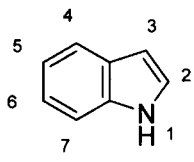
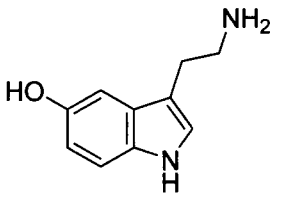
As far as the ^{13}C-NMR spectrum of indole is concerned, the chemical shifts of C_2 and C_3 follow the trend of those in pyrrole. C_2 (124.4 ppm) is much more down field in comparison with that of C_2 (102.5 ppm), again thanks to the inductive effect of the N atom. The two quaternary carbon atoms C_{7a} and C_{3a} show up at 135.8 and 127.9 ppm, respectively. In addition, the heights for these two quaternary carbon atoms are significantly short in comparison with the carbon atoms with a hydrogen atom adjacent to them. The reason is that the two quaternary carbon atoms lack the nuclear Overhauser effect (nOe) that made the carbon peak taller with more protons ($-CH_3 > -CH_2 > -CH > -C$), also known as proton-enhancement.

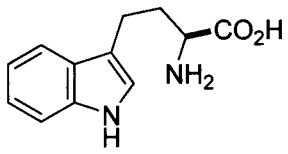
Indole is perhaps the most visible heterocycle in all of chemistry. Since Adolf von Baeyer proposed the structure of indole as a heteroaromatic compound 140 years ago, indole has embodied a myriad of natural products, pharmaceutical agents, and a growing list of polymers. In the human body, serotonin modulates 5-hydroxytryptamine (5-HT), a monoamine neurotransmitter primarily found in the gastrointestinal (GI) tract and central nervous system (CNS), and modulates vasoconstriction and many brain activities. Melatonin regulates circadian rhythms, most noticeably, sleep. Tryptamine is closely related to melatonin and the amino acid tryptophan.



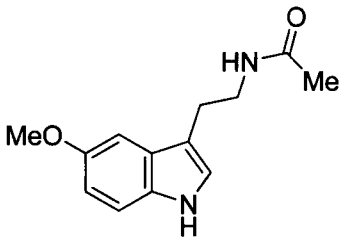
indole



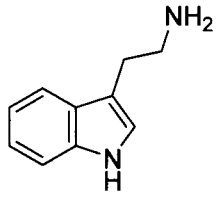
5-hydroxyindole (serotonin)



tryptophan



melatonin



tryptamine

In addition to the hundreds of well-known indole plant alkaloids (*e.g.*, yohimbine, reserpine, strychnine, ellipticine, lysergic acid, and physostigmine), the indole ring is present in an array of other organisms. The indigo analogue Tyrian purple is the ancient Egyptian dye produced by Mediterranean mollusks. It was so precious that it was only used to dye the robes of Roman zemperors. Indigo, the dye used to dye jeans, was initially