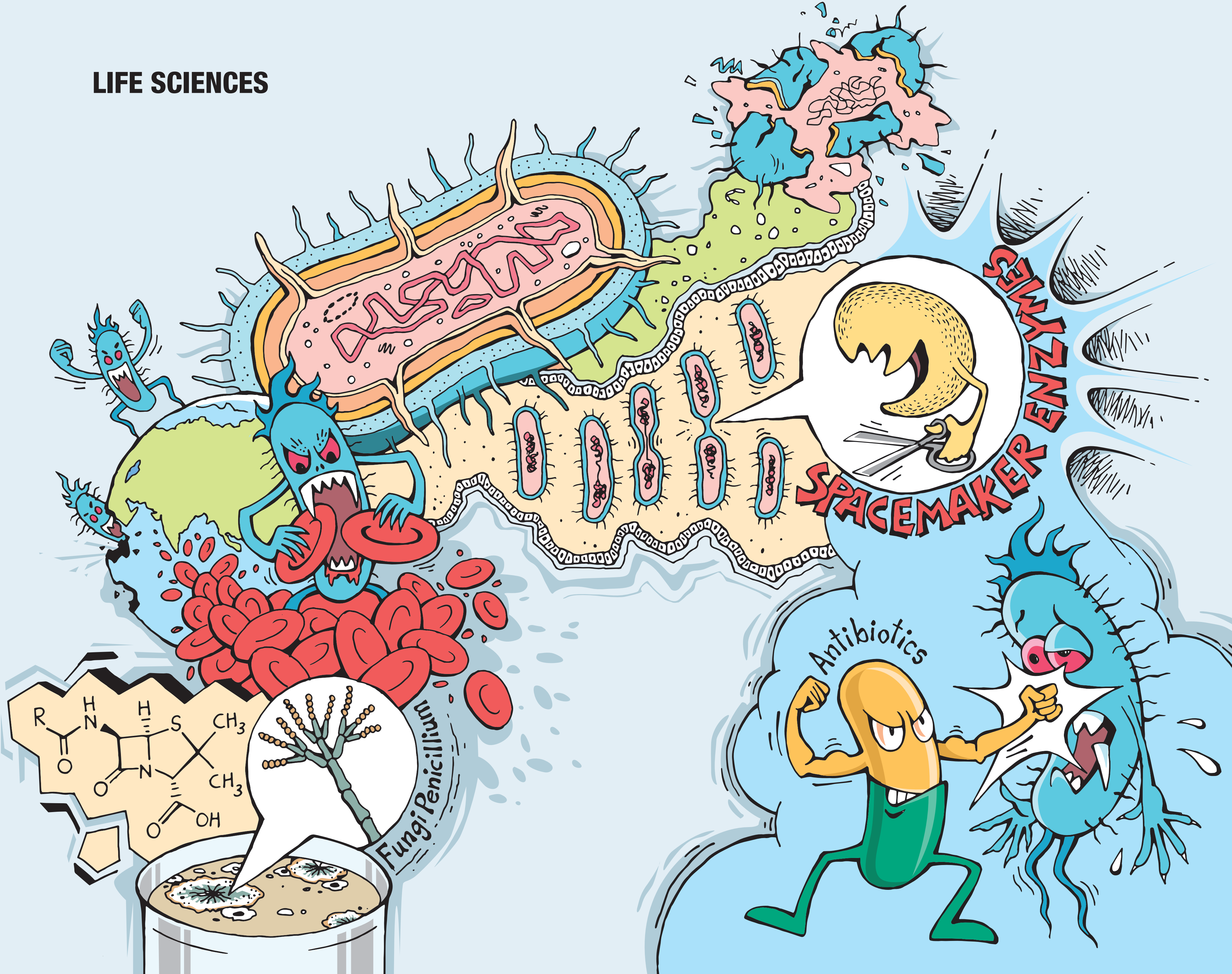
LIFE SCIENCES



THE WAR ON SUPERBUGS

In 1928 when Alexander Fleming accidentally discovered the green mold in his petri dish which then led to the discovery of penicillin, the world breathed a sigh of relief, confident that we had finally won the war against bacteria.

Cut to 2019 and we are confronted every day with headlines about superbugs killing thousands. The rampant use of antibiotics has led microbes to develop resistance to the drugs used to kill them. And so the hunt for more effective antibiotics is on once again.

As with any conflict, knowing your opponent is half the battle won. After all this time, what do we know about bacteria?

Even though they are single-celled organisms, bacteria are extremely well-equipped to handle the harshest of conditions. Their protective cell-wall is made of a material called peptidoglycan (PG) layer which is a complex mesh of two kinds of molecules—glycans, made up of N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) polymers and small peptide chains that connect the glycan strands.

At normal human body temperatures, bacteria multiply by cell division every 20 minutes. This happens by bacterial cells growing in size, during which time all the material inside the cell grows as well. Eventually one cell divides to become two daughter cells. This cell growth and division become possible because the PG layer of the cell wall is able to accommodate the expansion.

Now imagine what would happen if the PG layer does not increase in size as growth happens. The cell would simply burst open and die. How does the bacterial cell prevent this? Every living cell has protein molecules called enzymes which help along the reactions needed to support life. To prevent destruction during the expansion, bacteria use enzymes called hydrolases which 'cut' open the PG layer to make 'space'. Hence, they are also called ‘spacemaker’ enzymes. The cell is now able to accommodate more material to build the extra amount of PG which will then become part of the daughter cells. Other enzymes in the cell then help in combining the newly added glycan strands into the existing PG.

Dr. Manjula Reddy's work as a microbial geneticist involves understanding these enzymes that are involved in breaking and stitching together the cell-wall during bacterial cell multiplication. This would then help in manufacturing drugs that could specifically target these enzymes. The potential benefits of Dr. Reddy's work have huge implications for the future of mankind and our battle against deadly bacteria.