

3D Cell Culture Trends 2010



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Executive Summary

- This market report summarizes the results of HTStec's industry-wide global web-based benchmarking survey on three dimensional (3D) cell culture carried out in January 2010.
- The study was initiated by HTStec as part of its ongoing tracking of emerging life science technologies and marketplaces. The main objectives of this study were to comprehensively document current end user experiences, practices and opinions obtained when attempting 3D cell culture in basic research, drug discovery and tissue engineering & clinical research settings, and to understand their future requirements.
- The survey looked at the following aspects of 3D cell culture as practiced to date (2010) and in many cases as predicted/wanted for the future (2013): use of and familiarity with 3D cell culture; main applications for your 3D scaffolds/formats; species of cells used; types of primary cells used; 3D scaffolds/formats investigated and shown greatest promise; most important advantages; main limitations (barriers to wider adoption); where 3D cell cultures are expected to impact the most over the coming years; assay readouts, detection instruments and assay types used; throughput requirements; opinion on 3D culture-related products suppliers; transitioning of cell research from 2D to 3D culture; factor(s) most influencing the future purchasing of 3D cell culture-related products; opinion on the automation of 3D cell culture and tissue fabrication; budget allocated for buying new equipment to enable 3D cell cultures; opinions on ready-made 3D assays and model systems; budget allocated for 3D cell culture-related consumables; and unmet needs in 3D cell culture-related products today.
- The main questionnaire consisted of 24 multi-choice questions and 4 open-ended questions. In addition, there were 5 questions related solely to the administration of survey. The survey collected 142 validated responses.
- Survey responses were geographically split: 41% North America; 37% Europe; 13% Asia (Excluding Japan); 6% Rest of World; and 2% Japan.
- Respondents came from 78 University/Research Institute/Not-for-Profit Facilities; 28 Biotech; 11 Others; 9 Hospitals/Clinics; 7 Pharmaceutical Companies; 4 Government/Military/Defense Facilities; 2 Fee-For-Service Providers/CROs; 1 Biomanufacturing/Bioprocessing Lab; 1 Diagnostics Company; and 1 Agrochemical Company.
- Most survey respondents had a senior job role or position which was in descending order: 37 Research Scientists; 25 Others; 21 Professors/Assistant Professors; 13 Principal Investigators; 12 Post-Docs; 8 Senior Scientists/Researchers; 7 Lab Managers; 7 Department Heads; 5 Vice Presidents; 4 Directors; and 3 Section/Group Leaders.
- Respondents represented: 38 Basic Research – cell biology labs; 26 Tissue/Organ Engineering labs; 26 Basic Research – cell culture methodology labs; 13 Other Non-Clinical Area labs; 8 Clinical Research labs; 7 Drug Discovery – safety assessment/toxicology labs; 7 Basic Research – developmental biology labs; 4 Drug Discovery – primary screening labs; 4 Drug Discovery – target validation labs; 3 Drug Discovery – DMPK labs; 3 Drug Discovery – secondary screening/lead optimisation labs; and 2 Cell Supply & Cryopreservation labs.
- Survey results were expressed as an average of all survey respondents. In addition, where appropriate the data was reanalyzed after sub-division into the following 5 survey groups: 1) Basic Research; 2) Drug Discovery; 3) Tissue Engineering & Clinical Research; 4) Europe; and 5) North America.
- 70% respondents were currently using 3D cell culture.
- The majority of respondents had a high level of familiarity with 3D cell culture.
- The main application for respondents 3D scaffolds/formats were stem and primary cells, most of which were human derived.
- The types of primary cells most used to date for 3D cell culture were fibroblasts and endothelial cells.
- The 3D scaffolds/formats that have been most investigated to date were gel/hydrogel and aggregates/spheroids.
- Better mirrors the environment experienced by normal cells in the body was ranked as the most important advantage of 3D cell culture.
- Uncertainty (i.e. can my assay readouts be done) was ranked as the main limitation (barrier to adoption) of 3D cell culture.
- Tissue/organ engineering was ranked the area where respondents expect 3D cell culture to impact the most over the coming years.

- The assay readouts most used to date for 3D cell culture were fluorescence intensity and brightfield illumination.
- The detection instruments respondents have most successfully used to date with 3D cell cultures were regular and confocal microscopes.
- The assay type's respondents have most successfully demonstrated to date with 3D cell cultures were cell viability and cell proliferation.
- The median throughput achieved to date for 3D cell culture was <5 different assays processed or experiments running per 8h day.
- The majority of respondents indicated that existing 3D formats supported their desired or ideal throughput. Problems some respondents encountered in achieving their desired throughput in 3D formats are documented.
- The companies that immediately come to the mind as the leading suppliers/providers of 3D culture-related products were BD Biosciences and Life Technologies. These were also the 2 companies respondents have done the most 3D related business with to date.
- 64% of respondents plan or are in the process of transitioning work from 2D to 3D cell culture.
- Greater biological relevance was ranked as the most important reason for transitioning from 2D to 3D cell culture.
- Internal data proving value of 3D versus 2D cells was ranked as the factor which would most influence future purchasing on 3D cell culture-related products.
- Most survey respondents do not have an existing 2D automated cell culture/maintenance system, so cannot adapt it to run 3D. Of those respondents with an existing 2D automated cell culture system some have already implemented changes or others are actively looking at or investigating enhancements to enable 3D.
- 43% of respondents indicated that the availability of automated equipment would influence their choice of 3D scaffold/format.
- 32% of respondents indicated that they can use existing equipment to scale up and automate their chosen 3D scaffold/format.
- Feedback on the most important tasks to automate in 3D cell culture and the challenges they pose for automation are documented.
- Awareness of some emerging approaches/platforms for the automation of 3D cell culture and tissue fabrication and respondent interest in investigating/using them in the future was ascertained. These included: 1) Hamilton BioLeviator™ and Global Cell Solutions magnetic microcarrier GEM™ system; 2) The Automation Partnership (TAP) RAFT (Rapid Automated Fabrication of Tissues) technology; and 3) InSphero hanging drop approach for scaffold-free microtissue .
- The median maximum budget respondents would allocate to the purchase of new equipment to enable them to run 3D cell cultures at their chosen throughput, consistency and reproducibility was \$10-\$25K/lab.
- Only 19% of respondents have used ready-made 3D assays to date, although 77% would consider buying ready-made 3D tissue models if relevant assays were available.
- The availability of the right assay as ranked the most important influence in respondent's decision to purchase of ready-made 3D assays.
- Feedback on the particular assays or relevant models systems they would like to see vendors offer as 3D cell cultures or tissues are documented.
- The median annual budget allocated for 3D cell culture-related consumables was \$5K-\$10K/lab.
- A bottom-up model was developed around the respondent's annual budget for 3D cell culture-related consumables to estimate the global market for 3D cell culture-related consumable products which in 2010 is around \$30Million. The full report details the 2013 estimate, % CAGR, and segmentation.
- Feedback on the main unmet needs in 3D cell culture and tissue fabrication was documented.
- The full report provides the data, details of the breakdown of the responses for each question, its segmentation and the estimates for the future (2013). It also highlights some interesting differences between the survey groups, particularly Basic Research versus Drug Discovery or Tissue Engineering & Clinical Research.

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General Information on HTStec and HTStec's Trends Market Reports

- HTStec Limited an independent market research consultancy founded in September 2003 whose focus is on assisting clients delivering novel enabling platform technologies (liquid handling, laboratory automation, detection instrumentation and assay reagent technologies) to drug discovery. Over the past 7 years HTStec has published more than 50 market reports on drug discovery technologies and authored over 30 review articles in Drug Discovery World.
- HTStec's Trends reports owe their origins to the need by developers and vendors of new enabling technologies in drug discovery to get up-to-date relevant market metrics on which to base informed business decisions.
- Typically focused on a specific market niche or segment, in many cases overlooked or frequently misunderstood by broader market studies.
- Investigations are mainly initiated in response to a sponsor's specific requests.
- HTStec's extensive experience of the market, both as a Pharma End-User and working for a major Life Science Tool Provider ensures the industry relevance of the market research collected.
- Based entirely on web-based feedback from potential customers drawn mainly from Pharma and Biotechs, although increasingly University and Research Institute labs are also being researched.
- Produced extremely rapidly and typically published within 3 weeks of starting the collection phase.
- Reports are short, concise and focused on giving readers the basic data, analyzed in several different ways.
- Limited to reporting the main findings alone, without exhaustive discussion on the relevance of the results.
- Market estimates are mainly based on bottom-up calculations and usually avoid attempts to forecast widely beyond the next 2-3 years. Full details on the derivation of market estimates are given so readers can apply their own factors and easily make alternative estimates if they prefer.
- Owing to the sensitivity of some of the data collected, all reference to the origin of participating companies is removed, data is pooled to get an industry average and the anonymity of all respondents fully preserved and guaranteed.
- Critically HTStec's Trends reports have generated much interest and acclaim amongst survey respondents, to whom they are made available free of charge (subject to acceptance of HTStec's copyright terms) so they can benchmark their internal processes.
- Unlike alternatives HTStec's Market Surveys and Report are aimed at giving readers, information they want and can rely on, not information they don't need, cannot easily discern or is of dubious authenticity.
- HTStec aims to be the premier global provider of highly focused market research on enabling technologies in drug discovery.
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