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The Smallest Arteries May Hold the Key to Some of Medicineâ??s Biggest Unmet Needs

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At BIO 2026, Steffen-Sebastian Bolz, MD, Ph.D., Founder and Chief Scientific Officer of Qanatpharma, discusses why resistance artery dysfunction remains under-recognised, how AI is accelerating vascular target discovery, and why microvascular biology could reshape the future of cardiovascular, neurological, and metabolic disease treatment.



While most cardiovascular research has traditionally focused on the heart and large blood vessels, a growing body of evidence points to the critical role of resistance arteries in regulating blood flow, tissue oxygenation, and organ function. **At BIO International Convention 2026 in San Diego, BioSpectrum Asia spoke with Steffen-Sebastian Bolz, MD, Ph.D., Founder and Chief Scientific Officer of Qanatpharma,** about the emerging science of microvascular dysfunction, its connection to heart failure and cognitive decline, and how the company's AI-powered Arteriome Platform is uncovering novel therapeutic targets across multiple disease areas.

Microvascular dysfunction remains under recognized. Why?

Modern cardiovascular medicine has traditionally focused on the heart and large arteries. However, blood flow and tissue perfusion are controlled by much smaller arterial vessels deep within tissues, called resistance arteries, 50-250 µm in size. They can adjust their diameter to regulate blood flow to organs such as the brain, heart, and kidneys, helping maintain stable oxygen delivery throughout the body. Dysfunction of these microarteries is increasingly recognized not merely as a consequence of disease, but as a fundamental driver of pathology across cardiovascular and numerous other disorders.

Despite their critical physiological importance, resistance arteries remain among the least understood structures in vascular biology due to their small size, technical inaccessibility, and the lack of integrated technologies capable of studying their function in physiologically and pathophysiologically relevant settings.

At Qanatpharma’s we have been working to solve this knowledge gap as well as to identify and pioneer the development of therapies targeting resistance artery dysfunction. Our scientific founders established the central role of resistance artery

dysfunction in disease pathogenesis, leading to the foundation of our proprietary target and drug discovery platform, the Arteriome Platform. Arteriome combines microvascular biology, proprietary datasets, advanced disease models, computational discovery, and translational clinical research.

How strong is the link between heart failure and cognitive decline?

Heart failure affects approximately 64 million people worldwide and is increasingly recognized as a major risk factor for cognitive impairment. Epidemiological studies indicate that up to 50% of patients with heart failure exhibit measurable deficits in memory, attention, executive function, or processing speed, deficits that track with cardiac disease progression and carry significant clinical consequences. These include reduced treatment adherence, impaired self-care, higher hospitalization rates, increased healthcare utilization, and poorer survival outcomes.

A growing body of evidence suggests that a key mechanistic link between heart failure and cognitive decline is reduced cerebral blood flow. The brain requires a continuous and tightly regulated blood supply to maintain neuronal function and metabolic homeostasis. In heart failure, impaired cardiac output, microvascular dysfunction, and abnormalities in cerebral autoregulation can compromise cerebral perfusion, leading to chronic reductions in oxygen and nutrient delivery. Neuroimaging studies consistently demonstrate lower cerebral blood flow in patients with heart failure, particularly in brain regions involved in memory and executive function, with reductions correlating directly with worse cognitive performance.

Central to this process is dysfunction of the cerebral microcirculation and resistance arteries. Chronic reductions in cerebral blood flow can promote neuronal injury, neuroinflammation, and accelerated neurodegeneration, providing a plausible biological pathway linking cardiovascular disease to cognitive decline. Despite the strength of this association, no approved therapies currently target the underlying vascular mechanisms responsible for impaired cerebral perfusion and cognitive dysfunction in heart failure.

What role does AI play in identifying novel vascular targets?

AI is central to how we identify and validate novel vascular targets and translate them into novel therapeutics. At Qanatpharma AI operates at two distinct levels within our Arteriome platform.

The first is target discovery. Through standardized, modular experimental systems, the platform enables high-resolution functional characterization of microvascular physiology across multiple organs, disease states, and biological conditions, informed by research developed from decades of pioneering research in microvascular biology. The platform incorporates clinically relevant disease models—including heart failure, metabolic disease, neurovascular disorders, inflammation, and obesity—while accounting for organ-specific, sex-specific, and circadian variations in vascular regulation. We have generated complex, multidimensional data from resistance arteries, including functional phenotyping combined with transcriptomic, proteomic, and genetic profiles. No human analysis can efficiently extract meaningful patterns from that volume and complexity. Our AI-driven analytics do exactly that. Arteriome identifies and prioritizes molecular targets based on demonstrated functional relevance rather than simple disease association. This enables the discovery of organ-specific regulatory networks and therapeutically actionable targets with a higher probability of clinical success. We are linking microvascular behavior directly to underlying molecular mechanisms across multiple organs, disease states, and biological conditions.

The second is drug design. Once a target is validated, it moves into our AI-enabled discovery ecosystem, where generative AI, machine learning, and computational chemistry accelerate the design of novel chemical and biological entities. This compresses timelines significantly and increases the probability of arriving at candidates with genuine therapeutic relevance.

The result is an end-to-end where AI is not a layer added on top of conventional biology. It is embedded in how we generate insight and translate it into drug candidates from the outset.

How could your platform expand beyond heart failure?

It is fundamental principle underlying Qanatpharma's strategy that **resistance arteries are a universal biological control system that regulates blood flow, oxygen delivery, nutrient exchange, and tissue homeostasis across virtually every organ in the body.** As a result, dysfunction of these vessels has consequences far beyond the heart and vasculature and is

increasingly recognized as a common pathological denominator across a broad range of diseases.

While heart failure and cardiovascular disorders represent important initial indications, Qanatpharma's **Arteriome Platform** was designed to interrogate resistance artery biology irrespective of organ system. Resistance arteries govern local perfusion in the brain, kidney, retina, lungs, skeletal muscle, skin, and numerous other tissues. When their ability to appropriately dilate, constrict, or respond to metabolic demands becomes impaired, tissues experience chronic hypoperfusion, reduced oxygen delivery, inflammation, metabolic dysregulation, and progressive organ dysfunction.

This vascular dysfunction is implicated in numerous high-burden diseases with substantial unmet medical need, including cognitive impairment and vascular dementia, chronic kidney disease, diabetic microvascular complications, pulmonary hypertension, systemic inflammatory disorders, wound healing disorders, retinal diseases, and potentially even cancer, where abnormal microvascular function influences tumor hypoxia, drug delivery, and therapeutic resistance.

The power of the Arteriome Platform lies in its ability to identify the **organ-specific molecular mechanisms that drive resistance artery dysfunction across diverse disease settings**. By combining functional microvascular phenotyping, multi-omics profiling, advanced computational biology, and AI-enabled target discovery, the platform reveals regulatory networks that are often invisible to conventional disease-centric approaches. This allows Qanatpharma to discover therapeutic targets based on a shared pathogenic mechanism - microvascular dysfunction - rather than treating diseases as isolated entities.

Consequently, Arteriome represents more than a cardiovascular discovery platform. It is a **system-wide microvascular target discovery engine** capable of generating a pipeline of first-in-class therapies across multiple therapeutic areas. By addressing resistance artery dysfunction at its source, Qanatpharma is positioned to tackle some of the largest and most underserved diseases in medicine, creating opportunities that extend far beyond traditional cardiovascular therapeutics.

What are investors overlooking in cardiovascular innovation?

From Qanatpharma's perspective, one of the most overlooked areas in cardiovascular innovation is the biology of resistance arteries. Despite their central physiological importance, resistance artery research remains largely confined to academia and a small number of specialized laboratories worldwide.

The reason is simple: these vessels are exceptionally difficult to study. Unlike large arteries, resistance arteries are too small to be directly assessed using conventional imaging technologies or most circulating biomarkers. Instead, they must be carefully isolated from tissue and studied ex vivo using highly specialized techniques, equipment, and personnel. The process is labor-intensive, low-throughput, expensive, and historically difficult to scale. From a traditional venture perspective, this has often appeared to be the antithesis of an attractive investment opportunity.

Yet this technical barrier has created a significant blind spot. At Qanatpharma we are changing that. Recognizing both the biological importance and the technological limitations of the field, Qanatpharma has pursued a dual innovation strategy that has attracted investor attention. In addition to developing novel scientific insights into resistance artery function and dysfunction, the company has built disruptive experimental and computational platforms designed to accelerate target identification and drug development. We have standardized, automated, and dramatically increased the throughput of microvascular research, transforming a traditionally artisanal and low-throughput discipline into a scalable discovery engine.

This vision and strong science has resonated with a committed group of primarily European investors who recognized the opportunity long before it became widely appreciated. Their support has enabled Qanatpharma to advance its first cerebrovascular program into Phase 2 clinical development. Together, these investors share a conviction that the smallest arteries in the body may hold the key to addressing some of medicine's largest unmet needs, and that they can no longer be overlooked.

What is the single biggest takeaway from BIO 2026 that will influence your company's strategy over the next 12 months?

The biggest takeaway from BIO 2026 was the unmistakable signal that AI-driven drug discovery has moved from aspiration to implementation. The sheer number of sessions dedicated to AI, from the opening panel focused on adoption rates across biotech, to panels examining how generative genomics can accelerate target identification, to discussions on how AI is actually reshaping R&D productivity in 2026, made clear that this is no longer a conversation about potential. The field is executing.

For Qanatpharma, this validates a strategic direction we are already pursuing. The microvascular biology underlying our platform is complex, and the ability to use AI and machine learning to accelerate target identification, compound selection, and the mapping of molecular signalling in resistance arteries is directly relevant to how we work. What BIO reinforced is that the companies gaining the most traction are those that combine strong foundational science with the computational tools to move faster and with greater precision. That integration of deep biology and AI-powered discovery is what will define our development priorities over the next twelve months.