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Background/goal/objective of the study
Many radiolabeled PET tracers, which can specifically bind to 5HT1A receptors, have been developed for in vivo imaging of 5HT1A receptors in living brain with positron emission tomography[1, 2, 3]. However, due to the high cost of cyclotron-produced radionuclides such as 18F, 11C and lack of availability in most nuclear medicine departments (very short half-life), these tracers have limited use in clinical practice. Up to the present technetium-99m is still the most widely used radionuclide in diagnostic nuclear medicine by virtue of its ready availability, low cost and optimal radiation properties (t 1/2= 6 h, 89% photon yield of 140 keV).
The development of 99mTc cyclopentadienyltricarbonylpiperidine derivatives, in which Tc+1
is coordinated to cyclopentadienide (C5H5-) and three carbonyl groups, has been reported [4].
These complexes have shown high uptake in the brain of rats and rabbits [5, 6] as well as high affinity to the 5HT1A receptors in rats 20 min after i.v. administration [6].
In order to better understand the structure / biodistribution relationship of piperidine derivatives and to improve brain retention, two new substituted piperidine derivatives were synthesized, radiolabeled and evaluated by biodistribution studies in the rat brain. As Ref. we used a previously published complex [6].This complex has showed a high affinity to the hippocampus rich in 5HT1A receptors but a rapid wash out from the brain.

Methodology
Three piperidylferrocencarboxylats were synthesized by reaction of the piperidine alcohol with ferrocenecarbonyl chloride to give the corresponding esters (1, 2 and 3.)
Radiochemical synthesis is carried out in a microwave according to the following scheme:

Results and discussion

We replaced the Wenzel method which suffers from inadequate conditions (high temperature and long reaction time) by a microwave method. This new method allowed us to achieve a higher yield (90%) for a very short time of 2 min and allowed us to avoid heating at 150 ° C.
Biodistribution studies
In order to increase the brain uptake of tricarbonyl complexes, substituted piperidinol were used for the synthesis of complex 2a and 3a. Both substituted cyclopentadienyl
Piperidine can cross easily the blood brain barrier. However, the in vivo studies in rat showed a lower uptake of complex 3a carrying a butyl group in position 4 as compared to previously published data for the reference compound (complex 4a) [6]. On the other hand, the complex 2a carrying a methyl group in position 4 has shown the highest brain uptake (Fig. 3).
With the increase of the carbon chain in position 4 a camouflage of the functional group that interacts with the receptors could explain the decrease of the retention
Conclusion.
Llabeled complexes in the presence of a sterically hindered ester do not affect
the time of brain retention.

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