Research on Key Issues and Countermeasures Faced by Higher Education Institutions in the Development of Suzhou's Biomedical Innovation Consortium

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Abstract: The biopharmaceutical industry stands as Suzhou's premier sector and remains one of the city's long-term strategic priorities, boasting immense growth potential and dynamic development. Establishing innovation consortia within this field—led by industry leaders, supported by academic institutions, and fostering collaborative synergy among all innovation elements—enables breakthroughs in critical core technologies. This approach not only represents Suzhou's strategic choice to leverage its comparative advantages but also constitutes a profound strategy for driving high-quality development. However, in practice, issues such as inadequate institutional mechanisms and a shortage of high-calibre leading enterprises within the sector have indeed hampered the formation of these consortia. Consequently, universities find themselves sidelined, unable to maximize their intellectual support role. Identifying the underlying causes and proposing targeted pathways and measures is therefore an urgent priority.

Keywords: Biopharmaceuticals; Innovation Consortiums; Higher Education Institutions; Critical Issues; Countermeasures

1. Introduction

The biopharmaceutical industry stands as a vital pillar of modern healthcare, boasting immense growth potential and representing one of the most dynamic sectors. As a leading hub for biopharmaceutical development, Suzhou has spearheaded the establishment of innovation consortia within this field. Led by pioneering enterprises, these consortia pool diverse innovation resources, foster dedicated collaboration, and facilitate cross-sectoral synergies to overcome bottlenecks constraining technological advancement in biopharmaceutical companies. This approach represents not only a strategic choice to leverage local strengths but also a profoundly considered strategy to drive high-quality development. Higher education institutions, serving as vital intellectual pillars, are the foremost partners for leading enterprises. Their unique platform resources and talent reserves provide essential support. Moreover, innovation consortia transcend traditional disciplinary and organizational constraints, focusing on cultivating interdisciplinary, multi-skilled professionals to meet industrial demands. This approach aligns profoundly with contemporary university disciplinary restructuring and transformation, holding far-reaching significance [1]. However, in practical implementation, the development of innovation consortia faces challenges such as insufficient numbers of leading enterprises and imperfect institutional mechanisms, resulting in slow progress. This undoubtedly constrains the full realization of universities' potential and requires urgent resolution.

2. Key Challenges Faced by Higher Education Institutions in Building Suzhou's Biomedical Innovation Consortium

2.1 The Absence of Leading Enterprises and the Constrained Role of Higher Education Institutions

In the formation and operation of innovation consortia, the leading role of flagship enterprises cannot be overlooked. These entities possess absolute competitive advantages in terms of industry influence, resource integration, infrastructure development, and commercialization of outcomes, thereby safeguarding the consortium's healthy and sustainable development [2]. Although Suzhou has already gathered a cohort of listed

companies and sector-leading enterprises in the biopharmaceutical field, such as Innovent Biologics, Ascentage Pharma, GEM Genomics, and Briohealth, it still lacks absolute leaders with the calibre of Novo Nordisk, Roche, Qilu Pharmaceutical Co.,Ltd, or China National Biotec Corporation. Even Suzhou's foremost enterprise, Innovent Biologics, ranks only ninth in the 2024 China Pharmaceutical Market Top 50 Biopharmaceutical Companies. The consortiums currently most active in the biopharmaceutical sector—comprising Innovent Biologics, Ascentage Pharma, and and Peijia Medical currently lead consortiums at the municipal level. This indicates that both the quantity and calibre of technology-driven leading enterprises in Suzhou's biopharmaceutical sector have room for improvement. Furthermore, the research team's investigation revealed that fewer than 30% of listed companies in the biopharmaceutical sector have initiated the process of establishing and operating consortiums, with progress being relatively slow. For instance, BeiGene Medical (project initiated at the end of 2023, launched in mid-2024) requires further impetus to ignite enthusiasm.

2.2 Institutional Inadequacies and Obstacles to School-Enterprise Collaboration

Firstly, the increasingly prominent issue of land constraints. Suzhou's rapidly developing biopharmaceutical industry owes much to the relocation of operations from Shanghai following the setback to the overly idealistic 'Zhangjiang R&D + Shanghai manufacturing' model. However, as more biopharmaceutical enterprises entering the production phase establish themselves in Suzhou, the city now faces escalating land requirements. This has exposed tensions in industrial land supply, inefficient land utilization, and an urgent need to revitalize existing land reserves. Secondly, concerning talent, the current evaluation systems for university researchers predominantly focus on traditional metrics such as research project volume, paper quality, and scientific awards. When it comes to social service domains, most efforts remain superficial, resulting in limited interest among researchers in technology transfer, commercialization, and industrial collaboration. Finally, the bioeconomy encompasses broad domains, diverse product categories, and extensive value chains, involving multiple regulatory bodies. The current fragmented approach of departmental and sectoral oversight has yet to establish a regulatory framework suited to the bioeconomy's development, undermining the continuity and predictability of regulatory policies [3]. Moreover, assessment and decision-making mechanisms for major technological controversies remain inadequate. Technologies such as gene editing and stem cell therapy, which raise significant ethical and safety concerns, urgently require expert evaluation and decision-making frameworks to facilitate the orderly advancement of their research, development, and industrialization.

2.3 Funding Constraints and Sluggish Integration of Factors

Breaking through technological bottlenecks via innovation consortia necessitates sustained and substantial investment in research and development. Whether establishing public technology platforms, conquering cutting-edge 'game-changing' technologies, or facilitating the subsequent commercialization and dissemination of scientific achievements, these endeavours constitute protracted processes fraught with uncertainty. They demand that lead enterprises possess a certain spirit of adventure and 'greater vision' [4]. This holds particularly true in the field of innovative pharmaceuticals, which remains a quintessential high-investment industry [5]. Corporate innovation relies heavily on financing to support research and development, with the adage that 'it takes a billion dollars and a decade to develop a new drug' highlighting the exceptionally high risks involved, stated the founder of Innovent Biologics. Furthermore, in recent years, influenced by policies such as healthcare cost containment, many domestic innovative drug companies have been forced to choose between 'capturing market share or maintaining pricing power,' opting instead for market expansion. This has led to prolonged return cycles and constrained investment returns, causing many investors to shy away from the biopharmaceutical sector. Moreover, under current conditions, only companies with new drug sales can generate cash flow. For many innovative drug enterprises still in the R&D phase, the situation is even more severe. Amid fierce market competition, 'selling pipelines' and 'selling equity' have become the reluctant choice for numerous companies and consortiums.

The ‘cash crunch’ dilemma urgently requires resolution [6].

3. Resolution Pathways and Countermeasures

3.1 Accelerate the Cultivation of High-Calibre, Innovative Technology Leaders in the Biopharmaceutical Sector and Stimulate Their Enthusiasm for Innovation.

Firstly, adopt a multi-pronged approach to strengthen policy guidance. Primarily, fully leverage the roles of relevant departments including the Municipal Government, Science and Technology Bureau, Finance Bureau, Health Commission, and Medical Insurance Bureau to establish and improve cross-departmental coordination mechanisms. This will enable the coordinated management of large, medium, and small enterprises within the biomedicine sector [7], particularly those showing robust growth and potential to become industry leaders such as Scivita Medical, NanoMicro Technology Co., Ltd, BrightGene, and Suzhou Gritgen Science. This will also involve dynamic tracking, summarizing experiences, and promoting new models of integrated development. Secondly, leverage the guiding and catalytic role of fiscal funds by organizing target enterprises in the biopharmaceutical sector to actively apply for various provincial and national special funds. Explore incorporating support for major platforms, advanced models, and demonstration pilot projects that facilitate the integrated development of target enterprises into the city's biopharmaceutical industry support funds. Furthermore, advance the pilot scheme for credit guarantees in government procurement. Encourage the provision of performance guarantees and financing guarantees to small and micro enterprises that are indispensable partners and allies of leading enterprises participating in government procurement, thereby fostering a favourable external environment for integrated development.

Secondly, support target enterprises in establishing high-calibre research and development institutions. Firstly, establish a ‘service package’ system for leading technology enterprises, utilizing big data technology to collate and organize information on corporate service offerings and activities. This will create a professional service resource repository enabling precise matching and full access to services, thereby facilitating research into common challenges and the formulation of corresponding policies. Secondly, encourage qualified technology leaders such as Innovent Biologics and Basecare to spearhead research into critical common technologies. Focusing on industry and corporate innovation gaps, concentrate efforts on developing decisive, pivotal, universal, and forward-looking key technologies. This approach enhances their industry standing and competitive edge while preventing resource wastage from redundant innovation [8]. Finally, for enterprises in the biopharmaceutical sector demonstrating robust growth and having spearheaded the establishment of innovation consortia—such as LungCare, Beaverbio Medical, and Suzhou Iron Technology—priority shall be accorded to the establishment of provincial-level corporate research institutes and key laboratories. These entities shall receive stable support for research and development efforts targeting critical technological innovation nodes within the industrial chain. Furthermore, those meeting the criteria outlined in the Ministry of Science and Technology's Guidelines for the Development of Specialized Maker Spaces shall be prioritized for advancement and incorporated into the management framework for enterprise incubators.

Thirdly, we shall advance the protection and utilization of corporate intellectual property rights, enhance support for innovative technology enterprises in the biopharmaceutical sector, strengthen scientific and technological innovation, ensure robust intellectual property safeguards, and assist enterprises in accelerating technology dissemination through means such as transfer and licensing. This will enable more scientific research achievements to reach the market and benefit the public.

3.2 Implementing Targeted Measures to Overcome Institutional Barriers and Empower the Efficient Development of Consortia in the Biopharmaceutical Sector.

Firstly, we must persistently intensify efforts to revitalize existing land reserves. This begins with innovating land utilization models, continuously exploring multifaceted approaches and pathways for land revitalization and allocation. Specifically, this entails scientifically formulating redevelopment plans, proposing models such as government acquisition and redevelopment, redevelopment by new project

entities, or self-redevelopment by original land users. While adhering to laws and regulations, certain policy preferences may be granted to qualified and promising pharmaceutical enterprises that have already spearheaded consortium formation [9]. Encourage existing leading pharmaceutical enterprises to upgrade and transform through multiple approaches such as adding storeys, refurbishment, and utilizing underground space. Explore 'grafting and restructuring' by facilitating government-led investment attraction to bring high-quality pharmaceutical enterprises into industrial parks, while existing enterprises contribute land as equity. Secondly, establish a dynamic monitoring system for land resource requirements of existing biopharmaceutical enterprises, conducting enterprise monitoring and service work to promptly grasp key enterprises' production and operational status, as well as their resource needs. Integrate online and offline channels to coordinate enterprise support officers and resource department liaisons across all levels, creating a closed-loop mechanism for collecting, organizing, monitoring, and resolving enterprise requests. Ensure timely policy dissemination and implementation, enabling direct communication of enterprise resource needs to the government and enhancing both the quality and efficiency of resource provision and issue resolution. Finally, introduce a priority land allocation mechanism for high-quality enterprises in the biopharmaceutical sector based on data-driven land allocation. Appropriately prioritise enterprises that have taken the lead in establishing innovation consortia to stimulate the enthusiasm of qualified enterprises to take the lead.

Secondly, we shall continue to refine the assessment and evaluation system for innovative talent within the biopharmaceutical sector. Firstly, at the university level, we shall progressively dismantle academic biases such as the exclusive emphasis on research projects, publications, and academic qualifications in the appraisal and promotion of university faculty, institutional ratings, and scientific evaluations. The assessment criteria shall be refocused on technological breakthroughs and industrial contributions, with particular emphasis on evaluating the performance of serving personnel in areas including technical standards, solutions, high-quality patents with practical applicability, achievement transformation, economic benefits and societal feedback, and overall contribution. Furthermore, incorporate university staff's corporate practical experience into their assessment scope, strictly prohibiting fraudulent practices. Support and encourage faculty from Suzhou institutions such as Soochow University and Suzhou Health Vocational and Technical College to undertake regular placements within enterprises, integrating them into the formation and operation of innovation consortia. Finally, continuously refine the senior-level professional title evaluation mechanism for pharmaceutical engineering within the biopharmaceutical sector. Establish channels for mutual recognition between international professional qualifications and domestic titles, constructing a multi-tiered evaluation framework from technicians to engineers and senior engineers. This will maximize the innovative potential of industry talent.

Thirdly, dismantle institutional barriers and streamline administrative service procedures. Streamline existing approval procedures and expedite the establishment of review panels comprising scientists and industry representatives to select promising projects in fields such as gene editing and stem cell therapy. Furthermore, given that local medical institutions in Suzhou currently account for less than 20% of corporate clinical trial participation, relevant departments should establish a Clinical Collaboration Department. This department would compile databases of enterprises and hospitals to facilitate precise matching of clinical resources for companies.

3.3 Targeted Efforts to Continuously Strengthen Fiscal Support and Leadership.

Firstly, actively guide state-owned capital to participate in the establishment and operation of innovation consortia, while maintaining close attention to the implementation and refinement of measures concerning optimized fund allocation outlined in the 'Several Measures for Supporting the 'Peak-Building and Chain-Strengthening' of the Biopharmaceutical Industry Across the Entire Value Chain'. Strengthen the cultivation of medium-to-long-term investors and patient capital, and encourage the development of corporate venture capital. Primarily, support capable biopharmaceutical enterprises (such as Innovent Biologics and Ascentage Pharma) to grow stronger through mergers and acquisitions,

thereby injecting confidence into the industry's development [10]. Moreover, addressing the mismatch between long-term demand and short-term supply arising from activities such as new drug development—which typically require over a decade—and the prevalence of domestic financial products with maturities under five years, measures should be taken to encourage state-owned entities including Suzhou Venture Capital, Dongwu Securities, and Yuanhe Holdings to adjust the terms of their biopharmaceutical-related financial products. This can be achieved by reforming fund assessment methodologies, deepening registration system reforms, and optimising exit mechanisms to meet industry needs. Finally, state-owned entities should be supported in moderately increasing their proportion of early-stage investments in cutting-edge biopharmaceutical technologies to alleviate mismatches between front-end demand and back-end supply.

Secondly, authoritative endorsement will establish a regularized capital empowerment investment and financing exchange platform for upstream and downstream entities within the biopharmaceutical innovation consortium. Firstly, leading state-owned entities such as Suzhou Venture Capital, the People's Bank of China Suzhou Branch, and Suzhou High-Tech Investment will be supported in addressing the needs of the city's leading biopharmaceutical enterprises. Regular capital empowerment investment and financing matchmaking sessions will be organized to enable efficient alignment between enterprises and capital. Secondly, support unlisted industry leaders such as Weishengkang Medical Technology (Jiangsu) and Wecare -Probiotics (Suzhou) in preparing project roadshows and IPO applications, securing fresh financing rounds, and identifying investors or corporate partners for joint listings to alleviate R&D investment burdens. Finally, encourage leading state-owned entities to expand investment footprints, strengthen resource integration, and standardize industry development trajectories.

Thirdly, support qualified biopharmaceutical enterprises in pursuing overseas expansion to drive performance growth through two approaches: firstly, licence-out arrangements whereby companies grant overseas or global rights to their products to multinational pharmaceutical firms, thereby securing upfront payments and milestone payments; secondly, independent overseas expansion involving the conduct of clinical trials and product commercialization in foreign countries and regions.

4. Conclusion

In today's fiercely competitive global technological landscape, innovation undoubtedly serves as the core engine driving development. The integration of higher education institutions into innovation consortiums represents both an inevitable trend and an unprecedented strategic imperative. Universities must closely monitor the formation and evolution of innovation consortia across various sectors, actively engage with these networks, and identify their precise positioning. Only through such strategic alignment can they navigate the competitive terrain with steadfast progress and secure an unassailable position amidst intense rivalry.

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