Measurement of regional organ blood flow by means of fluorescent microspheres (FM) is an accepted method. However, determination of regional portal blood flow (RPBF) cannot be performed by microspheres owing to the entrapment of the spheres in the upstream capillary bed of the splanchnic organs. We hypothesized that an adequate experimental setting would enable us to measure RPBF by means of FM and to analyze its distribution within the pig liver. A mixing chamber for the injection of FM was developed, and its capability to distribute FM homogeneously in the blood was evaluated in vitro. The chamber was implanted into the portal vein of six anesthetized pigs (23.5 +/- 2.9 kg body wt). Three consecutive, simultaneous injections of FM of two different colors into the chamber were performed. Reference portal blood samples were collected by means of a Harvard pump. At the end of the experiment, the liver was explanted and fixed in formalin before dissection. FM were isolated from the tissue samples by an automated process, and fluorescence intensity was determined. Comparison of 5,458 single RPBF values, determined by simultaneously injected FM, revealed good agreement (bias 2.5%, precision 12.7%) and high correlation (r = 0.97, r² = 0.95, slope = 1.04, intercept = 0.05). Median RPBF was 1.07 +/- 0.78 ml x min(-1) x g(-1). Allocation of the blood flow values to the anatomic regions of the liver revealed a
significantly higher RPBF ($P = 0.01$) in the liver tissue located close to the diaphragm compared with the rest of the organ and a significantly lower RPBF ($P = 0.01$) in the left liver lobe compared with the median and right lobes. The results show that the model presented makes it possible to measure RPBF by means of FM reliably and that RPBF is distributed heterogeneously in the porcine liver.