# 1H Magnetic Resonance Spectroscopy of Human Schizophrenia Brain: A Replication Study

K. Harris[1], A. Gharib[1], P. Bhattacharya[2], A. P. Lin[2], B. D. Ross[1]

[1]MRS Unit, HMRI, Pasadena, California, United States, [2]MRS Unit, Rudi-Schulte Research Institute, Pasadena, California, United States

**Aims:** Clarify conflicting reports of regionally altered NAA/CRE ratios in previous schizophrenia (SZ) studies. Pilot work for a more advanced MRS assay of SZ brain.

**Background:** It is becoming clear that SZ is a metabolic disorder amenable to in-vivo study with MRS. Proton MRS studies in SZ have yielded conflicting results. Significant reductions of NAA in frontal and hippocampal regions, reported by some (1), are refuted by others (2,3). Our previously reported 31P study of SZ found elevation of glycerophosphocholine and differed from others (4) but did not reflect differences in NAA (5). Before proceeding to perform Proton Decoupled 1-13C enriched study of SZ currently under way in this facility, we felt it important to repeat 1H MRS in these and standard regions.

**Methods:** We performed MRI, and1H MRS in a GE LX 1.5T scanner in 22 patients diagnosed according to DSM-IV criteria with clinical interview by two psychiatrists. 1H examination (TE35ms TR1500ms) consisted of a 2x2x2 cm voxel (8cm3) in parietal grey (PCG), parietal white (SWM), frontal grey (ACG) and frontal white matter (FWM). Switching to a long TE 272 and TR 2200 (to match ref 1), we examined a 1x 1x 2.5cm (voxel in the right and left dorsolateral prefrontal cortex (DLPFC) and a 1.5 x 1.5 x 2.5 cm voxel in the right and left Hippocampus (HIPPO). We compared these measures with 22 age matched non-diseased control subjects.

**Results:** Representative 1H MR spectra from 8 brain locations is illustrated in Fig 1. Choline to creatine ratio was significantly elevated in the DLPFC (Fig 1) and parietal grey matter (Table) of SZ when compared to controls. No alterations af NAA or other proton MRS metabolites was noted.

| | Schizophrenics n=22 | | | Controls n=22 | | |
|---|---|---|---|---|---|---|
| | **NAA/CR** | **CHO/CR** | **MI/CR** | **NAA/CR** | **CHO/CR** | **MI/CR** |
| **PCG** | 1.53 ± .07 | **.69 ± .06*** | .72 ± .07 | 1.59 ± .06 | .64 ± .02 | .68 ± .04 |
| **ACG** | 1.51 ± .09 | .87 ± .15 | .71 ± .08 | 1.45 ± .09 | .84 ± .04 | .88 ± .09 |
| **SWM** | 1.72 ± .13 | 1.14 ± .09 | .84 ± .10 | 1.78 ± .09 | 1.14 ± .09 | .68 ± .07 |
| **FWM** | 1.50 ± .14 | 1.15 ± .149 | .80 ± .09 | 1.68 ± .09 | 1.16 ± .08 | .83 ± .13 |
| **DLPFC** | 2.39 ± 0.28 | **1.25±0.22**** | n.a | 2.28 ± 0.30 | 0.99 ± 0.09 | n.a |
| **HIPPO** | 2.16 ± 0.35 | 1.74 ± 0.41 | n.a | 2.04 ± 0.30 | 1.55 ± 0.29 | n.a |

**Conclusion:** Elevated Choline and not reduced NAA is found in a group of treated schizophrenic patients and appears unrelated to echo/relaxation times. Discrepancies with earlier studies cannot be completely resolved without precise adherence to their MRS protocol- 2D CSI multi-slice imaging (1). However, even with that protocol, the power calculation indicates that up to 100 SZ would be necessary to define Δ NAA. Such an effect is unlikely to be of diagnostic significance. We conclude that measure of NAA synthesis rate by 1-$^{13}$C glucose MRS (6) may be valuable in SZ.

* p= <.05 ** p= <.01 (a) no difference L vs R. (b) No difference L vs right

**References:**

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**PATIENTS** **CONTROLS**