sulfate. Biogenic amines agmatine, cadaverine and spermidine.

Conclusion The metabolite profile of the vaginal tract is strongly influenced by the vaginal microbiota. Detection of nicotine and breakdown products in the vagina may serve as molecular biomarkers of smoking. Kynurenate and biogenic amines have known roles in lymphocyte proliferation and inflammation and may indicate bacterial immune- and stress-resistance. Our results suggest that smoking affects several important metabolites present in the vagina that may have implications for women’s health.

Disclosure of interest statement We declare no conflict of interest.