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AIDAI IMANKULOVA

THE FATE OF A MEDICINE

Vol II

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«Издательские решения»

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The Fate of a medicine. Vol II / A. Imankulova — «Издательские решения»,

How does an ordinary white powder in a test tube become a lifesaver for millions? Welcome to a world where chemistry intertwines with human destinies! This book offers an honest, engaging, and ironic insider's look at pharmacy. You will discover how medicines are born, what myths the creators of the pharmacy business face, and why this profession requires a true calling. Discover science through the eyes of a dreamer-chemist!

Содержание

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Иллюстрации DALL-E
Обложка DALL-E

ISBN 978-5-0071-0857-7 (т. 2)
ISBN 978-5-0071-0858-4
Created with Ridero smart publishing system

Medical Disclaimer:

The author reminds readers that all materials in this book are intended solely for popular science, educational, and entertainment purposes. The professional metaphors used within are meant to explain the underlying logic of molecular functions and should not be taken as a direct guide for medical action. Governing the "Body-State," interpreting symptoms, and treating any disease must be done strictly under the supervision of a qualified medical professional — your attending physician. Never engage in self-treatment, handle your body's ecosystem with care, and always thoroughly verify the original official instructions and physical medication labels before use!

A Note to the Reader: from profession to biography

Science through the Eyes of a Visionary Chemist

Dear Reader! If you are holding this book, chances are we have already met. In the first volume, Medication as a Profession: Volume I, we took an incredible journey through the Pharmacy Megapolis. We discovered that every single tablet on the shelf has its own job, its own unique personality, and its own civic duty. We met the rugged stormtroopers known as Antibiotics from the Ministry of Defense, the polite traffic controllers called Beta-blockers from the Ministry of Transportation, and the tireless builders — the Vitamins. We learned to see the pharmacy not just as a warehouse full of boxes with confusing Latin letters, but as a living, bustling state where every drug is a certified specialist standing guard at its post.

But when the first volume wrapped up, a crucial, almost detective-like question was left hanging in the air.

Sure, we know what these molecules do for a living. But where do they come from? How do they earn their degrees? What kind of boot camps, customs inspections, and brutal exams must they survive before earning the honor of lying on a pharmacy shelf to save a life? And most importantly — what happens to them after they fulfill their duty inside the human body?

This book — the fate of a medicine: Volume II — simply had to be written. It is the completely logical, natural, and honest continuation of the first part. If Volume I was about the professions of drugs, then Volume II is their true, drama-filled biography. It is the journey of a special agent, from the very first blueprint on a supercomputer's neon screen to the final discharge train passing through the renal filters.

Throughout these pages, we will follow the entire life of a single molecule named Lofenacil. We will peek into secret design bureaus, winter over in the brutal GLP-standard training camps on mouse testing grounds, take part in a three-phase GCP clinical thriller involving real humans, and witness the cosmic sterility of GMP manufacturing plants. We will clash with the rigid bureaucracy of the Ministry of Health at the State Customs, endure the meat grinder of the liver, and finally, engage in hand-to-hand combat with disease on the front lines.

And in the grand finale, we will look into the future to meet a next-generation super-agent — "Cersi" (CAR-T therapy), whose fate is so unbelievable it will turn old pharmacology textbooks completely upside down.

This book is written without suffocating academic jargon; you will find far more everyday, human words here than complex formulas. It is designed to entertain, surprise, and make you fall in love with science. But if you are a young pharmacist just starting your journey in medicine, this metaphorical tale will serve as your ultimate field guide to the strict laws of pharmaceutical management and pharmacokinetics.

Get comfortable and pour yourself some coffee. Our special agent is already loaded into the test tube, and the patent countdown has begun. Here we go!

Chapter zero. An international tender for saviors

The Cabinet of Ministers Panics

The meeting halls of the Body-State's Cabinet of Ministers smelled of an impending storm and cortisol. Wall sensors flashed a warning crimson: a rebellion had erupted in the distant provinces — the lower lobes of the left lung. Local garrisons of immune cells were fighting heavy defensive battles, but the enemy, deeply entrenched inside the cytoplasm of peaceful cells, was systematically burning through tissues and cutting off oxygen supplies. The old, time-tested methods were useless. The enemy had mutated, studying the tactics of veteran antibiotic generals, and was now cynically mass-producing enzymes to dismantle their weapons mid-air.

"We need a new savior," the Prime Minister said dryly, tiredly rubbing the bridge of his nose. "And not just another blunt-force recruit with a club who will tear up half of our capillary highways along with the enemy. We need a surgical assassin. A stealth molecule. A special agent who can slip past all checkpoints, pinpoint a specific protein on the enemy's body, press it, and force their entire army to commit suicide."

The Minister of Finance sighed heavily, rolling a massive wooden abacus to the center of the table:

"Gentlemen, do you realize what this means? It means we are opening an international tender for the development of targeted therapy. The cost of this contract runs into billions of gold coins from our treasury. We will have to screen millions of candidates, and 99% of them will turn out to be duds or killers. Building training camps, running trials, expert evaluations… This will take ten years! Our Body-City might not survive until that day."

"Launch the tender," the Prime Minister cut in sharply. "We have no other choice."

The Science Behind It: R&D Economics and Prerequisites

In the real world, this dramatic briefing is known as identifying the Medical Need and assessing economic viability within the R&D (Research and Development) sector.

The pharmaceutical industry never creates drugs at random. The launch of any project is preceded by rigorous economic and epidemiological analysis:

1. The Rise of Resistance: Bacteria and viruses mutate constantly. The antibiotics that saved millions of lives thirty years ago are becoming ineffective today because pathogens have learned to produce protective enzymes (such as beta-lactamases).

2. Targeting (Targeted Action): Traditional medicine of the past often operated on a scorched-earth policy. A prime example is legacy chemotherapy in oncology, which destroys both the tumor and healthy, rapidly dividing cells in the bone marrow, hair, and epithelium. Modern science seeks "targeted" molecules.

They must recognize a specific defective protein or receptor while leaving healthy tissues completely untouched.

1. The Economic Barrier: Developing a single innovative drug in the 21st century costs an average of 1.3 to 2.6 billion dollars. This figure factors in the cost of thousands of failed attempts: a pharmaceutical company might synthesize 10,000 molecules and spend years working on them, yet only one will ever make it to the pharmacy shelf. The other 9,999 will prove ineffective or toxic at various stages of testing. This is precisely why the process takes about 10—12 years.

The Body's Cabinet of Ministers signed the decree. Across the globe, inside hundreds of secret design bureaus belonging to the world's leading pharmaceutical superpowers, supercomputer screens flickered to life. The finest minds of humanity opened their blueprints to engineer the ultimate biological soldier.


ГОСУДАРСТВО-ОРГАНИЗМ
КАБИНЕТ МИНИСТРОВ
ЛЕВОЕ ЛЁГКОЕ
ПРАВОЕ ЛЁГКОЕ
ЕДИНСТВО
ГАРМОНИЯ
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ВОССТАНИЕ ПАТОГЕНОВ
ОБОРОНА ИММУНИТЕТА
МЕЖДУНАРОДНЫЙ ТЕНДЕР
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Chapter 1. A birth certificate from a secrest design bureau (In which a molecule is drawn on a computer, given a tongue-twisting surname, and a merciless royal countdown begins)

A Neon Castle and a One-in-a-Million Casting Call

It all started in a secret design bureau — the laboratory of medical design. Picture a dark room, neon backlighting, and a bunch of mad biochemists spending hours spinning 3D models of complex proteins on massive screens instead of playing video games.

Their mission was to engineer a super-assassin targeting the very mutant that had sparked the rebellion in the Body-State's lungs. A tiny keyhole — a specific receptor protein — had been discovered on the mutant's surface. Insert the right key into this lock, and the mutant triggers its own self-destruction.

"Alright, boys, let's roll," the chief designer said, rubbing his hands together.

The computer initiated virtual screening, which is essentially a high-speed Tinder for molecules. The neural network began sorting through millions of random chemical compounds at machine-gun speed, trying to virtually "try them on" the enemy's lock.

Most candidates looked ridiculous: some were too fat to squeeze into the keyhole, others were too crooked, and some behaved so aggressively they tried to crash the computer itself. The screen flashed red: "Miss! Miss! Swipe next!"

Then, somewhere around the ten-millionth attempt, the system let out a victorious beep. A sleek, flawless benzene structure with a stylish tail of fluorine and nitrogen atoms spun onto the screen. It slipped into the receptor lock like a glove — click!

"There she is, our Golden Bullet!" the scientists shouted, rushing to pop open the champagne.

The molecule was born.

The Registry Office and the Royal Countdown

Celebrating is well and good, but in the Realm of Medicine, you are nothing without proper paperwork. The scientists carefully secured the newborn molecule inside a test tube and dashed off to the patent office to secure a Birth Certificate (Patent).

"Alright," a tired clerk at the window yawned. "Got a name for the kid?"

"We do! Let's call him… N-methyl-N- (4-trifluoromethylphenyl) aminopropane!"

"Are you out of your minds?" The clerk gestured wildly to his head. "The kids on the block will mock him. Pharmacists will twist their tongues. Give him a proper International Nonproprietary Name (INN) so the whole world knows his clan and lineage. Let's go with Lofenacil, for example."

"Deal!"

The clerk slammed a heavy royal stamp onto the documents and looked at the scientists with sympathy:

"Congratulations. The patent is granted for exactly 20 years. From this moment on, no one else in the world has the right to copy your Lofenacil. You are his sole parents and producers. But remember: the clock is already ticking."

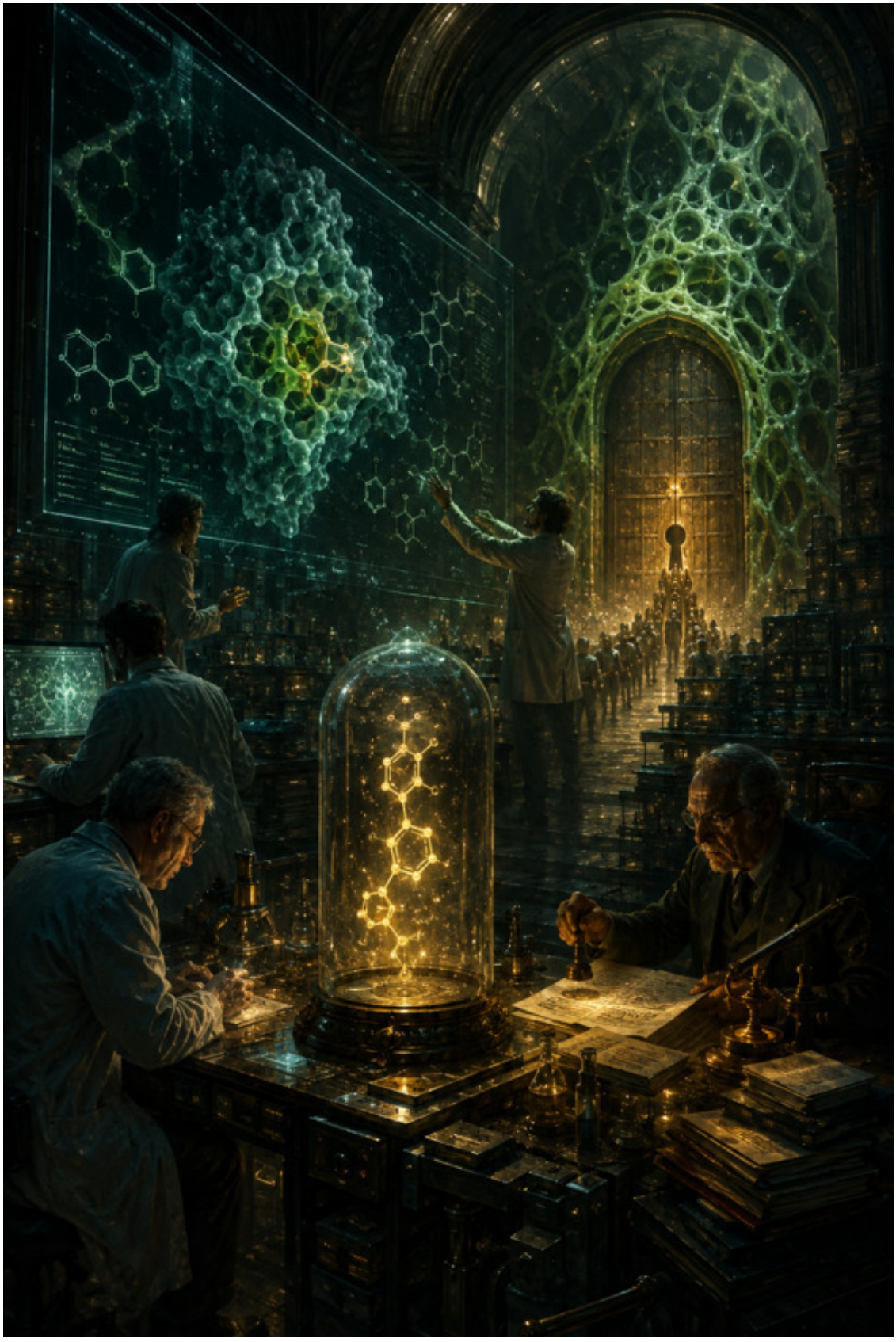
And that is when a mild panic hit the scientists. Royal law is unyielding: the 20-year patent protection begins evaporating the very day the molecule is born, while it is still lying "in its cradle" (the test tube). Lofenacil does not even know how to walk yet, remains untested in battle, and has zero clues about how a living body operates.

A long, hellish education lies ahead: the school of preclinical testing grounds and the university of human clinical trials. All of this will devour some 10 to 12 years!

“Wait, what does that mean?” the chief chemist calculated in his head. “By the time our Lofenacil finally graduates, passes all his exams, gets a proper passport-instruction manual, and lands a job on a pharmacy shelf… we will only have 7 or 8 years left to sell him and recoup the billions spent on his upbringing?!”

“Exactly,” the clerk smirked. “And the moment those 20 years run out, his patent protection burns to ash. A horde of pirate-generics will flood the market. They will copy your formula for free and sell Lofenacil on every street corner for pennies. So shake a leg and send the boy to the army!”

The test tube containing Lofenacil was carefully packed into a thermal bag. Ahead lay his very first nightmare — a maximum-security boot camp designed to test his resolve.



Chapter 2. The safety testing ground: the first survival academy (In which a molecule is pushed to its absolute limits under the GLP standard, mice are thrown at it, and scientists seek that fine line where benefit ends and disaster begins)

"Holy Sterility" Training Camp

And so, our Lofenacil arrived at a secret testing ground operating under the code name GLP — Good Laboratory Practice.

If you picture a cozy, ordinary lab filled with polite people, forget it. This is a harsh, maximum-security boot camp for newborn molecules. Everyone here walks around in identical white hazmat suits, breathes through filters, and a single undocumented sneeze in the logbook can get you discharged. The golden rule here is simple: if it is not on paper, it never happened in nature.

The drill instructor running the show was a gray-haired professor with a permanent stopwatch hanging around his neck. He looked through the glass of the test tube at Lofenacil with disdain.

"Well, you molecular juvenile, you think just because you spin around beautifully on a computer screen, you're ready to save the world?" the instructor boomed. "On screen, you're all Shakespeare, but in reality, you're toxic garbage. We're going to test your character. Team, bring out the Petri dishes, let's give the recruit an In vitro test!"

In vitro is Latin for "in glass". Lofenacil was poured right out of his test tube onto a cluster of isolated living cells cultured by scientists on a special gel.

"Alright, show us how you bind to a target!" the instructor yelled.

Lofenacil did not disappoint. He swiftly leapt onto the defective proteins of the rebelling cells and blocked them. The scientists behind the glass nodded approvingly, but the instructor merely smirked:

"Fine, you know how to shoot at stationary targets. Now let's see how you handle real chaos. Welcome to the In vivo stage! Bring out the mice!"

The Mouse Special Forces and Lofenacil's Quirks

In vivo is when a molecule is dropped into a fully functioning, living organism. For this purpose, GLP labs employ an elite mouse special forces unit — sterile white mice.

Lofenacil was given at a minimal dose and injected directly into a mouse's bloodstream. Our agent was stunned. On the computer, everything had been orderly and elegant. In reality, Lofenacil found himself plunged into a roaring torrent of plasma, where massive red blood cells rushed past, immune cells swore, and foreign proteins flew at him from every direction. Yet, the boy found his bearings: he swam to the mouse's lungs, located the flashpoint of inflammation, and skillfully restored order. The mouse did not even sneeze — it just kept running on its wheel.

"Hmm, it works," the instructor grunted. "Now let's check how greedy and unhinged our Lofenacil can get. Crank the dose up tenfold! Let's see where his Therapeutic Window lies."

Roughly speaking, the therapeutic window is a safe corridor for maneuvering. It is the distance between the "effective dose" (when the medicine begins to help) and the "toxic dose" (when the patient kicks the bucket from that same medicine).

The scientists began pampering Lofenacil, pouring him into the mice by the handful. At double the dose, the mice felt perfectly fine. At five times the dose, their ears grew a little itchy. At ten times the dose, the poor rodents started hiccuping and fainting because Lofenacil, in his foolish enthusiasm, blocked not only the bad protein in the lungs but also a couple of good proteins in the liver.

“Aha!” the instructor shouted triumphantly, logging the data into his tablet. “There are your hidden quirks! Write this down, team: if someone gobbles up too much Lofenacil, he turns into a toxic villain. Remember this number, scientists. This is the upper limit of our therapeutic window. One step to the left, one step to the right, and instead of saving a life, Lofenacil turns the body into a graveyard.”

Конец ознакомительного фрагмента.