2. SUMMARY

Background
Microdialysis has been used to measure blood perfusion in almost all tissues but data from rat gut submucosa are missing. Lithium, previously suggested as a suitable flow marker has not been validated yet. Coffee impairs gastric mucosal barrier, but the effect of caffeine on gastric blood flow requires elucidation. All established *in vivo* methods of mucosal permeability assessment necessitate the functional involvement of bloodstream – the application of microdialysis as an alternative has not yet been tested.

Aims
The aims were: firstly, to investigate the applicability of lithium microdialysis for monitoring blood flow changes due to ischemia/reperfusion in rat stomach and colon submucosa and to assess the systemic effects on selected enzymes and nitric oxide; secondly, to evaluate local impact of caffeine on gastric submucosal microcirculation, nitric oxide release and its systemic effect on oxidative stress-related marker malondialdehyde; and finally, to develop a microdialysis method of continuous mucosal permeability measurement in rat descending colon.

Materials and methods
Gastric and colon submucosal microdialysis technique plus colon single-pass luminal perfusion were used in pentobarbital-anaesthetized rats. As microdialysis perfusate, lithium, ethanol, Ringer or saline solution-containg media were applied. Luminal perfusate contained ^{51}Cr-EDTA-enriched Ringer solution with/out ethanol. Caffeine was applied i.p. in doses 1, 10 and 50 mg kg^{-1} b. wt. Ischemia and reperfusion were accomplished by temporary celiac artery occlusion.

Results
Lithium microdialysis indicated a decrease in blood perfusion during celiac artery occlusion in stomach. During reperfusion, the ischemic stomachs showed a restoration of blood perfusion in contrast to the preconditioned ones. Colon microcirculation remained unaltered as did studied serum analytes (study I). Caffeine administration did not affect gastric submucosal microcirculation, nitric oxide production or serum malondialdehyde (study II). Colon mucosa exposed to ethanol presented with profound macro- and microscopical changes associated with increased tracer permeability (study III).

Conclusions
The aforementioned microdialysis and mucosal permeability techniques were successfully tested and found applicable in given experimental settings. Caffeine was found not to interfere with submucosal blood perfusion, malondialdehyde and Ca^{2+}-independent nitric oxide synthesis. Further studies are needed to account for the lack of gastric protective blood flow enhancement due to ischemic preconditioning and to explore possible mechanisms behind the effects of caffeine on gastric physiology in relation to irritant effects of coffee.

Key words
Microdialysis • Blood Perfusion • Lithium • Gut • Nitric Oxide • Ischemic Preconditioning • Caffeine • Barrier • Permeability