

**Design, Synthesis, and Biological Evaluation of Piperic
Acid Template Based Naturally Inspired Novel
Multifunctional Molecules for the Treatment of
Alzheimer's Disease**



**Thesis submitted in partial fulfilment for the
Award of Degree**

Doctor of Philosophy

By

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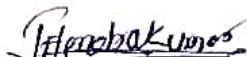
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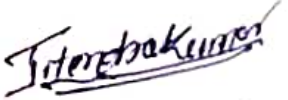

Jitendra Kumar

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List of Abbreviations

| Abbreviations | Full forms |
|-----------------------------|--|
| AD | Alzheimer's disease |
| ACh | Acetylcholine |
| <i>h</i> ACh | Human acetylcholine |
| AChE | Acetylcholinesterase |
| ADME | Absorption, Distribution, Metabolism, and Excretion |
| AFM | Atomic force microscopy |
| ATCI | Acetylthiocholine iodide |
| BTCI | Butyrylthiocholine iodide |
| BChE | Butyrylcholinesterase |
| BBB | Blood-Brain Barrier |
| CAS | Catalytic active site |
| CDCl ₃ | Deuterated chloroform |
| DMSO- <i>d</i> ₆ | Deuterated dimethyl sulfoxide- <i>d</i> ₆ |
| DPZ | Donepezil |
| DTNB | 5,5'-dithiobis-2-nitrobenzoic acid |
| DPPH | 2,2-diphenyl-1-picrylhydrazyl |
| EDCI.HCl | 1-[3-(dimethylamino)-propyl]-3-ethylcarbodiimide hydrochloride |
| PA | Piperic acid |
| FA | Ferulic acid |
| HBA | Hydrogen bond acceptor |

| | |
|------------------|--|
| HBD | Hydrogen bond donor |
| HRMS | High-resolution mass spectrometry |
| HOBt | <i>N</i> -hydroxybenzotriazole |
| IC ₅₀ | Inhibitory concentration is required to kill 50% of the population |
| MW | Molecular weight |
| MTT | 3- (4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium |
| PAS | Peripheral anionic site |
| ROS | Reactive oxygen species |
| TMS | Tetramethylsilane |

List of Symbols

| Symbols | Meaning |
|--------------------|------------------------|
| α | Alpha |
| β | Beta |
| δ | Delta |
| $^{\circ}\text{C}$ | Degree Celsius |
| \AA | Angstrom |
| mg | Milligram |
| μg | Micro gram |
| μM | Micromole |
| mmol | Millimole |
| mL | Milliliter |
| μL | Microliter |
| h | Hour |
| s | Singlet |
| nm | Nanometer |
| μm | Micrometer |
| mm | Millimeter |
| cm | Centimeter |
| ppm | Parts per million |
| rpm | Revolutions per minute |
| Kcal | Kilocalories |

| | |
|------------|-----------------------|
| Hz | Hertz |
| MHz | Megahertz |
| <i>J</i> | Coupling constant |
| d | Doublet |
| t | Triplet |
| m | Multiplet |
| dd | Doublet of doublet |
| <i>m/z</i> | Mass to charge ratio |
| % | Percent |
| pH | Potential of hydrogen |
| ≤ | Less than or equal |
| < | Less than |
| > | More than |
| ± | Plus or minus |