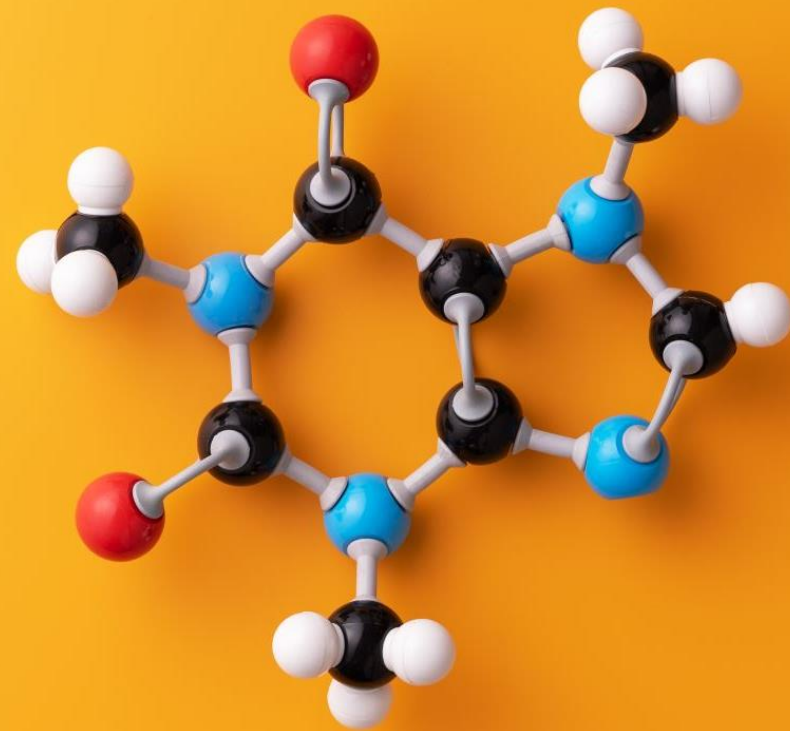


TO STUDY BIOACTIVE SMALL MOLECULE MARKET IN ONCOLOGY AND DIFFERENT AREAS

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INTRODUCTION

- Bioactive small molecules refers to the class of molecules which has low molecular weight and are used for various life science research purposes. They do not have mass more than a one kilodalton.
- There are two types -
 1. Naturally Occurring BSM
 2. Synthetic BSM
- They are used for various research purposes by being used as a chemical probe . These are also used as therapeutic agents , pesticides etc

LITERATURE REVIEW

- **Role of Small Molecule Targeted Compounds in Cancer -**

Small molecules can alter the tumor activity by binding to the target protein. They can be even administered as tablets and in spite of this, they do not alter the activity of genes, hence no altered immune response. Small molecules can even act as enzyme inhibitors as sometimes they inhibit the catalytic activity of enzymes by binding to them. And some small compounds act by binding to the receptor and activate them.

- **A Novel Sulfonyl-Based Small Molecule Exhibiting Anti-cancer Properties**

Phenotypic screening is one of the methods to identify novel bioactive small molecules. Some compounds possess immuno-modulatory properties and sulfonyl containing hit. These compounds induce apoptosis in human cancer cells. These compounds are basically identified by HTS assay.

- **Small Molecules Targeting HATs, HDACs, and BRDs in Cancer Therapy**

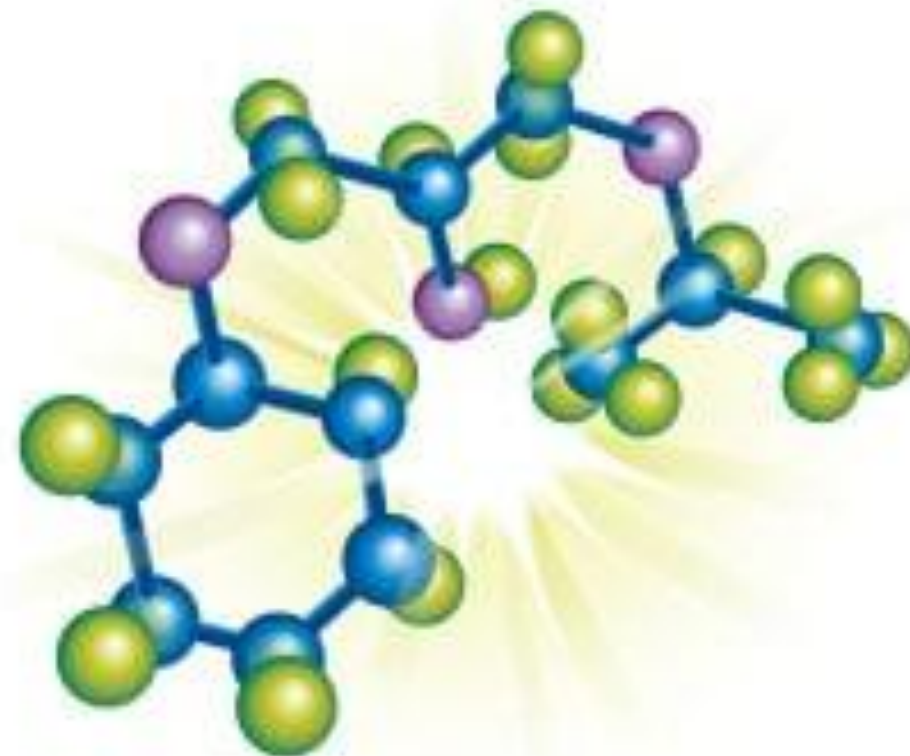
Histone acetylation modification has played the very crucial role in tumorigenesis. Some epigenetic regulation mechanisms have vital involvement in development and prognosis of cancer. So drugs targeting epigenetic regulation are new innovation for cancer treatment. Many active small molecules that target histone acetylation regulatory enzymes or proteins like HATs, HDACs and BRDs, they have restoring protein levels to normal.

- **Identification of Bioactive Small Molecule Inhibitors of Separase**

Aneuploidy is associated with deregulated separase activity which is the major characteristic of mostly human cancer. For identifying the small molecules which are capable of inhibiting Separase, highly sensitive assay is established to quantify separase activity in cells. In vitro assays confirmed that these compounds inhibit separase but do not effect other protein related to separase like caspase & CD-clan protease. When performed compound treatment, HeLa cells with compromised separase activity reflected chromosome segregation defects. So these studies reflect that separase inhibiting compounds serve as lead compounds.

- **Bioactive Natural Small Molecule-Tuned Coassembly of Photosensitive Drugs for Highly Efficient Synergistic and Enhanced Type I Photochemotherapy**

Self assembling Natural small molecules have gathered much attention as they possess anti cancer properties. With green and facile supramolecular strategy, a series of carrier-free terpenoid was developed which aids in enhanced synergistic photodynamic/chemotherapy. These molecules possess favourable therapeutic features possessing synergistic, enhanced and secure combinatorial cancer efficacy along with highly efficient tumor ablation.



- **Simultaneous and controlled release of two different bioactive small molecules from nature inspired single material**

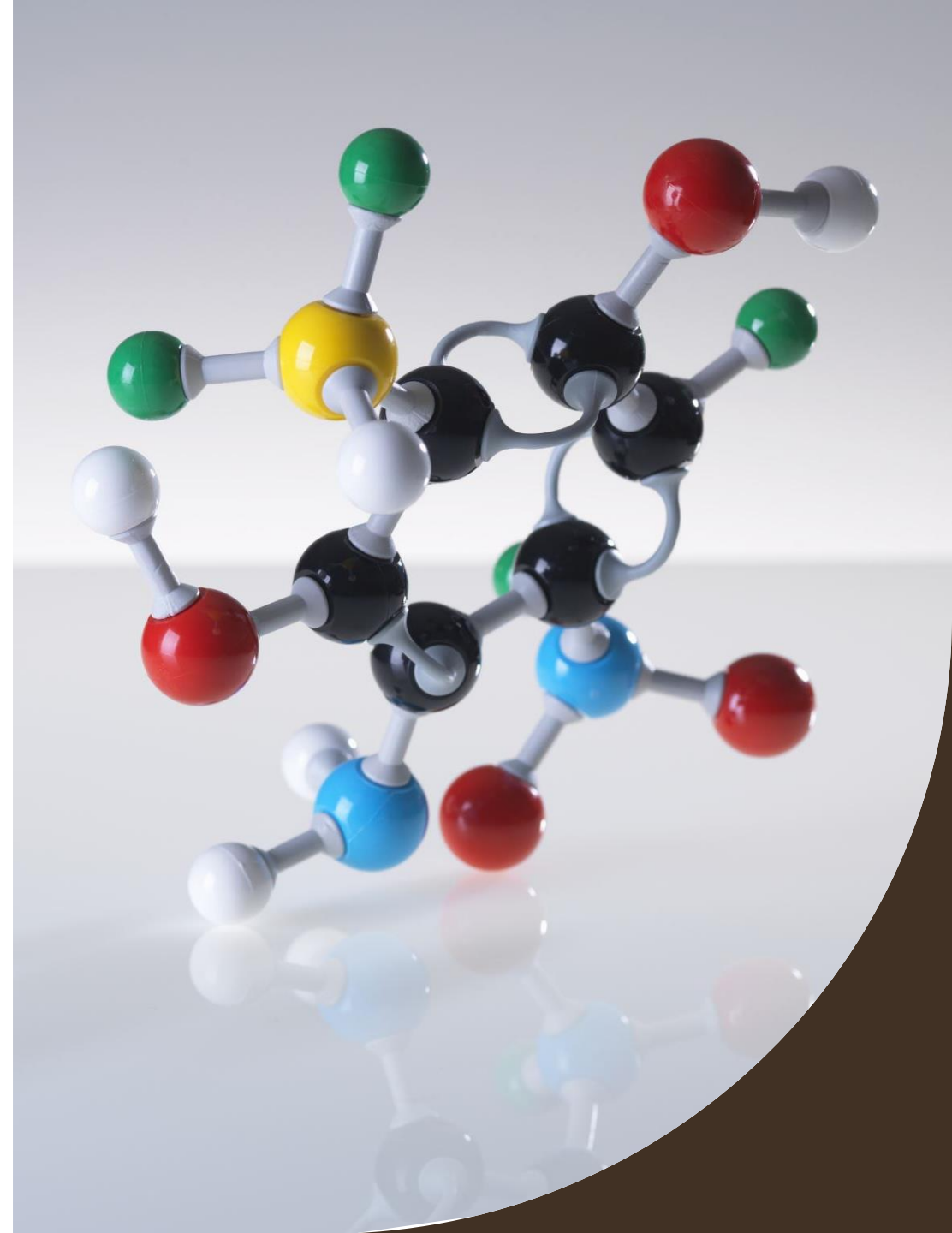
Controlled release of multiple bioactive molecule from same bioactive matrix is challenging . By using one step covalent and gelation of single polymer , biocompatible polymeric material is synthesized . These polymeric loaded small molecules displays bulk wettability properties and are capable of co-release of two different biomolecules . These biomolecules are capable of inhibiting cancer cell proliferation. These molecules in neae future are capable of aiding in more biomedical applications .

- **A small molecule strategy for targeting cancer stem cells in Hypoxic Microenviornments**

Breast cancer comprises of heterogenic subpopulations out of which some cells are problematic . These cells are known as BCSCs and are solely responsible for recurrence . They are more prevalent in oxygen free environment which is majorly responsible for proliferation and stemness of these cells . There are some small molecules which targets these cells by decreasing CSC migration and lowering tumorigenesis.

STUDY OBJECTIVES AND METHODOLOGY

- **Objectives** - The major study objective is to explore the uses of the Bioactive small molecules .
 1. To define and describe the research areas and applications for using bioactive small molecules in Oncology and other areas
 2. To provide detailed information regarding the major factors and technology influencing Bioactive small molecule market
 3. To enlist the drivers , opportunities , restraints and challenges associated with current use as well as future use of bioactive small molecules
 4. To estimate the future growth of the market
- **Research Methodology** - A detailed literature review was conducted , with search technique oriented in a way such that articles published between 2015 to 2022. All the required data was collected from various crucial websites , databases , Journals , publications and papers . 100 research papers were looked for this research , 34 were excluded as they do not have small molecules as their context . 30 papers were excluded as they do not have any relation to small molecules . 29 articles were not full text articles so remaining 7 articles are reviewed which satisfies all the requirements.
- **Research Question** - To study bioactive small molecule market in Oncology and different areas
- **Study type** - Secondary
- **Study Design** - Observational Descriptive study - Secondary

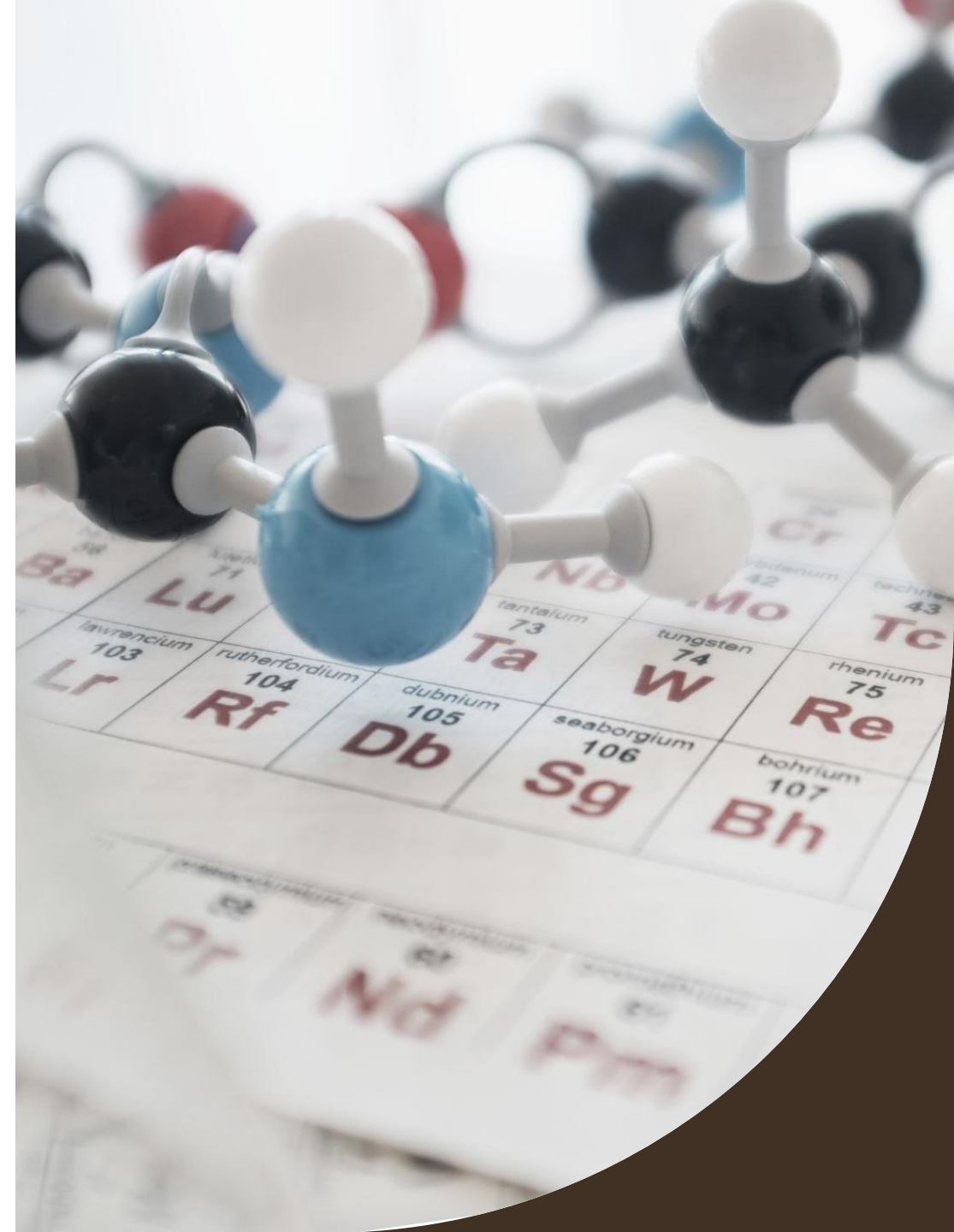


- **Inclusion Criteria -**

- ✓ All relevant articles between 2015 to 2022
- ✓ Articles including oncology and small molecules
- ✓ Articles including qualitative and quantitative information of small molecule market

- ✓ **Exclusion Criteria -**

- ✓ Articles published before 2015
- ✓ Studies not including small molecule



DRIVERS AND OPPORTUNITIES

- **Advancement and rising application of chemical probes**
 - **Rising investment in development and utilization of bioactive small molecules**
 - **Rise in chronic diseases**
 - **Emerging countries pose a hotbed for opportunities**
 - **Growing demand for drug repurposing**
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RESTRAINTS AND CHALLENGES

- **Challenges with natural product based drug discovery**
- **Negative impact of machine bias**
- **Lack of skilled personnel**

FUTURE TRENDS

- **DNA Encoded libraries and fragment based libraries**
- **Increasing applications of CADD**



RESEARCH AREAS AND APPLICATIONS

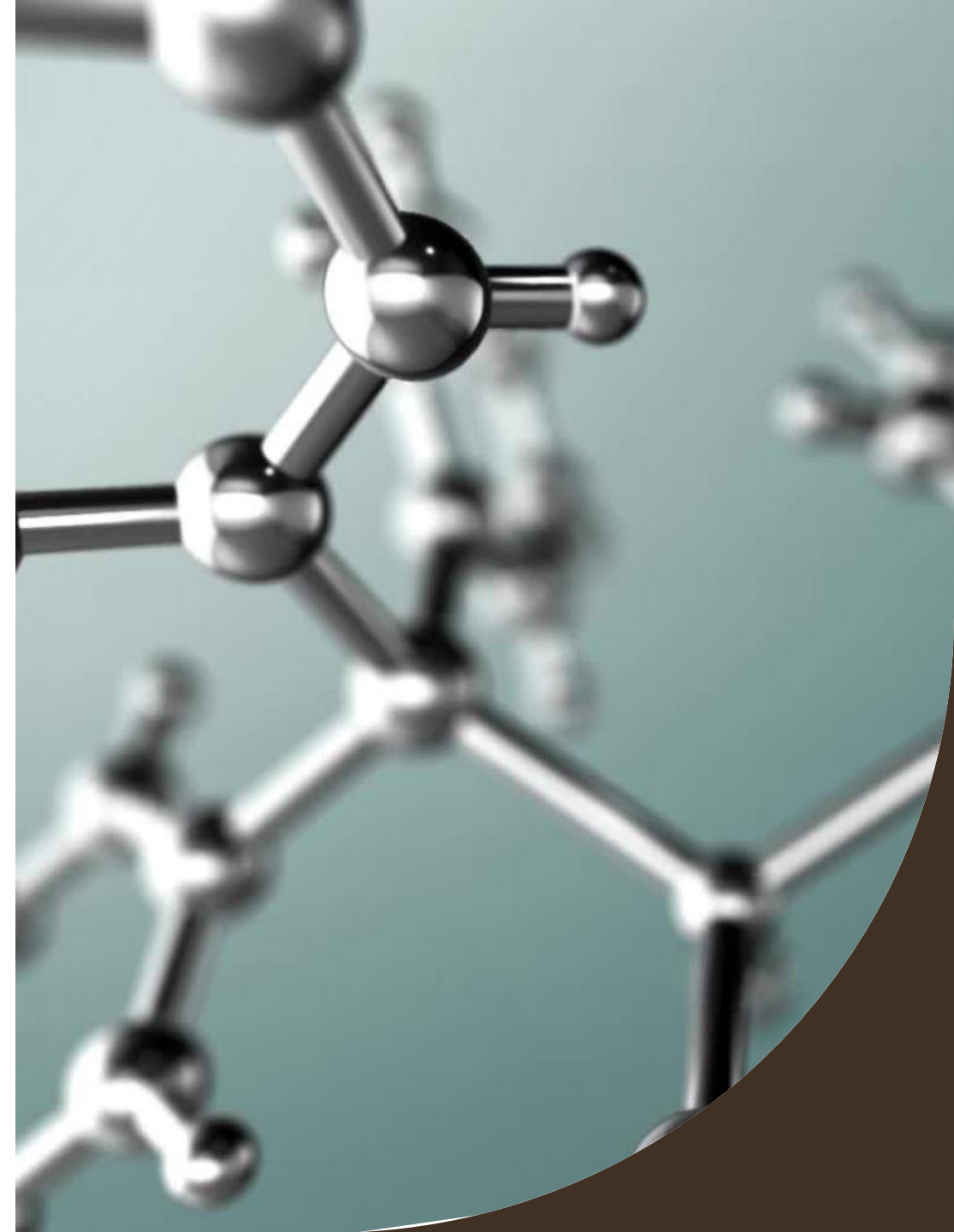
- **ONCOLOGY** - Oncology is one of the most widely used application of bioactive small molecule such as target identification and to study oncology related pathways , identify new drugs , signaling pathways etc
- **NEUROSCIENCES** - Bioactive small molecules are used as reference standard to assess molecular structure or study modifications in iron chelators , dopamine agonists in neurodegenerative diseases
- **GENE REGULATION** - Gene regulation are driven by growth of genomics and targeted medicine. Bioactive molecules are used for Identification and study of master metabolites through screening , that can control cell physiology

MARKET ESTIMATION

- The Global market for Bioactive small molecule market is estimated to be 350 USD Million which is expected to grow and will generate a revenue of around 450 USD Million
- Further , this market will expand into diagnostics , Academia , biotech and pharma and will fulfill different purposes
- Aggressive AI adoption and increasing number of local bioactive molecule suppliers and exploding growth of pharma/biotech companies in the region
- Academic institutions have significant share of research in bioactive small molecules
- Diagnostic is another important sector

KEY TAKE-AWAYS

- Growth rate for this market is about 2.0-3.0%
- Expanding applications of chemical probes and PROTACs/LYTACs etc are some of the key growth contributing factors
- The important reason which restricts research process are limited negative controls
- Oncology remains one of the very important research areas for bioactive small molecules
- They also hold key importance in uses like reference standard and invivo studies



THANK YOU

