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In vivo and *in vitro* analysis of cancer by Raman-IR-SNOM-AFM imaging and femtosecond spectroscopy – From single cells to humans

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This contribution will explore cutting edge molecular (Raman, IR, fluorescence, SNOM, AFM, TERS, femtosecond spectroscopy) mapping and time resolved dynamics of cellular structures of cancers, localization of drugs and nanoparticles in cells and tissues. The multidisciplinary nature of the studies span the a diverse range of biological, chemical, and physical sciences related to cancer biology. This contribution will provide insight regarding the new molecular mapping and their ability to monitor biochemistry of biomolecules in the cells and tissues, distribution of drugs, and nanomaterials as they interact with cells and tissues. The main focus will be on the presentation of integrated picture of cancer by near field microscopy SNOM, AFM and hyperspectral Raman imaging to look inside human breast ducts. We will demonstrate how this approach gives important answer about location and distribution of biochemical components in human cells and tissue during cancer development. The lecture shows new look inside human breast duct using Raman imaging, an emerging technology of molecular imaging, that may bring revolution in understanding of cancer biology. Our contribution is a first report in the literature demonstrating such a detailed analysis of normal and cancerous ducts in human breast tissue. The main advantage of Raman imaging is that it gives spatial information about various chemical constituents in defined cellular organelles in contrast to conventional methods (LC/MS, NMR, HPLC) that rely on bulk or fractionated analyses of extracted components.

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Anticonvulsant activity of newly synthesized benzoylhydrazones with 2*H*-chromene and coumarin moieties in ICR mice

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Several 2H-chromene and coumarin based benzoylhydrazones were synthesized and evaluated for their anticonvulsant activity and neurotoxicity. The structures of the newly synthesized compounds were confirmed by 1H and 13C NMR, FTIR and HRMS (ESI) spectroscopy. The initial anticonvulsant screening was performed using the maximal electroshock induced seizure tests (MES) and the subcutaneous pentylenetetrazol (scPTZ) test in ICR mice. As phenytoin was used as a standard drug, compounds 3a and 3c exhibited 50% and 100% protection, respectively, against tonic-clonic seizures and tendency to alleviate the mortality in the MES test at the highest dose of 300 mg/kg. Unlike diazepam (2.5 mg/kg), the compounds were unable to exhibit 100% suppression of clonic seizures in the scPTZ test, at the experimental doses. However, 3b demonstrated 50% while 3a - 37% protection against clonic seizures at a dose of 300 mg/kg in the scPTZ test. The mortality was also significantly diminished to 0 % and 13 %, respectively. Motor impairment, evaluated with the rotarod test, was minimal at 300 mg/kg. Taken together, the results suggest that the newly synthesized 2H-chromene- and coumarin based benzoylhydrazones could be efficient as adjuvants against secondarily generalized tonic-clonic seizures and primarily generalized seizures in humans.

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