Editorial

20 years of *Nature Reviews Cardiology*

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The 20th anniversary of *Nature Reviews Cardiology* comes at a time of exciting innovation for cardiovascular research and clinical cardiology, with the advent of nucleic acid-targeted therapeutics, applications of artificial intelligence, promotion of a healthy cardiovascular exposome, personalization of medicine, and recognition of the importance of diversity, equity and inclusion in health care.

This issue of *Nature Reviews Cardiology* marks the journal's 20th anniversary (a milestone sometimes celebrated by a gift of porcelain) and is being published at a time of rapid advances across the field of cardiovascular research and clinical cardiology. These advances are helping to improve patient care and reduce the global burden of cardiovascular disease, which remains the leading cause of death worldwide[1].

Pharmacotherapy for cardiovascular disease continues to evolve, with, for example, the breakthrough development and approval of proprotein convertase subtilisin/kexin type 9 inhibitors, sodium–glucose cotransporter 2 inhibitors and glucagon-like peptide 1 receptor agonists, which have transformed the treatment of dyslipidaemia, diabetes mellitus, obesity and heart failure. These and many other drugs either block or activate protein receptors, with beneficial effects on the cardiovascular system. However, a revolution is occurring in the advent of nucleic acid-targeted therapies for the prevention and treatment of cardiovascular disease. The approaches include antisense oligonucleotides, small interfering RNAs and even genome editing techniques (using CRISPR–Cas9 or base editing). Protein production can be downregulated or upregulated on a long-term basis with a single injection, thereby improving patient adherence. Indeed, research is ongoing into permanent editing of the genome to correct monogenic channelopathies and cardiomyopathies. The prospect of permanently curing these lethal and heritable conditions would be life-changing for patients and future offspring but comes with technical challenges and ethical concerns that must be addressed.

Artificial intelligence, including machine learning and large language models, is permeating every aspect of human endeavour, and the field of cardiology is embracing the potential of this novel technology[2]. Starting with enhanced interpretation of the electrocardiogram, machine learning is now being integrated into nearly every aspect of the clinical pathway, including diagnosis, risk stratification, medical imaging, treatment optimization and prognostication. The potential to improve medical decision-making, streamline processes and save health-care professionals' time is immense, but concerns

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remain about the 'black box' nature of the algorithms and the potential for biases in the training datasets to be perpetuated and exacerbated.

Ideally, the emphasis of health-care systems would shift from the treatment of cardiovascular disease to the promotion of cardiovascular health. We have the tools to control traditional cardiovascular risk factors, such as dyslipidaemia, hypertension, diabetes, tobacco smoking and physical inactivity, and they must be effectively and equitably deployed. Nevertheless, additional cardiovascular risk factors have been identified. For example, a poor diet that is high in salt, *trans* fats, ultra-processed foods and sugar-sweetened beverages unbalances the gut microbiota, which can result in harmful cardiovascular effects. Furthermore, pollution of the air, water and soil by particulate matter, microplastics and heavy metals; the rising temperatures caused by the climate change crisis; sleep disruption and apnoea; the built environment in which we live; and lifestyle-related and work-based psychological stress can all have negative effects on cardiovascular homeostasis, circadian rhythms and cardiometabolism. Optimizing an individual's exposome must be a key component of the primordial prevention of cardiovascular disease[3].

A shared mechanism of many of these cardiovascular risk factors is activation of the immune system and the establishment of a systemic pro-inflammatory state. We have chosen to use this issue of the journal to focus on the multifaceted roles of the innate and adaptive

Editorial

immune systems in the development and progression of atherosclerosis[4–9]. The burgeoning field of atheroimmunology is a new frontier in the battle against atherosclerotic cardiovascular disease, especially in those individuals who have a residual inflammatory risk after successful treatment with lipid-lowering drugs. This holistic approach to treatment does not apply only to the concept of cardioimmunology; other interdisciplinary specialisms such as cardiorheumatology and cardio-oncology are well established. Bidirectional interactions with other organ systems are also areas of active study (for example, the heart–brain, heart–gut and heart–liver axes).

As the treatment and prevention of disease becomes increasingly personalized, attention must be given to diversity, equity and inclusion in cardiology and the broader health-care system[10]. Low socioeconomic status is a latent risk factor for poor cardiovascular health and reduced access to health care. Minority populations are more likely to be underdiagnosed and undertreated. This situation is perpetuated by the underrepresentation of women and ethnic minority individuals in clinical trials, resulting in uncertainty about how best to treat these patient populations. The editors of *Nature Reviews Cardiology* strive to embed the principles of diversity, equity and inclusion in our commissioning and editorial processes and to be advocates for change. Together with the research and clinical communities, we can advance our

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understanding of cardiovascular biology and the practice of cardiovascular medicine for the benefit of patients and wider society.

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