

Image of the Month

## Preclinical [<sup>18</sup>F]tetrafluoroborate-PET/CT imaging of pituitary gland hyperplasia

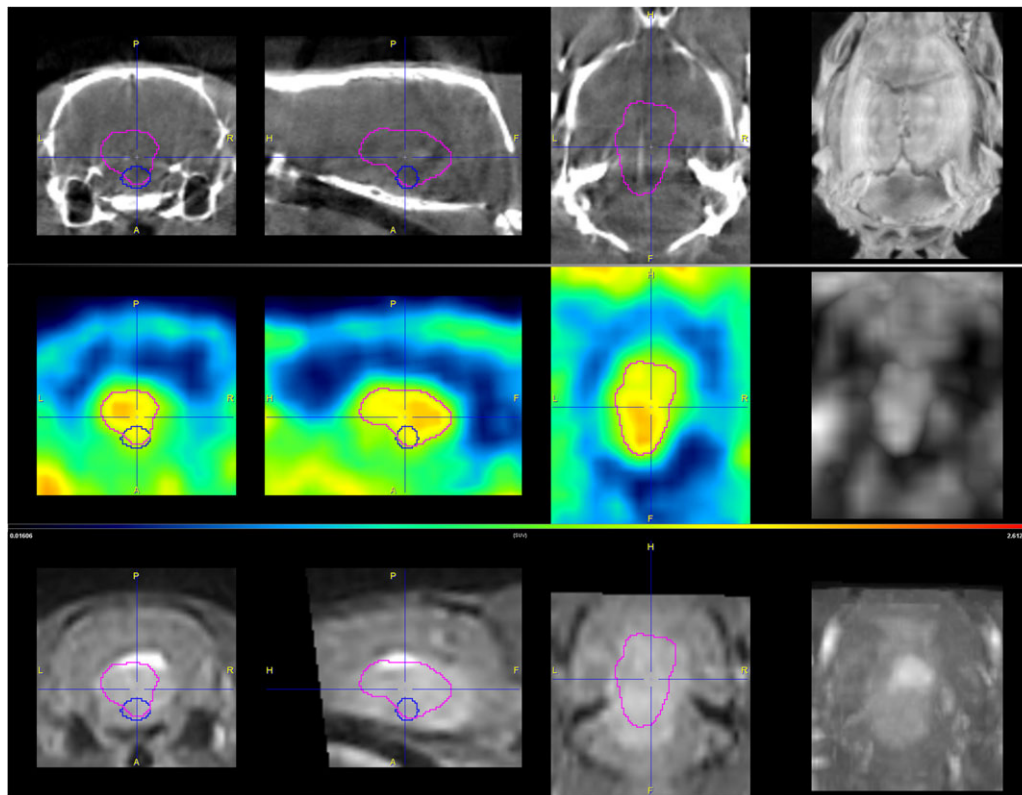
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By blocking of sodium–iodide symporter (NIS) in thyroid gland with potassium perchlorate administered in drinking water to rats for 18 months, we provoke hyperplasia of thyroid which led to thyroid cancer, but also of hyperplasia (benign tumour) of pituitary

gland since the lack of thyroid hormones, as a consequence of NIS blockage, hyper-stimulates pituitary in order to produce more thyrotropin stimulating hormone (TSH), the hormone that stimulates thyroid for hormone secretion. There is evidence that hyperplasia of



**Figure 1.** [<sup>18</sup>F]TFB CT (top), PET (middle) and gadoteric acid MRI (bottom row, done 9 days after PET/CT) images of rat's head with pituitary hyperplasia. Magenta outlines the tumour on PET, blue—the normal pituitary gland.

pituitary is provoked by perchlorate or estradiol benzoate in animal models. NIS is expressed in pituitary at the level of about one-tenth of that in thyroid. [ $^{18}\text{F}$ ]tetrafluoroborate ([ $^{18}\text{F}$ ]TFB), which mimics iodine, is a large mononegative anion that binds specifically to NIS. TFB-SUVmax (maximum Standard Uptake Value in the volume of interest, g/mL) in PET is correlated with NIS expression in thyroid.

The view of [ $^{18}\text{F}$ ]TFB CT/PET/MRI study of pituitary gland in a rat is shown in Fig. 1. Maximum SUV is 2.17 on cold colour scale and magenta is a tumour zone. MRI was done nine days after PET/CT. The enlarged pituitary gland (magenta) compared with the outline of a pituitary gland of a control animal (blue) can be seen. The imaging was later confirmed by a necropsy with pituitary tumour. The finding was repeated in five other rats treated in the same way.

MRI imaging features were hyperintense with marked enhancement after contrast administration (Gadoteric Acid 0.5 mmol/ml, doses 0.2 ml/kg BW) and moderately heterogeneous pattern. CT modality was used solely for anatomical orientation. MRI with

gadolinium contrast is also capable of delineating the tumour, however it lacks specificity of TFB, therefore if MRI with gadolinium contrast is done alone, the tumour may be diagnosed as brain one and not a pituitary.

[ $^{18}\text{F}$ ]TFB is used for thyroid cancer diagnosis in preclinical research, never so far in pituitary hyperplasia or cancer.

### Conflict of interest statement

None declared.

### Ethical statement

Animal studies have been approved by the University of Seville ethics committee.