Functional mapping of serotonin transporters by PET in conscious common marmosets

We have now established an animal PET imaging method for the conscious common marmoset, which is a small primate used as a biomedical animal model, and have generated a functional map of brain serotonin transporters in the brain.

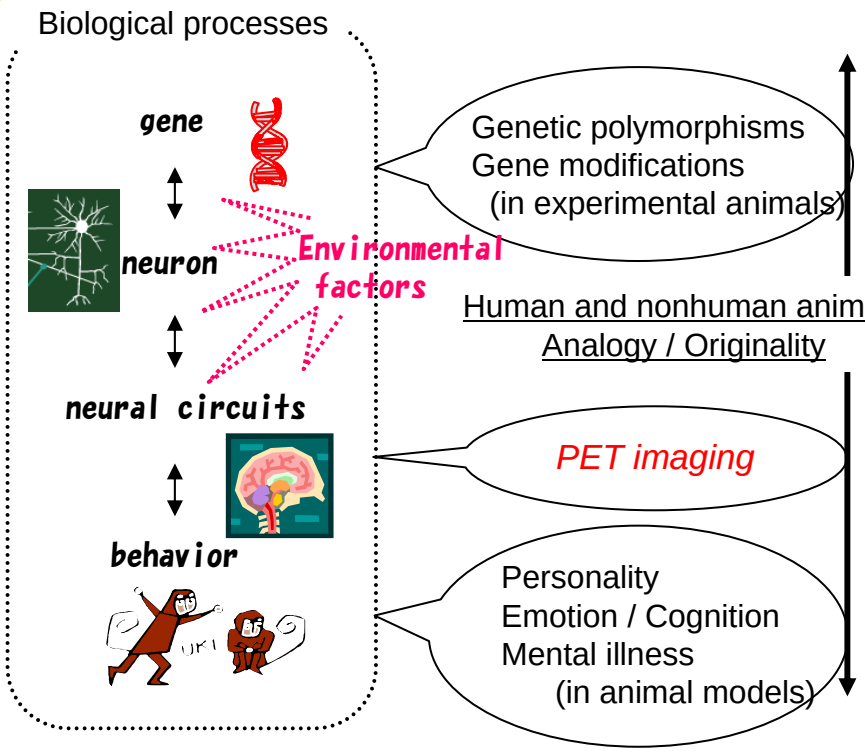


Fig 1. PET: an in vivo measurement of brain function in both human and animals

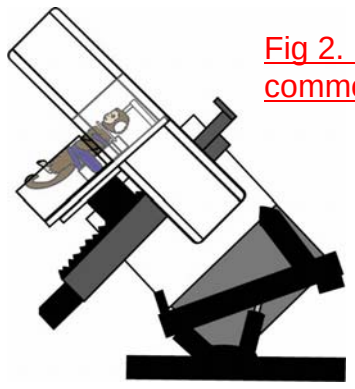
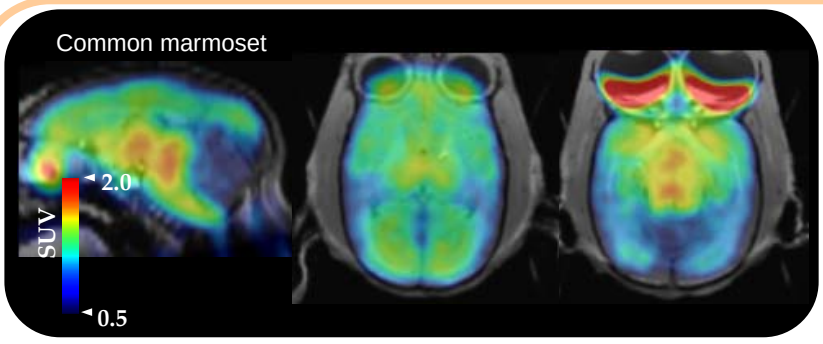
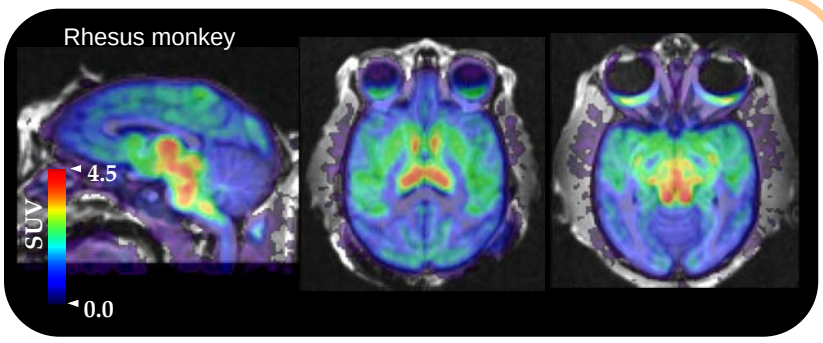


Fig 2. PET system for common marmosets

A conscious marmoset is placed in the PET system using a painless fixation method to prevent movement.

PET is useful for investigating in vivo brain function, allowing us to visualize neuronal events associated with the regulatory processes between the genetic and behavioral level (Fig. 1). We used the common marmoset for this PET study as they have been shown to be useful for studying the development of social behavior and display human-like social behavior, such as cooperative sociality (Fig. 2). [^{11}C]DASB, a specific radiotracer for serotonin transporters, was used with PET to generate a functional map of the serotonin receptors in the brain of common marmosets and this was compared to that of the rhesus monkey. This is the first PET imaging showing the functional activity and distribution of brain serotonin transporters in conscious common marmosets (*Synapse*, in press).





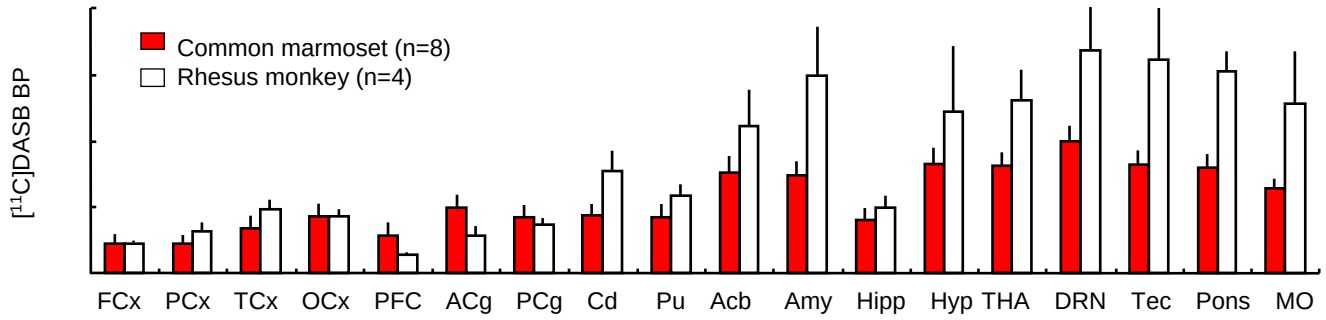


Fig 3. Serotonin transporter binding using a specific PET tracer [^{11}C]DASB: common marmoset vs. rhesus monkey

PET binding potential (BP) images of [^{11}C]DASB were overlaid on the MRI of the common marmoset (upper left) or the rhesus monkey (upper right). Both species shows similar distribution patterns of [^{11}C]DASB binding, although the common marmoset brain showed relatively the same or much higher BP in cortical and hippocampus regions, and lower BP in some subcortical regions than compared to the rhesus monkey brain (bottom).

Future directions

The present results indicate that PET imaging with [^{11}C]DASB under a conscious state is a valuable tool for investigating the physiological serotonergic functions in common marmosets. When combined with behavior analysis, PET studies with common marmosets may provide neurobiological and neurochemical bases for brain function in this species, becoming a valuable model for humans.