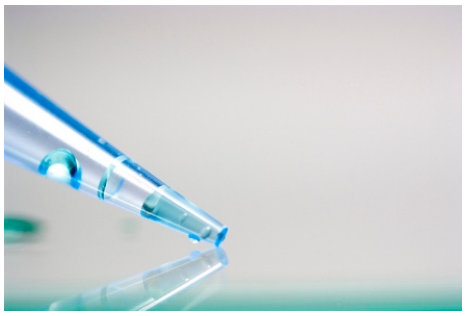

Not-so-magic Bullets: Searching for Better Policies to Govern Drug Discovery

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Here in the 21st century we have a standard vision of how medical care is supposed to work in developed countries: you fall ill, visit a doctor, receive treatment, and are cured. Deviations from this model are explained away by lack of access to good healthcare: long wait times to get a doctor's appointment or subsequent testing, the expense of private health insurance, or the refusal of universal healthcare systems to fund cutting-edge treatments [1]. Interventions to remedy the above issues rest on the assumption that, given better access to the best that healthcare has to offer, few would walk away from treatment unhealed. This view is fuelled by the belief that modern medicine has at its disposal an arsenal of "magic bullets," drugs that are both:

I. Highly specific, meaning that they target only the intended disease, reducing side effects, and
II. Highly effective, meaning that they restore the patient to normal health [2].

A classic example of a magic bullet is penicillin for bacterial infections: the drug binds to an enzyme found only in bacteria and causes them to die without interfering with human systems. However, according to a growing army of skeptics, including philosopher of science Jacob Stegenga, such specificity and effectiveness are rare among modern drugs, and this has implications for how medical research should progress.

In his upcoming book, Stegenga argues that modern medicine has on the whole produced few "magic bullets" [2]. On the whole, many of the most commonly prescribed modern drugs — including statins and antidepressants — are only mildly effective at curing the conditions they are meant to target, and side effects are much worse than the research suggests. For example, taking statins for five years on average saves the life of only 1 in 83 patients with prior heart disease, but 1 in 10 of these patients develop muscle damage [3]. This means that on the whole, we spend an enormous amount of money on drugs that have very little benefit.

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Stegenga outlines several reasons for this state of affairs, foremost among them the fact that the drug development and approval systems are inherently flawed. Rampant publication bias means that papers presenting positive findings are published more often than papers that have negative findings. Clinical trials often don't last long enough to pinpoint long term negative side effects. Peer review doesn't reliably weed out results that cannot be replicated. And, most damning of all, he writes, strategies designed to test medical interventions—such as randomized controlled trials (RCTs) and meta-analyses—are inherently malleable and open to manipulation, whether conscious or unconscious [5].

Furthermore, the structure of the pharmaceutical marketplace means that drug companies do not

focus on the research that can do the broadest benefits. Companies spend R&D funding on creating competitors to profitable drugs, rather than channeling these resources into finding drugs for medical needs that are as yet unmet. This is particularly true for illnesses that largely affect people in the developing world who are unable to pay for expensive treatment. [6] Even though competition through so-called "me-too" drugs helps reduce prices, drug companies claim that they have to stay high enough to offset the cost of developing drugs that don't end up on the market [3].

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According to Stegenga, we're better off diverting funding towards non-medical interventions that aim to prevent diseases in the first place. Most diseases are too biologically complex for "magic bullet" solutions: many have more than one causal basis, making a single drug insufficient. The fact that biological pathways are highly interconnected also makes it more likely that a drug will act where it is not supposed to, resulting in limited efficacy with unwanted side effects. [2] On a worldwide scale, ensuring access to basics such as clean drinking water will have the largest effect on the global disease burden, but Stegenga also highlights the importance of better-quality research into other non-pharmaceutical options, such as nutrition, stress reduction and physical therapy. Interventions in this area are often low-cost and highly effective compared to drugs, but research into their effects (especially in the case of nutrition) is often retrospective, skewed by corporate interests, and even more malleable than pharmaceutical RCTs [6].

There are a number of policy interventions that could address these issues. Policies that divert a fraction of the money spent on drug research towards lifestyle impacts — which are largely not patentable and therefore overlooked — could help solidify the evidence base for these interventions and greatly improve strategies for patient care. This is not to say that pharmaceutical research should be completely abolished; rather, money that we do spend on pharmaceuticals should go towards truly novel research rather than "me-too" drugs that do little to improve patient outcomes compared to existing drugs. Researchers should also focus greater attention on diseases that are less biologically complex, or on simple solutions to combat illnesses in the developing world, which come at a lower cost. Stricter regulations would deny approval to drugs that target conditions for which there is already a viable treatment, unless they confer a significant benefit over existing medications, incentivizing companies to bring drugs to market based on their effectiveness rather than marketing potential [6].

Conclusion

The main point to be taken from Stegenga's research is that claims of drug efficacy are often vastly overstated, with the media presenting claims of new "game-changers" almost daily. These claims cloud the fact that for millions of people, ranging from cancer patients to sufferers of chronic pain, medicines are incredibly costly and have a limited effect. It is crucial that those with the power to fund and regulate health interventions internalize the improbability of finding magic bullet cures, and increase funding for preventative interventions that will provide the best cost-benefit outcome for patient care.

About the Author

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