Drug Repurposing Guidebook

Building Block I462

This document defines the content of the FACT SHEET to be created for each identified tool, incentives, initiative or practice (the Building Block) introduced by public bodies or used by developers to expedite drug repurposing in Rare Diseases (RDs).

ITEM	DESCRIPTION
Building Block (BB) Title	**Public-private partnerships** **"Shaping the collaboration between academia and pharmaceutical industry"**
References	1) https://eipg.eu/tag/pharmaceutical-policy-2/ 2) Public-Private Partnerships: Compound and Data Sharing in Drug Discovery and Development - PubMed (nih.gov) 3) Translat Regulat Sci. 2(2): 47–50, 2020; doi: 10.33611/trs.2020-008 4)https://investors.exscientia.ai/press-releases/press-release-details/2020/europes-largest-initiative-launches-to-accelerate-therapy-development-for-covid-19-and-future-coronavirus-threats/Default.aspx 5) European pharmaceutical research and development: Could public infrastructure overcome market failures? | Panel for the Future of Science and Technology (STOA) | European Parliament (europa.eu) 6) https://www.imi.europa 7) CORBEL project - https://eatris.eu/projects/corbel-coordinated-research-infrastructures-building-enduring-life-sciences-services/.eu/ 8) Academia-Industry collaboration best practice guide - https://eatris.eu/wp-content/uploads/2019/12/CORBEL_Academia_Industry_Collaboration_Best_Practices_Guide.pdf 9) BIO Europe partnering event - https://informaconnect.com/bioeurope/
Description	The collaboration between academia, pharma and funders (private-public partnerships) is critical in enhancing the success of drug repurposing by translating new repurposing ideas from research to practice. Building a partnership with aligned needs of public and private partners will enable funding to initiate these projects and provide a model framework to help streamline all the key processes right from the initial development to the final target of having a licensed repurposed product for the patient.

<table>
<tr><th>ITEM</th><th>DESCRIPTION</th></tr>
<tr><td></td><td>Academics could benefit from the experience of Pharma companies on their knowledge of the clinical development, manufacturing, commercialization, quality, regulatory, project management resources, technical know-how and funding aspects to progress with drug repurposing opportunities

Industry could benefit from added value of academia due to their scientific experience, expertise in rare, orphan diseases, understanding of unmet treatment gaps, clinical outcomes and treatment patterns. The technology transfer office (TTOs) responsible for technology transfer or collaboration of R&D projects, protection and management of the intellectual property rights, clinical trials, increase research institute/university's visibility among for-profit players in the field (including pharma and biotech companies as well as venture capital firms) and actively advertise the most advanced projects.</td></tr>
<tr><td>Category</td><td>Engagement with MA</td></tr>
<tr><td>Type of BB</td><td>Development practice</td></tr>
<tr><td>Geographical scope</td><td>International</td></tr>
<tr><td>Availability</td><td>Many repurposing ideas originate from research conducted by pharmaceutical companies and/or from academic institutions.

Experienced organisations like IMI, EATRIS, Biocat and BIO Europe augment such collaborations through advocacy, funding, connecting SME and big pharma via networking, focussed partnering events fostering sustainable dedicated public-private partnerships.</td></tr>
<tr><td>Scope of use[1]</td><td>Block on Public-private relationship, focuses on shaping the collaboration between academia and companies

Issues and respective solutions to improve Drug- repurposing

<table>
<tr><th></th><th>Issue</th><th>Solution</th></tr>
<tr><td>Finding partners for Academia to partner with</td><td>Academia have limited resources to help successfully complete and facilitate drug repurposing projects</td><td>A group created with a wide range of different stakeholders (Academics and Pharma) to encourage collaboration and data sharing to help facilitate and accelerate drug-repurposing ideas.</td></tr>
<tr><td>Improving Stakeholder</td><td>Coordination between EU institutions and organisations</td><td>An EU one-stop shop for non-commercial repurposing.
A European network of experts.</td></tr>
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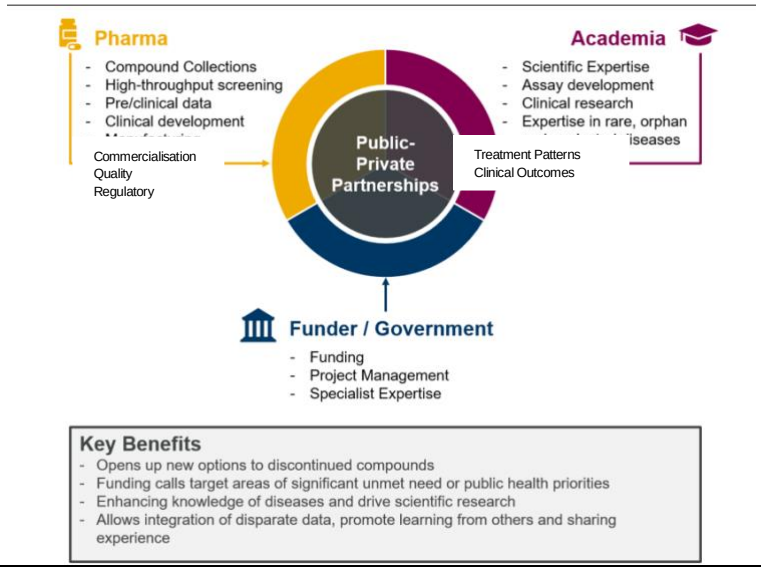
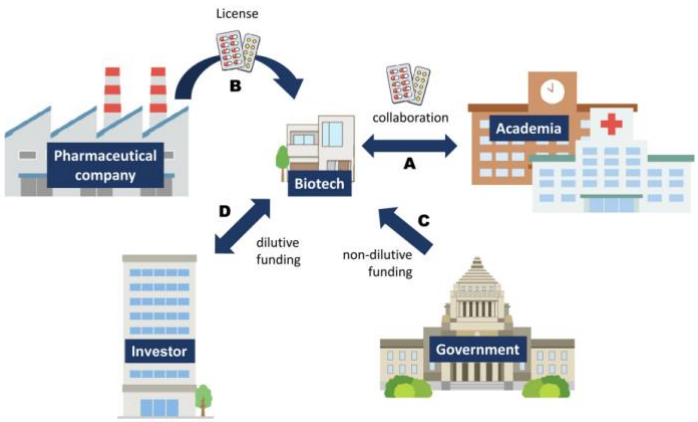
	collaboration and coordination	Poor cooperation between industry and non-commercial champions	Encouraging working together to obtain regulatory approval and sharing of data on shelved products not protected by patents.
	Ensuring Funding	No Prioritisation mechanism	A European list of priority indications.
		Poor availability of funding	More funding from public sources. Exploring the viability of novel funding mechanisms. Public-private partnership to combine skills and resources for both public and private sectors.
Stakeholders involved[2]		
Enablers/ Requirements	Public-Private collaboration model for drug repurposing (Reference 3) 		

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	Dilutive Funding: Funding that requires company to give equity/ ownership rights to the funder **Non-Dilutive Funding:** Funding that does not require company to give equity/ ownership rights to the funder Experienced business developers, legal and regulatory experts, technology transfer offices are vital to construct a complementary/synergistic partnership based on aligned needs of public and private partner and considering viable business models.
Examples	Connecting Academia and Industry for successful drug repurposing in rare diseases **1. The Alpelisib Repurposing Case study** • A first contact with industry (Novartis) initiated by French academia exploring the therapeutic potential of alpelisib, an investigational anticancer drug (phase III) in PIK3CA*-related overgrowth spectrum (PROS), a group of rare genetic disorders without treatment. The Paris team discovered that PIK3CA-related cancers and PROS shared the same pathogenetic mechanism leading to abnormal dysregulated cell growth and that activating PIK3CA mutations were found in both cancer and overgrowth syndromes. This was the basis for alpelisib, a specific inhibitor of the PI3KCA developed by Novartis in cancer, being repurposed in PROS. • After achieving impressive outcomes first on PROS mouse models and then on 2 patients suffering from severe and life-threatening PROS, the group was authorized to administer alpelisib to additional patients. The study supporting PIK3CA inhibition as a promising therapeutic strategy in patients with PROS was published in 2018. • In 2019, US FDA granted alpelisib, "Breakthrough Therapy Designation" based on real world data. In 2021, Alpelisib received an Orphan Drug Designation from the EMA. This was followed by a conditional approval from the FDA under the brand name Vijoice® in 2022. • The approval of Vijoice® marks a turning point for PROS patients. Novartis is conducting additional clinical trials to further understand the long-term efficacy and safety of alpelisib in PROS. **PIK3CA: Phosphatidylinositol-4,5-Bisphosphate 3-Kinase Catalytic Subunit Alpha* **2. COVID-19- Urgent need for accelerated therapy developments to market novel (Vaccines) and repurposed therapies (i.e. Dexamethasone) for COVID-19 (4)** • CARE (Corona Accelerated R&D in Europe), a new group supported by the Innovative Medicines Initiative (IMI) was launched to accelerate the discovery and development of medicines for Covid-19. A public-private partnership Included 37 different partner organisations comprising of scientists from academia, research centers, small medium enterprises, European Federation of Pharmaceutical industries and associations (EFPIA) member companies and

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	IMI associated partners from Belgium, China, Denmark, France, Germany, the Netherlands, Poland, Spain, Switzerland, the UK and the US
Output	Facilitating and developing public-private partnerships to initiate, accelerate and help finance the repurposing of drugs
Best time to apply and time window	Private-public collaboration groups could be initiated from the start of a newly identified drug repurposing development idea. Early-stage collaboration, however, is not the only option; late-stage collaboration may be a tactical de-risking policy for Big Pharma.
Expert tips	**PROs:** • Find new opportunities for repurposing of existing drugs • Helps resourcing projects (with funding/ partners complementary expertise) to accelerate these projects • Will facilitate the drug development processes and help translation of drug repurposing from research to practice in more time and cost-efficient manner **CONs:** • Time investment to build the right partnership (agree on scope and legal framework) where analysis should be handled with care in informing drug development decisions to avoid errors in execution. **KEY DRIVERS FOR EFFECTIVE AND SUCCESSFUL COLLABORATION BETWEEN ACADEMIA AND INDUSTRY** • Intellectual Property agreements such as - is the compound to be repurposed patented? IP owner? Expiration date? Supplementary protection certificates? Freedom to Operate? • Access to raw data, regulatory master file, Pharmacovigilance reports and safety data of the original product • Business constraints and expectations (Pipeline, strategy, opportunity for the private partner) • Robustness of the Proof of Concept; industry/market feasibility; cost-effectiveness • Human factor consideration (“fit” between stakeholders, resources and commitment) • Clinical Trial strategy and time to CSR