



"The Future Without Antibiotics: A Wake-Up Call"

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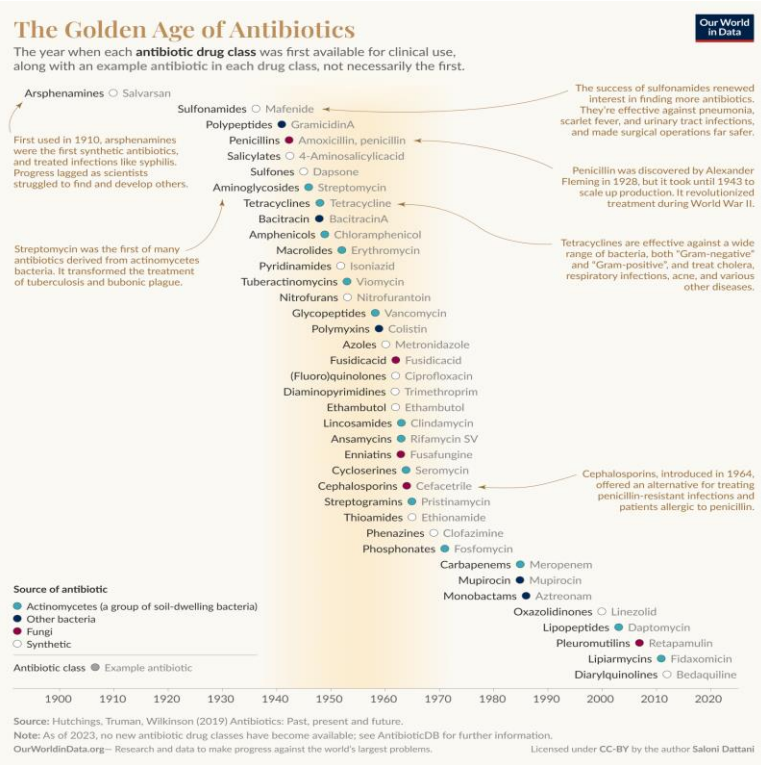
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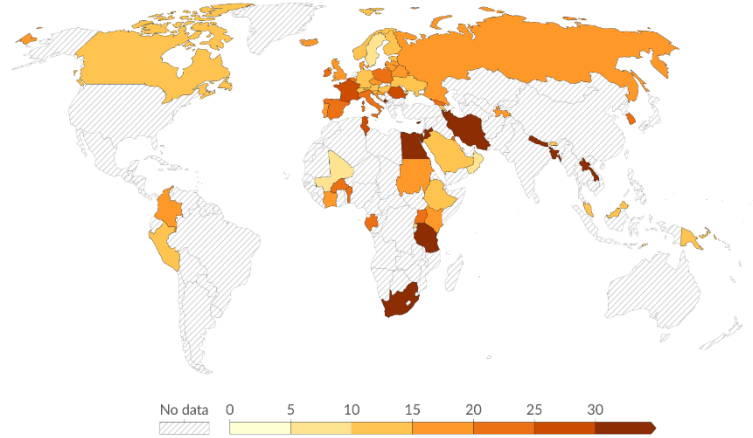
INTRODUCTION

Antibiotics development and current patterns of usage



Antibiotic consumption rate, 2022

Reported volume of antibiotics used per 1,000 people per day, measured in defined daily doses¹. Countries may report data from different sources, including insurance claims, import records, hospital prescriptions, and wholesale data.

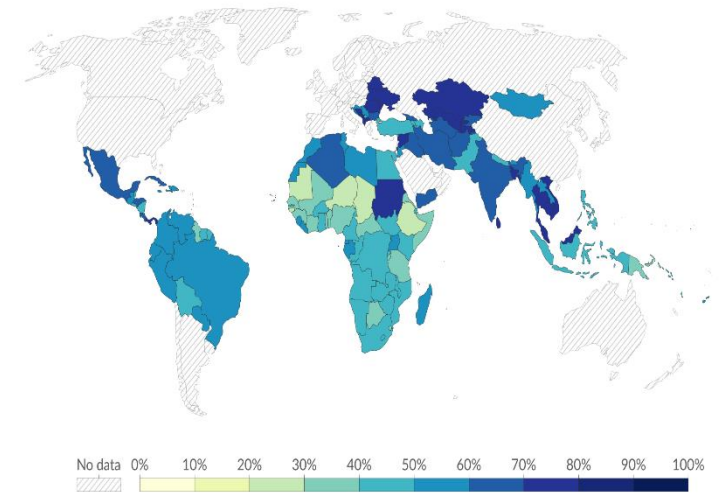


Data source: WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) (2024) OurWorldinData.org/antibiotics | CC BY
 Note: Only shown for countries reporting to the WHO's GLASS system to track antimicrobial usage and resistance.

1. Defined Daily Doses Defined Daily Doses (DDDs) are standardized units to compare the volumes of different medicines. One unit represents the typical number of doses taken by an individual per day, to treat a particular condition. For each medicine, the main condition it is used to treat is taken as the reference. Thus, five DDDs corresponds to the total amount of a medicine typically used in a day by five people. DDDs per 1,000 people are adjusted for the population size. This helps compare the consumption of medicines of different types.

Share of children with symptoms of a respiratory infection who received antibiotics, 2018

The reported share of children under five years old, with symptoms of lower respiratory tract infection, who received antibiotics for this illness, as reported by their caregiver.



Data source: DHS; UN MICS; Browne AJ et al. (2021)

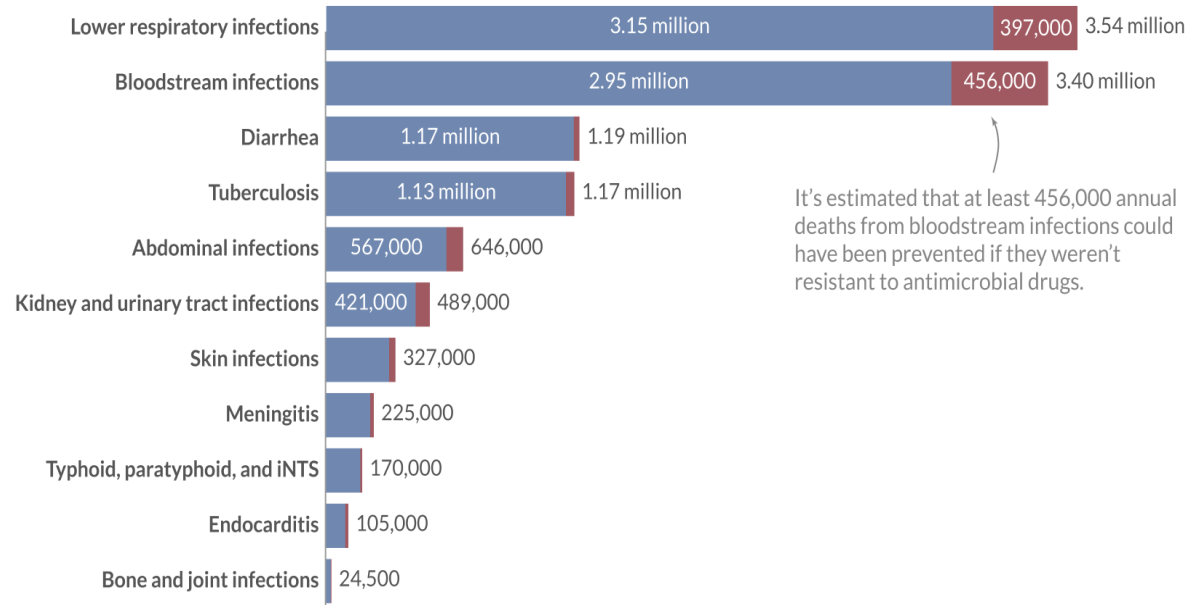
OurWorldinData.org/antibiotics | CC BY

Global deaths from infectious disease syndromes, broken down by antimicrobial resistance



Annual data for 2021. Estimates are based on models of causes of death, infection types, pathogens, resistance levels, and their impact on infection duration and complications. Estimates are limited by poor data collection in many regions.

■ Attributed to antimicrobial resistance ■ Not attributed to or not assessed for antimicrobial resistance



It's estimated that at least 456,000 annual deaths from bloodstream infections could have been prevented if they weren't resistant to antimicrobial drugs.

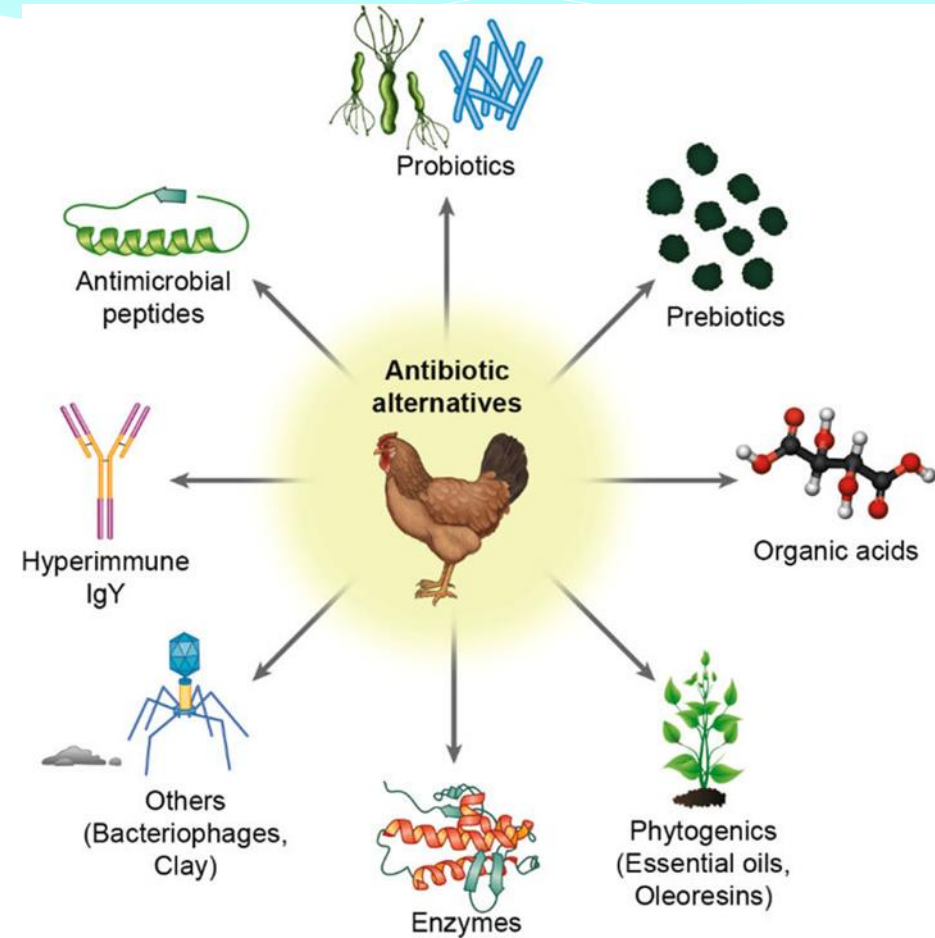
Data source: Institute for Health Metrics and Evaluation (IHME); University of Oxford (2024) OurWorldinData.org/antibiotics | CC BY

Note: Deaths can be caused by multiple syndromes, so the sum of deaths attributed to each syndrome shown here can exceed the total number of deaths.

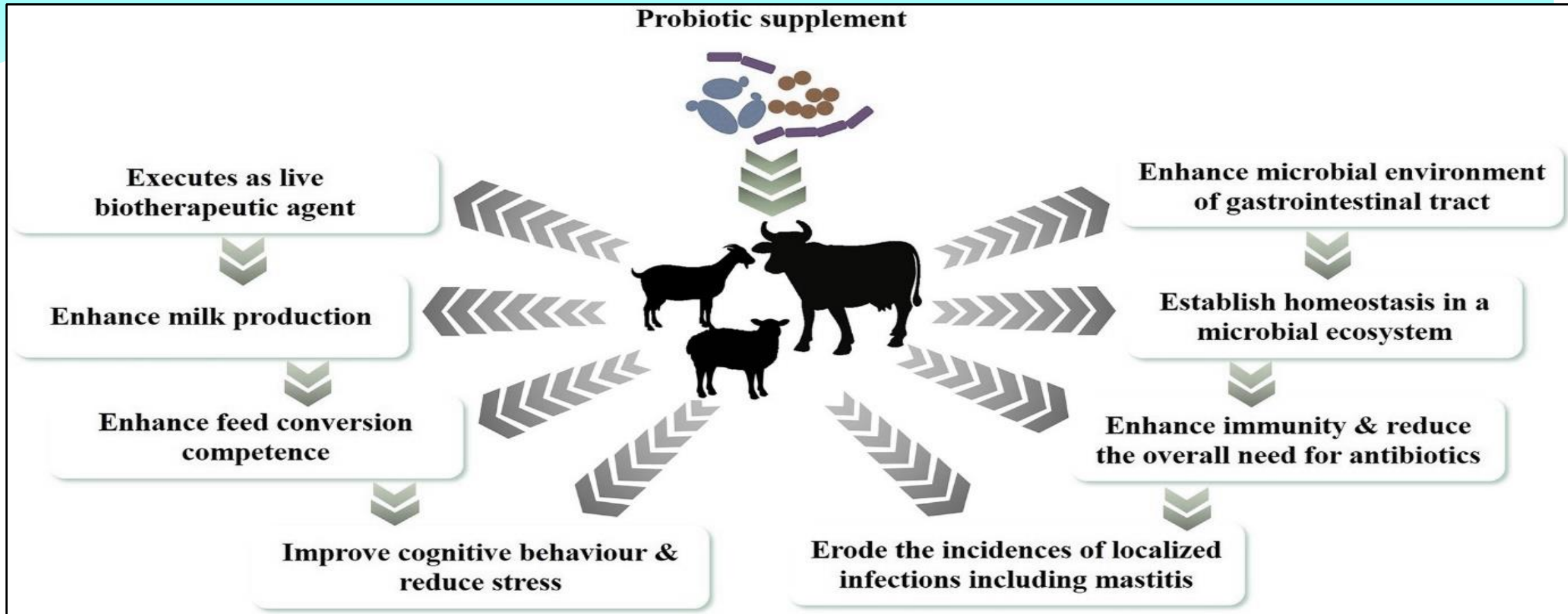
INTERVENTIONS



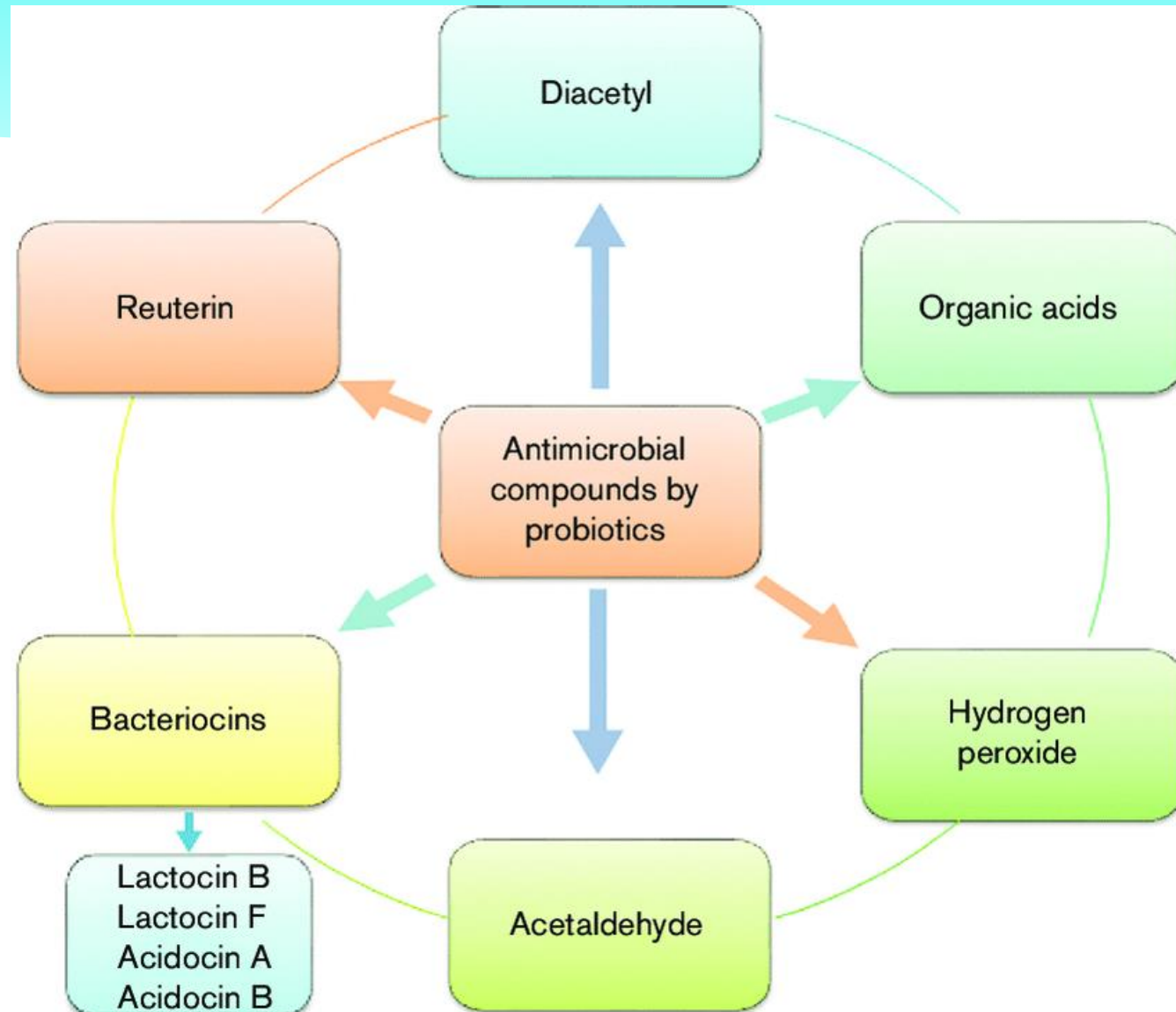
REDUCING ANTIMICROBIAL RESISTANCE



“Probiotics are live microorganism which, when administered in adequate amounts8 confer a health benefit on the host”(FAO/WHO)



Why do probiotics exhibit antibiotic- like properties?



Mongolian probiotic formulations and indigenous strains

✓ Probiotic formulation technology



ANGIRKHAN

A technology has been developed for a probiotic-enriched formulation containing 11.25% total protein, nine essential minerals (Al, Ca, Cu, Fe, K, Mg, Mn, Na, and P), and a combination of *Lactobacillus casei*, *Lactobacillus fermentum*, and *Lactobacillus plantarum* at a concentration of no less than 3×10^8 CFU/mL. This formulation is intended to enhance the immune status of neonatal and juvenile livestock, promote growth, and prevent and treat gastrointestinal infections.



“MONSUBTIL”

This probiotic formulation contains *Bacillus subtilis* C2-7c, isolated from the gastrointestinal tract of grazing sheep, at a concentration of 3×10^8 CFU/g and 40% total protein. It is designed to regulate the balance of intestinal microbiota in neonatal and juvenile livestock and to promote growth by enhancing enzymatic activity.

✓ Indigenous probiotic strains



Strains of lactic acid bacteria isolated from goat colostrum: *Lactobacillus casei* 1ca, *L. helveticus* 11h, *L. fermentum* 17f, *L. plantarum* 23p, and *L. delbrueckii* subsp. *bulgaricus* 48d."



"Strains of propionic acid bacteria isolated from the ruminant digestive tract: *Propionibacterium acidipropionici* and *P. acnes*."



Strains of carotenoid-producing *Flavobacterium* spp. isolated from the ruminant digestive tract.



Bacillus subtilis c2-7c

Antagonistic activity of probiotic strains

№	Indigenous probiotic strains	The extent of growth inhibition of pathogenic strains and the formation of the inhibition zone (mm)			M±m
		<i>E.coli</i> 10963	<i>Sal.</i> 14028	<i>S.aureus</i> 5695	
1	<i>L.helveticus</i> 11h	22	25	23	23.3±2
2	<i>L.plantarum</i> 23p	26	25	24	25±1
3	<i>Propionibacterium acidipropionici</i> - Prop. acid2	24	23	22	23±1
4	<i>Propionibacterium acnes</i> - Prop. acnes4	22	23	22	22.3±0.5
5	<i>Flavobacterium</i> spp.F5	27	12	31	23.3±3.5
6	<i>Flavobacterium</i> spp.F69	26	12	28	22±3
	M ±m	24.5±2	20±6	25±3.6	

Table 1. Results of the antagonistic activity of probiotic strains used in the study against intestinal pathogens



Figure 2. Antagonistic activity of indigenous lactic acid bacterial strains.



Figure 3. Antagonistic activity of indigenous propionic acid bacterial strains

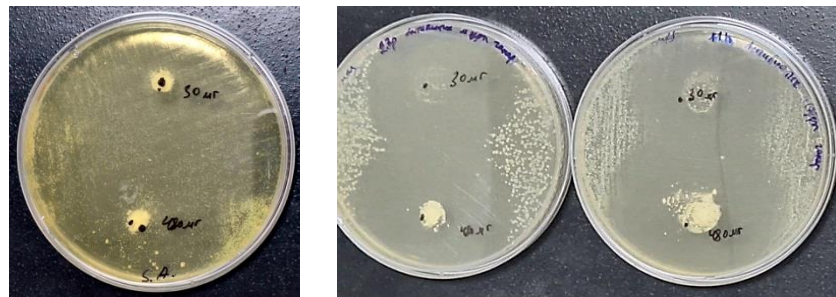


Figure 1. Antibiotic susceptibility of *E. coli* and *S. aureus* to Bimodine bolus

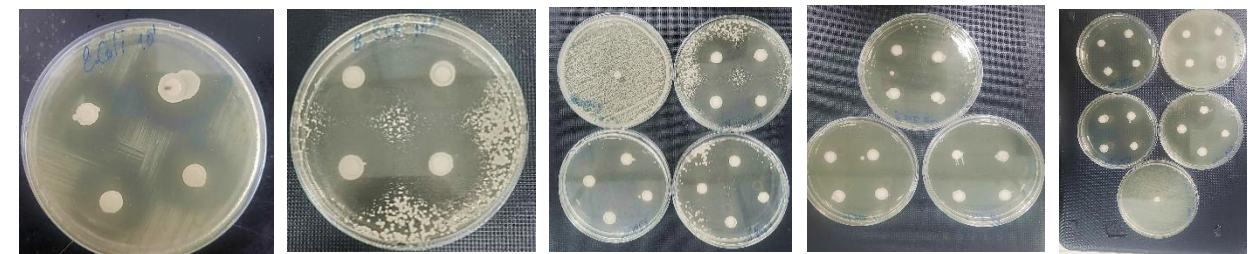


Figure 4. Antagonistic activity of indigenous *Flavobacterium* spp. strains.

Effect of probiotic treatment in calves exhibiting diarrhea symptoms

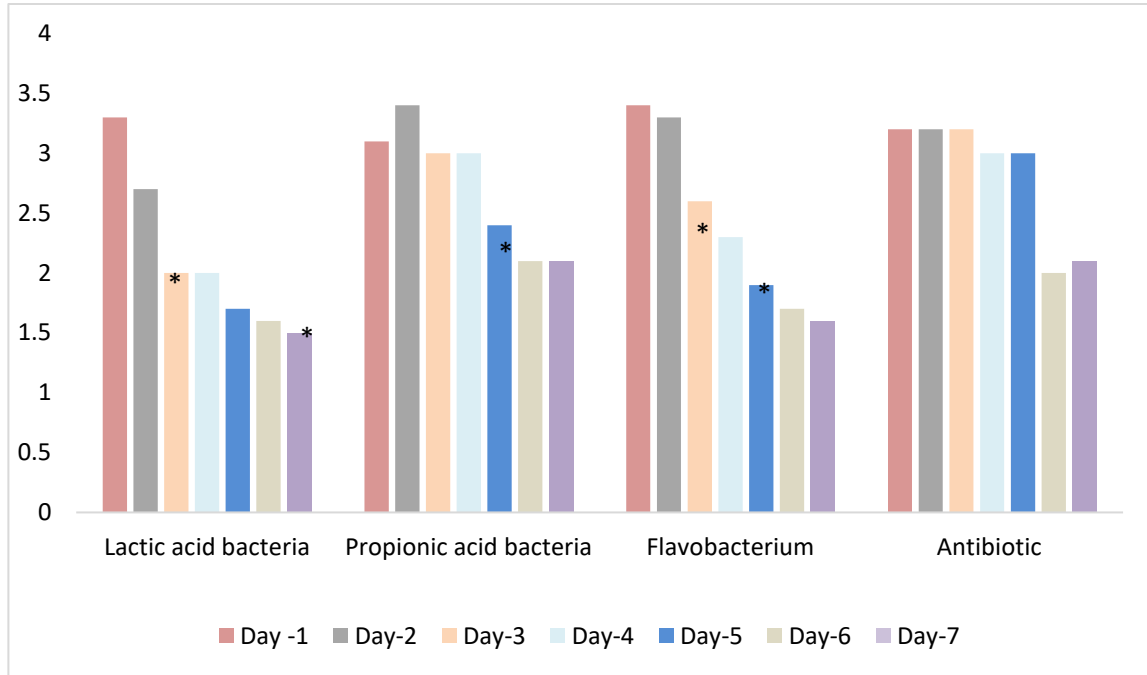


Figure 9. Consistency of calf feces before, during, and after treatment

Graph 1. Evaluation of calf feces during the experimental period (by day)"

Legend: 1 – normal solid, 2 – soft, 3 – very loose, 4 – watery

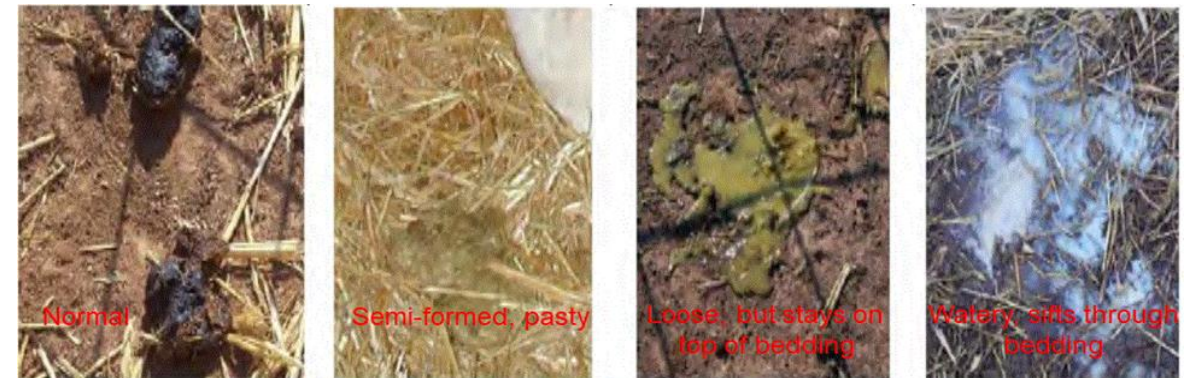


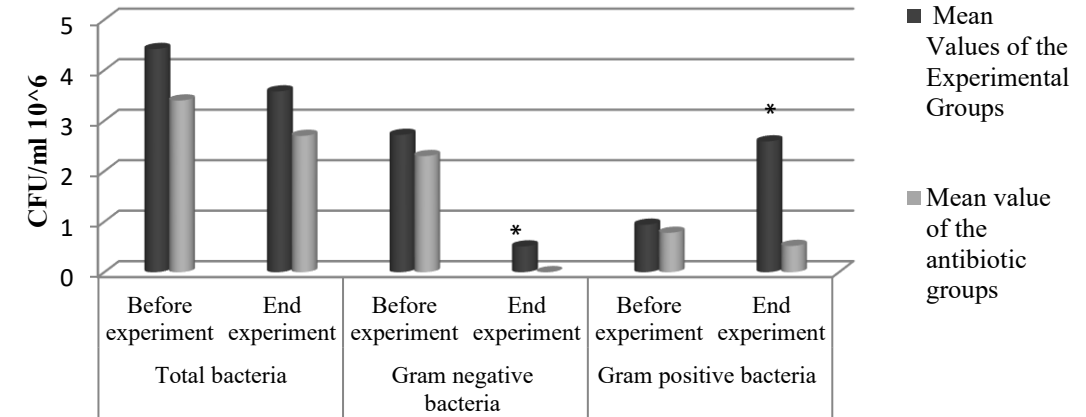
Figure 10. Calf Health Scoring Guide Created by the University of Wisconsin-Madison School of Veterinary Medicine

Bacteriological analysis of calf feces:

№	Group	Farm 1			Farm 2		
		Total Bacteria CFU/ml x 10 ⁶	Gram negative bacteria CFU/ml x 10 ⁶	Gram- positive bacteria CFU/ml x 10 ⁶	Total Bacteria CFU/ml x 10 ⁶	Gram negative bacteria CFU/ml x 10 ⁶	Gram- positive bacteria CFU/ml x 10 ⁶
1	<i>Lactic acid bacteria</i>	2.79	*0.3	*1.6	*2.6	*0.2	*2.24
2	<i>Propionic acid bacteria</i>	4.0	1.8	*1	*4.8	1.8	*2.02
3	<i>Flavobacterium spp.</i>	3.1	*0.2	*2.8	*3.7	*0.6	*3
4	<i>Antibiotic</i>	2.4	1	0.45	3	1.2	0.6
	<i>Before experimental</i>	4,3	2,7	0,79	4,1	2,5	1,05

(*p<0.05)

Table 5. Bacteriological analysis of calf feces before the experiment, prior to treatment, and at the end of the trial



Graph 2. Total bacterial counts and counts of Gram-positive and Gram-negative bacteria in calf feces

“Use antibiotics wisely today, embrace alternatives, and protect tomorrow’s health”

“Өнөөдөр антибиотикийг ухаалгаар хэрэглэж, альтернатив боломжуудыг ашиглаж маргаашийн эрүүл мэндээ хамгаалаарай”



Thank you for your attention

