GBM Drug Bank – a new resource for glioblastoma drug discovery and informatics research

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Conflict of Interest

The authors declare no conflicting interests

Authorship

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The availability of open access chemical databases associating compounds with their biological activities impacts fundamentally the early stages of modern drug discovery.[1] The increasing interest in both drug repurposing[2] and drug combination[3] also necessitates the development of databases detailing compounds and mechanisms that have been explored previously.

The peer reviewed literature reports many compounds that are active in glioblastoma (GBM) disease models, as well as compounds which have been trialled in the clinic. However, the wealth of information can easily be overwhelming, and extracting the relevant data from the scientific literature is a major undertaking. Easy access to a combined information resource would greatly benefit the GBM scientific community, both reducing duplication of effort and catalyse translation from preclinical to clinical studies. We have therefore launched the GBM Drug Bank, a freely available virtual resource, detailing compounds that have shown efficacy in a GBM pre-clinical model or trialled in the clinic.

The GBM Drug Bank provides the first disease focused database for GBM drug discovery. Assembling and comparing the landscape of compound activities will facilitate new drug development and guide the selection of effective drug combinations, with the ultimate aim of improving patient outcomes in GBM.

Selection criteria

Reports on compound effects in GBM models as well as associated clinical results were mined from PubMed. Additional clinical data was obtained from ClinicalTrials.gov. Only English language publications were considered.

Briefly, the following steps have to be fulfilled for a compound to be entered in the database:

1. The compound and its effects must be described in a peer reviewed PubMed indexed article or be listed at ClinicalTrials.gov in a trial for glioma or glioblastoma
2. The compound must be entered in PubChem[4]

3. The compound must have an effect in a relevant GBM model or have been evaluated in a clinical setting

In order to limit the inclusion to well described entities, the compound is required to be entered in PubChem for inclusion in the database.

Although information on a compound's molecular mechanism is preferred, it is not essential for inclusion in the database. We have annotated compounds only with a proven mode of action and not speculated on unproven mechanisms. Furthermore, we have elected to include the compounds known mode of action if it is likely to be related to the effect seen in the GBM models.

Furthermore, only compounds showing effects as single agents or in combination with radiation was considered. Thus compounds enhancing effects of other agents without showing an effect on their own are not included in the database.

Database content

The GBM Drug Bank currently contains 500 expertly curated entries with an associated 525 scientific publications and links to 473 clinical trial identifiers (Table 1). Overall, the data spans more than 170 different molecular mechanisms. 141 of the entries have been evaluated *in vivo* and 133 entries are associated with one or more clinical trial record.

In addition, many different preclinical model systems are represented with the most commonly used cell lines being U87, U251, primary human glioma cultures, T98G, and A172.

Although, we believe that the 500 compounds covered in the first version of the database is sufficient to form a useful resource, we are continuously working on assembling additional entries with the aim of making the coverage of the GBM Drug Bank as complete as possible.

The GBM Drug Bank is freely available through the website www.gbmdrugbank.com

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Table 1. The number of entries in the database.

Entry	**Number in the database**
Compounds	500
Preclinical References	443
Clinical References	82
Molecular Mechanisms	170
Trial Identifiers	473