Impact of PDB Structures on Anti-Cancer Drug Approvals

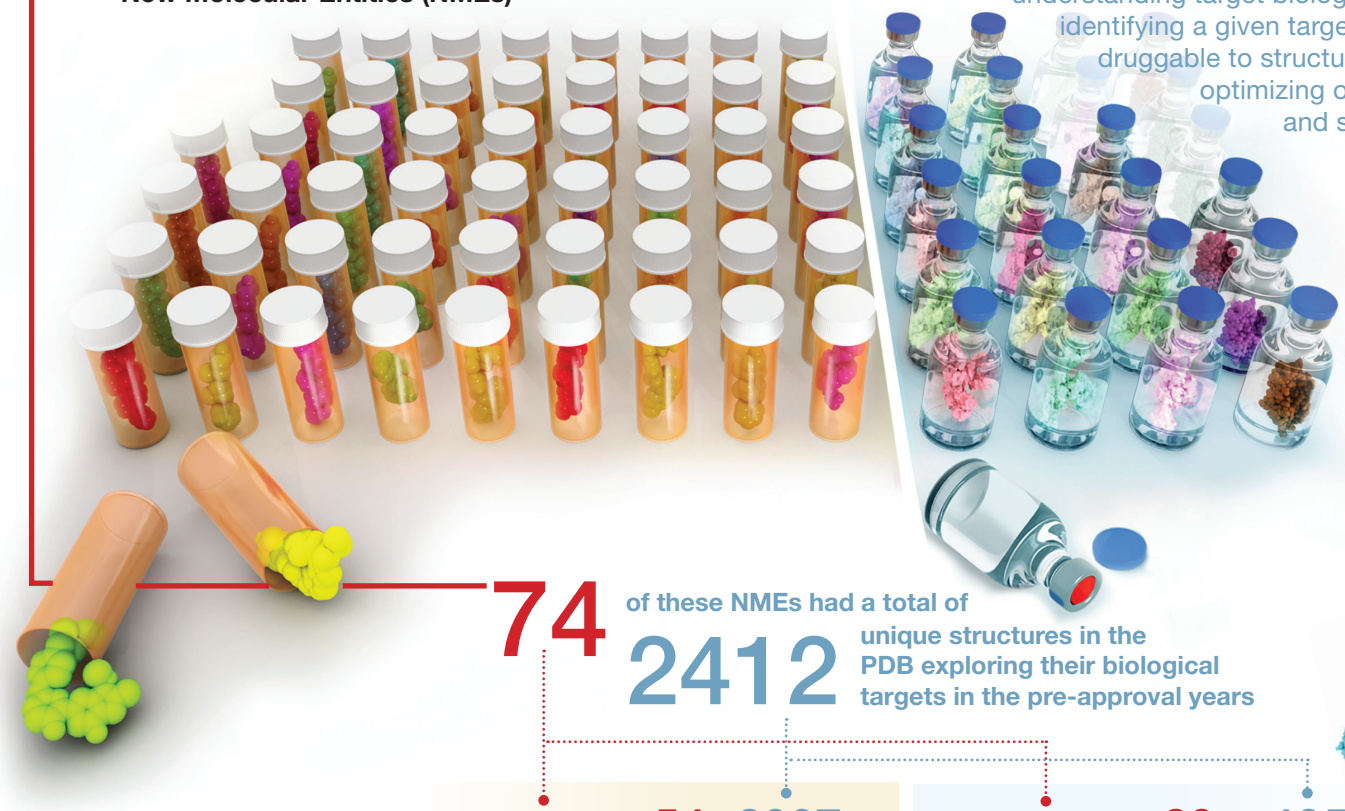
RCSB PDB PROTEIN DATA BANK
rcsb.org

Between 2010-2018, the US FDA approved

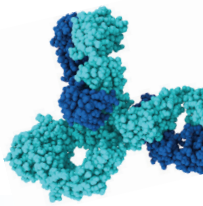
79 NEW ANTI-CANCER DRUGS

New Molecular Entities (NMEs)

Open access to three-dimensional structure information from the Protein Data Bank (PDB) facilitates discovery and development of life saving drugs. The impact ranges from understanding target biology through identifying a given target as likely druggable to structure-guided optimizing of potency and selectivity.



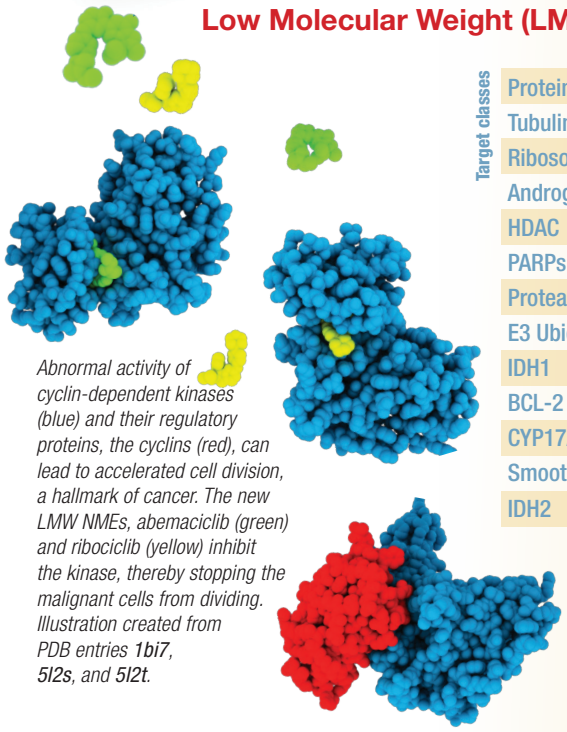
74 of these NMEs had a total of **2412** unique structures in the PDB exploring their biological targets in the pre-approval years



Low Molecular Weight (LMW) NMEs 54 2007

Target classes		Number of unique PDB structures for LMW NME Target
Protein Kinase	33	1,136
Tubulin	2	249
Ribosome A Site	1	134
Androgen Receptor	2	96
HDAC	2	92
PARPs	4	89
Proteasome	2	62
E3 Ubiquitin Ligase	1	50
IDH1	1	40
BCL-2	1	26
CYP17A1	1	13
Smoothened	3	11
IDH2	1	9

41 Number of LMW NME/target complexes in the PDB

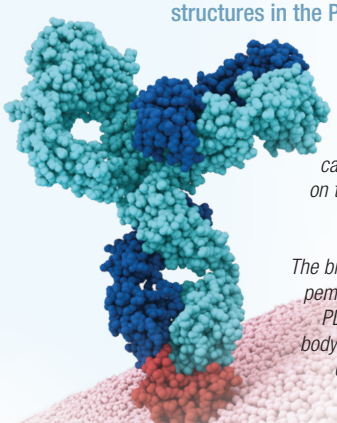


*Abnormal activity of cyclin-dependent kinases (blue) and their regulatory proteins, the cyclins (red), can lead to accelerated cell division, a hallmark of cancer. The new LMW NMEs, abemaciclib (green) and ribociclib (yellow) inhibit the kinase, thereby stopping the malignant cells from dividing. Illustration created from PDB entries **1bi7**, **5l2s**, and **5l2t**.*

Biologic NMEs 20 405

		Number of unique PDB structures for NME Target
Antibody	14	395
Antibody-Drug Complex	4	30
Other	2	48

13 Number of biologic NME structures in the PDB



*The T-cell surface protein PD-1 (dark red) can bind to another protein on the surface of cancer cell suppressing the body's immune response. The biologic NME, the antibody pembrolizumab (blue), blocks PD-1, thereby enabling the body to kill cancer. Illustration created from PDB entries **5ggs** and **5dk3**.*

Reference: Westbrook *et al.* (2020) Impact of Protein Data Bank on Anti-neoplastic Approvals. *Drug Discovery Today* **25**: 837-850 doi: 10.1016/j.drudis.2020.02.002

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