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Johnson & Johnson Deal Signals Industry-Shattering Potential of RNAi

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We are currently perched on the precipice of a biomedical revolution. In the coming years, RNA interference (RNAi) will fundamentally reshape the pharmaceutical landscape. RNAi may help effectively eliminate many of the world's most resilient viruses, curing some of the most intractable diseases on the planet—everything from Hepatitis B to HIV may be completely neutralized.

RNAi works by destroying flawed protein-building instructions caused by viruses that corrupt DNA. Proteins perform a variety of important functions in the body—some proteins help break down food; others transport oxygen around the body; still others help regulate blood-sugar levels. These various proteins are constantly being produced in the body's cells, and DNA helps cells know which proteins to produce and when to produce them.

DNA is essentially a master-list of instructions stored within every cell; it is the all-encompassing recipe book containing the steps for making every possible protein. Cells regularly copy small segments of DNA—like photocopying excerpts from a large list of instructions—and ship the appropriate excerpts to millions of ribosomes, which function as the protein-builders within the cell. Upon receiving these instructions, the ribosomes get to work, constructing the appropriate proteins. In short, the cell is like a factory—DNA is the factory's instruction manual, containing steps for all production processes; ribosomes are the workers, toiling away on the assembly line. This well-oiled factory performs extremely well, until a virus intervenes.

DNA viruses, such as Hepatitis B and HPV, breach cells and corrupt DNA—effectively rewriting portions of the instruction manual and sending flawed protein-building instructions to ribosomes. This is where RNAi—the aforementioned biomedical breakthrough—can save the day. RNAi can selectively intercept and destroy these flawed instructions before they reach the cell's ribosomes. Using RNAi, all DNA viruses (from Hepatitis B to HPV to Herpes) could potentially be stopped in their tracks.

Less than 20 years ago, the legitimacy of this treatment was widely questioned, with scientific literature lamenting that RNAi "has had only limited success" and concluding that "the long-term potential of [RNAi] has yet to be determined." However, skepticism and dismay were

replaced by profound optimism just a few months ago, when the FDA approved the first-ever commercial RNAi drug: Patisiran. This marked the first major step towards making RNAi a staple tool in our medical arsenal. Indeed, the "landmark approval" was described as "one that will surely rewrite pharmacology textbooks". The second—and arguably even more important—step came just last week, when Johnson & Johnson signed a deal with Arrowhead Pharmaceuticals, Inc. to develop and market another RNAi drug.

Arrowhead is developing an RNAi therapy specifically targeted towards curing Hepatitis B. Johnson & Johnson has purchased the rights to develop and market Arrowhead's proprietary drug. But these development rights came at a hefty price—Johnson & Johnson will pay $3.7 billion over the course of the deal. Even for a large company like Johnson & Johnson, this deal is massive in scale; to put things in perspective, Johnson & Johnson only earns about $800 million per quarter in revenue from treating infectious diseases. The deal with Arrowhead will therefore cost Johnson & Johnson the equivalent of its entire annual infectious disease treatment revenue.

If companies are willing to invest this much, they must expect RNAi to dominate disease treatment—they are banking on the industry-shattering potential of RNAi. This means a world without DNA viruses draws ever closer, and the implications are profound for every field and discipline. For the economy, this means a stronger, healthier workforce producing and demanding a larger quantity of commodities. For the environment, this in turn means greater pressure on scarce natural resources. Widespread usage of RNAi is also certain to bring a plethora of complex new legal problems, from IP and licensing issues to medical malpractice suits. RNAi thus seems poised to radically transform not only the medical landscape, but potentially every aspect of human society.