Introduction:
A specific metabolite of mitochondria – itaconic acid is formed upon pro-inflammatory activation. The attempts of various researches to find the itaconic acid in peripheral blood of patients with sepsis were unsuccessful [1]. Some phenylcarboxylic acids (PhCAs) are known to be microbial metabolites and sepsis biomarkers; they also affect the mitochondrial functions [2].

Methods:
Concentrations of PhCAs (phenyllactic, p-hydroxyphenylacetic, p-hydroxyphenyllactic acids) and mitochondrial metabolites (succinic, itaconic acids) in 48 serum samples from 8 patients on the 1st day of diagnosis of sepsis and 35 serum samples from 22 patients with late stages of sepsis (SEPSIS-3) were measured by gas chromatography–mass spectrometry; control group – 20 donors.

Results:
Itaconic acid was found in low concentrations (0.5–2.3 µM) only at early stage of sepsis. The multiple increase in levels of PhCAs and mitochondrial metabolites were detected in patients with late stage of sepsis in comparison with early stage and donors, p<0.001. Increased succinic acid (up to 100–1000 µM) concentration is the result of succinate dehydrogenase inhibition by microbial metabolism intermediates (PhCAs), which was confirmed by in vitro experiments in isolated mitochondria (Fig.1).

Conclusion:
Itaconic acid may be a promising marker in early stage of sepsis, which needs to be proved.

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References:
1. Meiser J. Oncotarget 9:32098–32107, 2018