Sample method for basic screening of the *Phytotitre* library

The *Phytotitre* natural product extract library may be used for many *in vitro* research purposes, but the most commonly performed technique is likely to be screening for extracts which demonstrate biological activity against a particular target, receptor or phenotype, using a cell or recombinant protein-based assay in microplate format. The user should consider their requirements carefully before developing the assay, which should be optimised for their own purposes. The following suggestions are offered to aid the development of a simple screening protocol.

Safety precautions:

- DMSO can cause irritation to eyes and skin or by inhalation. Avoid contact with eyes and skin, wear gloves and appropriate laboratory wear.
- This product is for *in vitro* research purposes only, it must not be consumed or allowed to come into contact with foods or drinks.

Prior to screening:

- An assay should be developed in which the activity of the target of interest can be measured using a readout amenable to medium throughput screening (for example, this could be based on a transcriptionally-induced reporter enzyme, biochemical or fluorescence based measurements of enzyme activity, cellular proliferation or viability, ELISA of secreted proteins etc).
- Prepare 10x 96-well microtitre plates containing the cells or reagents required to screen the *Phytotitre* library (a volume of 100 - 200 µl per well is often appropriate).
- Every well in columns 2-11 of these plates should contain cells or reagents suitable for assay, and at least one additional column should be plated to allow for negative (DMSO only) and positive controls appropriate for the assay in question.

Defrosting the library:

- Allow *Phytotitre* plates to defrost and then equillibrate to room temperature before removing sealing cap mats (NB DMSO remains solid below 19^{o}C).
- If possible, centrifuge the library plates gently in pairs at 50 - 200 g for 1 minute, at the lowest setting of acceleration or deceleration. This allows the plate contents to settle (otherwise droplets of extract can remain on cap mats as they are removed and significant volumes of extract can be lost).
- Note which corner of the plate locates the tab pull of the cap mat.
- Carefully remove the silicone cap mats by pulling slowly from one corner, and store in a safe place with the plugs facing upwards for later re-use.

  Tip: if extract materials are observed on the top surface of the plate after this process, wipe the plate surface with absorbent paper to avoid cross-contamination between wells

Challenging the target assay plate:

- If robotic transfer of library extracts onto the target assay plate is preferred, please follow a protocol suitable for your equipment (plates are sequentially numbered from CB01 to CB10 in barcode code 128).
- If manual transfer of library extracts onto the target assay plate is preferred, the following steps may be employed.
- Align the first library plate to be screened next to the first of the plates containing the target assay wells to be used.
- Ensure both plates are in the same orientation (well A1 at top left).
- Using an 8-way multichannel pipette, transfer 1 µl of extract from each well of a single column (8 wells) from the library plate, and expel the aliquots into the wells of the corresponding column on the adjacent assay plate.
  Tip: a common starting point in terms of dilution of extract onto the target assay is 1:100 (achieved by pipetting 1 µl of extract onto 99 µl target), but if too many hits are observed at this dilution, it may be useful to prepare daughter plates at 1:10 or futher dilutions in DMSO for subsequent assays
- Use fresh tips for each column to avoid cross-contamination and back transfer of materials from the assay plate into the library plate.
  Tip: to help keep track of which columns have been pipetted, a sterile plate lid can be used to cover the previously used columns, or alternatively, pipetting past the first stop can introduce a bubble into the target plate which serves as a visible cue as to which wells have been completed.
- Add 1 µl DMSO alone to several wells in columns 1 or 12 of the assay plate to serve as negative controls (vehicle alone).
- Ideally, positive control agents should also be pipetted into other spare wells of the target assay plate, as appropriate for the assay in question.
- After the assay plate has been challenged with 80 extracts and controls, reseal the library plate using the same cap mat in the same orientation. Press firmly several times from the centre outwards to make a good seal.
  Tip: DMSO is highly hygroscopic. To limit the absorption of moisture, which can accelerate degradation of bioactivity of extracts while in storage, ensure the plates are warmed to room temperature before opening, and replace cap mats immediately after aliquoting.
- Continue this process until all 10 library plates have been aliquoted onto target plates.
- Library plates can then be returned to storage at -20^{o}C or -80^{o}C.

Identifiying and taking hits forward:

- After a suitable period of incubation, measure the appropriate readouts for the target assay plate.
- Hits can be defined either on the basis of *a priori* performance goals (e.g. taking forward all those extracts which inhibit receptor activity by 80% or more), or percentage hit rate (e.g. taking forward the 20 extracts which display the highest level of inhibition).
- Remove from the stock library plates a small quantity of the positive extracts and aliquot in a daughter plate of preliminary hits.
- Re-assay the preliminary positive extracts using a counter-screen assay to reveal those extracts with non-specific activity (the counter screen assay could be based, for example, on a related non-targeted receptor with the same target, or the same target with a different readout method).
- Most researchers focus subsequent attention on those extracts which demonstrate high activity in the primary screen and low activity in the counter-screen.
- Proceed to the identification of compounds responsible for biological activity in such extracts (using, for example, activity-guided separation and mass-spectrometry/NMR).

  Tip: Please visit our website for advice on performing activity-guided separation, or contact us if you would like help with this part of the work or with the identification of active compounds in hit extracts.

TECHNICAL HINTS AND LIMITATIONS

- If the primary screen yields too many hits, or background activity is excessive for many of the extracts, consider diluting the library 10x or further in DMSO and re-aliquoting in daughter plates before re-assay.
- Aliquoting the library into daughter plates may also be appropriate if many freeze-thaw cycles are expected.
- If proceding to HPLC of extracts, please bear in mind that many of the products are of borderline solubility at room temperature, so should be filtered carefully before such work is attempted to avoid column blockages.
- Avoid cross-contamination of wells by using tips once only.