Expansion of Monophasic Salmonella Typhimurium in Strategic Areas of Brazilian Pig Farming.

Expansão da Salmonella Typhimurium Monofásica em Áreas Estratégicas da Suinocultura Brasileira.

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Brazil is a global leader in pig farming, with over 90% of production concentrated in the South, Southeast, and Midwest regions. Despite advancements in biosecurity and sanitary practices, *Salmonella* spp. infections remain a major concern for public health and the swine production chain. Among the more than 2,600 known serovars, *Salmonella Typhimurium* and its monophasic variant (1,4,[5],12:i:-) are especially relevant due to their zoonotic potential, environmental persistence, and association with multi-drug resistance. The monophasic variant, increasingly reported worldwide, is linked to clinical diseases such as septicemia and enterocolitis in pigs during the nursery and growing phases. Its high isolation rate from carcasses, lymph nodes, and byproducts indicates widespread contamination from farm to slaughterhouse. The presence of resistance genes for tetracyclines, aminoglycosides, and sulfonamides further emphasizes the need for integrated control strategies. This study involved samples from pigs in Brazil's major pig-producing regions collected between 2020 and May 2025. Tissues from the respiratory, hepatobiliary, and gastrointestinal systems were analyzed at the MicroVet Veterinary Diagnostic Laboratory. *Salmonella* spp. were identified using MALDI-TOF mass spectrometry, conventional serotyping, and PCR. The data were used to evaluate the distribution of *S. Typhimurium* and its monophasic variant across regions, years, and swine organ systems. The results show a clear shift in the prevalence of serovars over the past five years, with a sharp rise in the monophasic variant, which accounted for 99.7% of all *S. Typhimurium* isolates. In contrast, the classic *S. Typhimurium* serovar showed a declining trend: it was most prevalent in 2021 (43.4%) but dropped to 15.2% in 2024 and just 1.4% by May 2025. Geographically, 72.8% of isolates were from the South, followed by 14.5% from the Southeast and 12.7% from the Midwest. While this reflects regional production volumes, it may also indicate differences in biosafety practices, pig density, and production systems. In some southern slaughterhouses, *S. Typhimurium* appears in up to 30% of carcasses and waste, with increasing monophasic strain prevalence and antimicrobial resistance. Similar patterns are found in Southeast agro-industrial facilities, while the Midwest shows higher prevalence of both *Typhimurium* and *Derby* serovars, relevant for regional surveillance. Regarding organ type, intestinal samples had the highest isolation rate (69.3%), with a 99% dominance of the monophasic variant. Hepatobiliary tissues had a lower prevalence (6.42%). These findings reinforce the gastrointestinal origin and food safety relevance of *S. Typhimurium*. Additionally, 23.9% of isolates were from respiratory tissues, and 97.7% of these were monophasic, suggesting systemic bacterial spread and aligning with past reports of extraintestinal infections in clinically ill pigs. In conclusion, the monophasic variant of *Salmonella Typhimurium* has become the dominant strain in Brazil's pig farming industry, demonstrating its adaptability, resistance, and capacity to cause systemic disease. This scenario underscores the urgent need for integrated

monitoring, diagnostics, and control strategies, such as the development of autogenous vaccines, to reduce animal health risks and ensure food safety.

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Table 1. Relationship between sample type and the isolation of Salmonella Typhimurium in pigs between 2021 and 2025 in the main producing regions of Brazil.

Serovar	Sample Type by Isolation	Isolations per year					
		2021	2022	2023	2024	2025	Total
S. Typhimurium (1,4[5],12:i:-)	Enteric sample	228	155	53	59	1	496
	Hepatobiliary sample	21	10	6	9	0	46
	Respiratory sample	61	38	25	39	5	168
S. Typhimurium (1,4,[5],12:i:1,2)	Enteric sample	0	0	0	1	1	2
S. Typhimurium (1,4[5],12:-:1,2)	Respiratory sample	0	0	0	1	3	4
	Enteric sample	1	0	0	0	0	1
Total		311	203	84	109	10	717

Table 2. Quantitative isolation of Salmonella Typhimurium in pigs between 2021 and 2025 in the main producing regions of Brazil.

Year	Brazilian regions			
	Southern region	Southeast Region	Central-West Region	Total
2021	246	40	25	311
2022	134	28	41	203
2023	54	11	19	84
2024	81	24	4	109
2025	7	1	2	10
Total	522	104	91	717