The battle over milk: consumption, public health and the industrialization of the milk supply in São Paulo, 1911-1945

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Abstract

In 1911, the city of São Paulo decided to modernize its milk supply system by opening up the import market for industrially pasteurized milk. But the industrial product was widely rejected, creating even more demand for raw milk produced in small barns under potentially unsafe conditions. This study examines how public authorities handled the double challenge of both minimizing the health risks of raw milk and helping to improve the industrial product, over the course of three decades. The article ends with an analysis of the effects of mandatory pasteurization, introduced in 1939, which equated to a ban on the sale of raw milk in the city of São Paulo.

Keywords: history; São Paulo (city); milk supply; hygiene safety; state regulation.

Sören Brinkmann[i]

[i] Professor, Willy Brandt Center for German and European Studies/ University of Wroclaw.
Wroclaw – Poland

orcid.org/0000-0002-1413-323X

sorenjens.brinkmann@uwr.edu.pl

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The milk question in São Paulo

The specialized literature shows that early in the twentieth century the city of São Paulo was able to set up an efficient regime of tuberculin testing[1] and mandatory slaughter of dairy cows, in order to eradicate bovine tuberculosis from the local herd and thus protect urban consumers, most of whom were babies and newborns, from the dangers of contracting the terrible disease from milk. However, the actual implementation of this regime was preceded not only by massive protests from the owners of the cows, the so-called *vaqueiros*, but also by scientific doubts raised within the international medical community that called into question the theory of the transmissibility of the bovine variant of the bacillus and thus the usefulness of the measures in place.[2] The subsequent debate within the São Paulo Society of Medicine and Surgery, the city's top health authority, however, culminated in 1903 with a clear vote in favor of the measures the city had adopted (Ribeiro, 1991, p.151; Antunes et al., 2002, p.618). Consequently, the City Council decided to resume the testing campaign and to reinforce the section in charge of milk inspection, led by the veterinarian Epifanio Pedrosa, with four additional assistants and an isolation hospital for suspected cases. In addition, a compensation of one hundred *réis* for each cow that tested positive was guaranteed to the cow owners. This last measure was crucial for convincing the *vaqueiros* to obey the law and take infected animals to the slaughterhouse instead of secretly selling them off in nearby towns, as had been common practice in previous years. Given this context, Pedrosa's statement in 1904 to the São Paulo Anti-Tuberculosis League that the milk sold in São Paulo was no longer at risk of carrying the "Koch bacillus" (Mota, 2005, p.133; Brinkmann, 2020, p.78-80) was no exaggeration.

However, the following years would show that this advance in health safety was merely a temporary solution. On the one hand, the regime in place only eliminated the danger of tuberculosis, although there were many other risks of microbial contamination of raw milk in its long journey from the cow's udder to the consumer. Furthermore, thanks to the continual expansion of the herd and the arrival of new dairy cattle from the interior, it was not possible to eradicate tuberculosis from urban barns completely. In other words, the campaign for testing and slaughtering infected animals became a permanent measure that proved especially costly for the cattlemen with predictable consequences for milk prices. Because compensation payments only covered a small part of the economic losses they incurred with every cow put down, while the rate of infection in barns remained around 16% (Relatório..., 1909, p.27, 1911, p.23). It is not surprising, therefore, that in 1910 the Italian-born Doctor Antonio Carini (1872-1950) warned that in his opinion, high milk prices were contributing to high infant mortality, since many poor families could not afford to buy milk anymore (Carini, 1910, p.466). Moreover, given São Paulo's rapid economic and demographic growth, a system of milk production that relied on an infinite number of micro-producers with unhygienic methods was simply not adequate for the level of development of the flourishing metropolis. And it is also worth adding that the city was surrounded by a vast rural hinterland with an infinite agricultural potential for producing clean milk and other dairy products. In this sense, for example, the well-known pediatrician Clemente Ferreira (1857-1947) argued against "*vaqueiro* milk" and, at the same

time, advocated a reorganization according to the milk supply system of the Argentine capital, where since the end of the nineteenth century several large dairy companies had emerged that used modern technologies and the scale effect to offer a product that was hygienically safe and affordable (Silva, Ferreira, 1910).

In 1911 – only a year later – the São Paulo City Council took the first step toward restructuring the milk supply system along the lines described above. Thus, a new municipal law ended the cattlemen's previous commercial monopoly[3] and opened up the city's market for industrially "sanitized" milk "from other municipalities" (São Paulo, 21 nov. 1911). As the council minutes show, this initiative arose not only in response to hygiene arguments, but also to the commercial interests of three new dairy companies from the city's hinterlands, which had petitioned for free access for their products on the São Paulo market (Correio Paulistano, 8 nov. 1911). However, it is worth pointing out that rather than resolving the milk question in favor of the industrial product, the new law led to a heated and long-lasting commercial struggle between pasteurized and raw milk, whose health implications would pose an enormous challenge to the authorities of São Paulo for more than three decades. The reasons for this unexpected result must be sought, above all, in the quality defects of the industrial product and its subsequent rejection by a large fraction of consumers in São Paulo. The consequence was that their buying preferences guaranteed the survival of urban barns as an important source of the city's milk supply. Thus, even by the mid-1930s, *vaqueiro* milk – some fifty to sixty thousand liters a day – met almost half the total demand for liquid milk in the city of São Paulo (Frensel, 1935, p.15).

Starting with the 1911 law and its consequences, this study aims to deepen examination of the milk question in São Paulo by reconstructing the process of state regulation of the dairy business up until the introduction of mandatory pasteurization in 1939. This last decision equated to a complete ban on the sale of raw milk in the city of São Paulo and thus serves to close the time period studied in this analysis. It is worth highlighting that in practice from 1911 on – encouraged by the rapid growth of the population – São Paulo authorities opted for an industrial solution to the milk question in the city. However, the flaws in the industrial supply system, along with the persistence of a large number of urban barns, emerged as a double challenge for the authorities who had both to minimize the health risks of locally-produced raw milk and also to jump-start the process of improving the industrial product. Pursuing both objectives in the context of an ever-growing dairy market required not only a considerable capacity for administration and intervention, but also expanding the radius of action for the authorities in charge, as the city's dairy supply area grew. The historical reconstruction of "milk policies" in São Paulo throughout the period defined above shows two fundamentally different phases. In the first phase, administrative inaction predominated, due obviously to the municipal authorities being overwhelmed by the magnitude of the problem. As control of the dairy business was transferred to the state government in 1931, however, a second phase began, marked by rapid expansion and professionalization of the responsible bodies and rigid interventions in all ambits of the dairy sector. This commitment on the part of the São Paulo state government simultaneously served as a justification for the city's definitive transition to a milk supply system that was exclusively industrial.

It must be emphasized that unlike the traditional "dairy countries" of the northern hemisphere, in Brazil the history of milk as a food along with its multiple health, agricultural and commercial implications has not so far received the attention it deserves from researchers. As a result, for the issues examined here, the contributions from specialized literature are very limited. Therefore, this study is based almost exclusively on a corpus of primary sources of various types, such as municipal and state legislation as well as annual reports and minutes from the Municipal Council sessions, which were substantially enriched by articles in specialized journals and the daily newspapers of the era. This corpus of documents is the fruit of a systematic search of different archives and libraries in São Paulo.

The "milk war" in São Paulo and its consequences

Although concrete data is missing, everything indicates that opening the São Paulo market to pasteurized milk, in November 1911, had immediate effects. Before the Municipal Council could formulate a decree regulating the new business, the three dairy companies mentioned above reserved import licenses and opened up sales outlets in the city.[4] The rapid initial success of the imported milk, which was obviously sold at much lower prices than the locally-produced milk, was reflected above all in the reaction of the *vaqueiros*. Already in December of that same year, the City Council received a petition demanding a higher compensation for the slaughter of milk cows infected with tuberculosis. The petition alleged that the cattlemen were suffering economic discrimination in comparison to industrial competitors from outside, due to the regime of mandatory slaughter. However, after long deliberations lasting over a year, in which the hygiene and justice commissions testified, the Council eventually rejected the petition (Anais… 15 dic. 1911, p.474 y s., 24 ene. 1913, p.13-15). Shortly thereafter, in April 1913, an article appeared in the well-known daily paper *O Estado de S. Paulo* (20 abr. 1913, p.10), signed by the United Cattlemen's Society (Sociedade União dos Vaqueiros), an association founded recently by the dairy producers of the city. It highlighted the rigorous sanitary measures of locally-produced milk, which they claimed guaranteed "a healthy and robust product," whilst simultaneously casting doubt on the quality of the pasteurized product thanks to the lack of rules and oversight by the city authorities.

Open conflict broke out in January 1914, when a recently-elected Municipal Council began its term by promising it would solve the milk question through new regulations for all kinds of dairy business in the city. All eyes at that point were on the physician and agronomist Carlos Botelho (1855-1947), whose popularity and considerable administrative experience made him seem the ideal man to find a solution. However, before the Hygiene Commission of the City Council, which he directed, could start work on the issue, a wave of protest broke out in the daily press against pasteurized milk. Under the headline "The people must not let themselves be deceived. It is important to distinguish good milk from bad" (A Capital, 6 ene. 1914, p.1), an endless spate of articles were published every day for several months, painting a scandalous picture of the three dairy companies from the interior. The accusations included using milk from sick cows, using faulty machinery and

toxic preservatives, deceiving customers by passing off watered-down, poorly preserved, acid milk, and the generic reproach that pasteurized milk contributed to rise in infant mortality (A Capital, 20 ene. 1914, 27 ene. 1914, 13 feb. 1914, 14 feb. 1914, 20 mar. 1914, 14 abr. 1914, 16 abr. 1914).

What had begun as a partisan campaign that only served the cattlemen's interests soon morphed thanks to the intervention of figures whose authority was irrefutable. In October 1914, the director of the municipal milk inspection, Epifanio Pedrosa, confirmed many of the accusations leveled at the three dairy companies in a detailed interview with *A Capital* (31 oct. 1914, p.2) in which he stated, furthermore, that "the intervention of friends and politicians [as well as] the protection and narrowness of the [current] criminal law do not permit us to exercise very rigorous control." Input from doctors probably had even more impact on São Paulo consumers. Thus, for example, the physician Eduardo Rodrigues Alves (1915, p.5) wrote in the *Annaes Paulistas de Medicina e Cirurgia*: "Permitting the import and sale of milk that is clearly inferior, in competition with the milk produced in the municipal district of the capital with direct oversight from public authorities, was certainly a grave error ... Thus the bad product shortly began outselling the good one and ... it virtually dominates the market."

Particularly noteworthy seems that Clemente Ferreira (1857-1947), the pediatrician mentioned earlier as a fierce advocate of rapid industrialization of the city's milk supply, was forced to express a radical change of opinion. In a long article published in *Brasil-Médico*, the most relevant Brazilian medical journal of the time, Ferreira (1914, p.196) concluded categorically: "For the nutrition of children, for artificial feeding of infants, until progress is made we will advise [using] milk produced in dairy barns in the capital, where there is more direct monitoring of cattle health, milking and retail sales."

Given the enormous public attention generated by the milk question at this time, the City Council's reaction was surprising. In June 1915, a year and a half into his term, and having failed to come up with any concrete proposals, Carlos Botelho resigned as director of the Hygiene Commission and withdrew completely from public life. Soon afterwards the Council passed an unusually terse decree that – rather than setting new rules for the pasteurized milk business – merely corrected a few technical errors in the 1911 law (São Paulo, 26 ago. 1915).[5] The practical result of this retreat on the part of the authorities was to give carte blanche to the dairy companies to continue business as usual and follow their own judgment. The available sources do not permit us to ascertain the causes of such conduct on the Council's part. However, it needs to be highlighted that it was not the dairy companies that profited the most from this outcome. Instead, everything indicates that the smear campaign against pasteurized milk, supported by some prominent doctors, combined with the real quality and taste advantages of the cattlemen's milk, had a decisive impact on the behavior of a large fraction of São Paulo consumers. Official statistics show that in the years following the conflict, pasteurized milk consumption stagnated in the city, whereas milk production in the municipal district saw an impressive expansion. In 1920, when total liquid milk consumption in the city reached around 55 thousand liters a day – over twice what it had been in 1910 – around forty thousand liters, meaning 70%, came from urban barns (Relatório..., 1919, p.88, 1921, p.XXIX-XXXI).

This huge increase in milk production was of course accompanied by the proliferation of new barns and a huge growth in the cattle herd, which in turn caused serious difficulties for the city's authorities. According to the new director, veterinarian Mariano Cursino de Moura, in 1920 the municipal milk inspection was still only functioning with four assistants, who were in charge of health monitoring for a growing number of dairy producers in the hinterlands, around three hundred stores in the city and a veritable army of one thousand two hundred street vendors. But what concerned Moura the most at that point was the struggle against bovine tuberculosis. Because, due to the lack of staff, it was not possible to carry out more than eight hundred tuberculin tests a year, whereas the dairy herd in the municipal area had reached a total of twelve thousand cattle. Furthermore, there was clear evidence that the dreaded disease was still spreading in the city's dairy sheds, with an average infection rate of up to 35% at that point. As a result, the campaign against bovine tuberculosis had lost all credibility and efficacy, while consuming *vaqueiro* milk had virtually become a game of Russian roulette for consumer health (Relatório…, 1921, p.XXIX-XXXXI).

Seeking solutions: the problem of raw milk

It was only in 1924, after almost four years of inaction, that the physician and city councilor Doctor Luciano Gualberto (1883-1959) finally introduced an ambitious bill for a complete overhaul of the city's milk supply system along with substantial expansion of the inspection service. The biggest novelty in his bill involved the problem of raw milk. Instead of intensifying the tuberculin testing campaign, Gualberto proposed simply to extend industrial pasteurization to the milk produced in the capital. The practical advantages were clear, because this made it possible to eliminate not only the danger of contagion from the Koch bacillus, but also all the other health risks that raw milk could harbor. And at the same time, it would avoid the enormous expenses that a systematic campaign against bovine tuberculosis would require, while the cattlemen would no longer suffer the periodic loss of some of their milk cows (Anais…, 28 oct. 1924, p.961-964).

Despite these advantages, when Gualberto's plans were made public, they unleashed a storm of protest from different quarters. The most vehement criticisms came from the United Cattlemen's Society, which understandably feared that industrial pasteurization would deprive its members not only of direct contact with their clients but also of their product's competitive edge – its raw quality – over pasteurized milk from the interior. But Gualberto's plans did not please the dairy companies' owners either, since they feared losing their economic independence, because Gualberto's bill proposed licensing one single investor to pasteurize and bottle all of São Paulo's milk, which obviously raised the danger of establishing a milk monopoly (Anais…, 28 mar. 1925, p.444-446; Jornal do Comércio, 20 nov. 1924).

Eventually, after several months of negotiations, in April 1925 the City Council passed a compromise law that ensured the business of pasteurization and bottling would be shared by granting several licenses (São Paulo, 29 abr. 1925, artículo 3°). As a result, three companies in the capital obtained licenses and began building three new dairy plants in

the municipal area, known as entrepostos. One of these belonged to the United Cattlemen's Society, which explains why the reorganization of the city's milk supply system had finally been accepted by its members.[6] And when the three new dairy plants began functioning in 1927, it seemed as if the notorious milk question was now a thing of the past (Relatório…, 1927, p.22).

However, the new situation did not remain stable for long. According to Nicolino Morena (1890-1966), director of the Food Inspection Service of the state of São Paulo, launching the three dairy plants led to bitter competition for market share (Morena, 1942, p.68-76; Frensel, 1935, p.15). Especially aggressive was the behaviour of the Leite Vigor company that obviously sought to quickly eliminate its competitors, thanks to its ample financial resources. In the battle for customers, Leite Vigor used mobile distribution through trucks or horse-drawn carts with insulated tanks. In the early 1930s, the company had around 78 milk trucks covering the city to distribute up to 32 thousand liters of milk a day, even in areas where their competitors were active. It is no surprise, therefore, that in May 1931, *O Estado de S. Paulo* (5 mayo 1931, p.7) reported that the Leite Vigor carts had to do their rounds accompanied by armed guards "to prevent damage."

On the other hand, it became increasingly clear that the biggest loser in this struggle was the pasteurization plant run by the United Cattlemen's Society. Nicolino Morena (1942, p.76) argues that its problems stemmed from managerial errors and the "lack of trained staff." However, it is also likely that the *vaqueiros*' plant ran into specific logistical problems due to the spatial extent of the municipal district and the geographical dispersion of its barns. Whatever the case, it is clear that the authorities recorded a sizeable drop in the number of cattlemen since the dairy plants started their operations (Picollo, 1930, p.622), while in early 1930 the newspaper *A Capital* launched a new campaign against the milk brought from outside the city of São Paulo. The main target was Leite Vigor, who was accused of "poisoning" the city's children, while at the same time the paper explicitly demanded the abolition of mandatory pasteurization (A Capital, 6 ene. 1930, 11 ene. 1930, 18 ene. 1930). Even more important is the fact that the majority of consumers clearly supported returning to the previous situation. Luís Picollo, director of the Animal Husbandry Section of the São Paulo Department of Agriculture, wrote in an article published in 1930: "Among consumers it is widely held that the milk currently being sold in São Paulo is inferior to the kind that used to be sold … Most of the city's population … prefers raw milk, produced here in the Capital, since it is, nutritionally speaking, superior to the milk produced in the interior" (Picollo, 1930, p.621-623).

In October 1930, shortly after the local producers' pasteurization plant had gone bankrupt, the city of São Paulo gave in to pressure and suspended mandatory pasteurization for the milk produced in the municipal district. And in February 1931, when the São Paulo state government took over the responsibility for the sanitary inspection of the milk trade, permission to sell raw milk in the city was confirmed (São Paulo, 28 feb. 1931). In order to counter the resulting halth risks, the state government simultaneously created a new section in the Department of Agriculture in order to resume the fight against bovine tuberculosis in local barns (São Paulo, 20 mayo 1931, artículos 1°-3°, 10 ene. 1931, artículos 2°, 8°). However, this measure was of little practical value, since the section lacked not

only a budget for compensation payments for slaughtered cows, but also the legal power to implement systematic emergency slaughter of infected animals. It is no surprise, then, that the campaign ended after only 3,010 dairy cows had been inoculated, while the 380 animals who tested positive – rather than being removed from milk production – could only be marked with ear tags (Esquibel, 1937, p.18).

It is highly likely that given the huge number of cows and the lack of financial resources during the Great Depression, which dealt a severe blow to São Paulo's coffee-economy, it was simply impossible at that point to fund a systematic campaign to eradicate bovine tuberculosis. However, instead of giving in, government officials soon came up with a new, low-cost strategy to solve the raw milk problem. Thus, in the 1934 reform of state regulations for the dairy business a system for grading milk quality was introduced, evidently inspired by American models. Under this new system, the only raw milk that could be marketed freely was grade A, which was for milk produced in specialized dairy farms under very strict hygiene rules. According to official data, in São Paulo in the mid-1930s there were seven producers of this kind of milk, who between them produced no more than 2,400 liters a day, since it was a niche product that sold for very high prices (Medeiros, 1936, p.17-25; Frensel, 1935, p.17 y s.; O abastecimento…, 1935, p.8).

To solve the real problem of raw milk from urban barns, the authorities sought to distinguish between grade B and grade C milk. Both were pasteurized, but grade B milk was produced in the municipal district, and was of fresher quality than milk imported from the hinterlands due to much shorter distances and quicker processing. The authorities calculated that this advantage would introduce a different price scheme, which in turn would help convince the *vaqueiros* to voluntarily bring their milk in for pasteurization at one of the dairy plants (São Paulo, 11 ago. 1934, artículo 21°). However, once again the reality of the milk market destroyed all hopes. In a detailed report by the Federal Ministry for Agriculture on the state of the dairy business in the city of São Paulo, published in 1936, we find the following statement:

> It turns out that when the cattlemen were urged to pasteurize their milk according to the law so as to increase its value and sell it at the best price, they refused to obey the law. They have no interest in selling their product for a better price or increasing demand for it by displacing type 'C' milk with type 'B;' nor are they interested in improving the safety of their product, since without their observing any of these onerous requirements, consumption is more than guaranteed by a clientele that fights over their daily harvest (Medeiros, 1936, p.30).

Faced with this latest failure, and despite the ongoing lack of funding, in 1935 the Department of Agriculture decided to relaunch the tuberculin testing campaign, the preliminary results of which indicated more than ever an urgent need for action: In comparison with the 12.6% of infected animals in the 1931 campaign, this time inoculation of the first 5,500 cows revealed an alarming average infection rate of 40% (Esquibel, 1937). Even so, consistent measures on the part of the government were still a long way off. However, it is worth pointing out that the authorities at that time obviously still favored a solution that tried to accommodate the interests of both cattlemen and consumers. In January 1947,

the government passed a law that called for creation of an Animal Health Post in a strategic location, in charge of conducting a systemic battle against bovine tuberculosis throughout the municipal area. The most striking feature of this bill was indisputably financial, since the São Paulo government planned compensation payments of three hundred thousand réis for each slaughtered cow. Based on the infection rate and the total number of dairy cows in the municipal area, the budget amounted to a stunning total of one thousand five hundred million réis (São Paulo, 13 ene. 1937, 19 ago. 1938; Esquibel, 1937, p.20 y s.).

A "milk policy" for the future

The clearest snapshot of how the São Paulo authorities envisaged the milk supply of the future comes from the third National Conference on Hygiene, held in São Paulo in 1926. At that meeting, displaying the city's pride in defining itself as a prosperous metropolis that was unquestionably the vanguard of "national progress," Nicolino Morena, the aforementioned director of the Food Inspection Service, promised a true agroindustrial revolution in the sector:

> By educating the *caipira,*[7] building good highways, providing efficient pasteurization in dairies, transportation in refrigerated vehicles and railway cars, cold storage in milk depots and in pop-up dairies, by implementing a steely and tireless health monitoring, São Paulo will be supplied with safe milk: we just have to want it! (Morena, Abreu, 1926, p.735).

However, this daring vow was not fulfilled until 1931, when responsibility for the sanitary inspection of the dairy trade passed from the municipal to the state government. From then on, the authorities went to considerable effort to support dairy activities with various kinds of measures in the city's most important dairy farming areas in order to substantially improve the quality of the milk that reached the city. Thus, in that same year 1931, the new dairy inspection department launched a broad educational campaign called "clean milk" (*leite limpo*) in the dairy areas, in an effort to convince farmers to adopt good hygiene practices in their day-to-day work. In a total of five locations – four in the Vale de Paraiba, the most important supply area for the city, and one in the Mogiana region of São Paulo[8] – the department created permanent field offices known as Regional Inspections for Milk and Dairy Products. In the words of the director of the regional inspection of Guaratinguetá, Fausto D'Oliveira Quaglia (1934, p.511), this was a "true center for rural health education," whose mission was to raise consciousness in milk producers and dairy workers about how to handle liquid milk properly, whilst at the same time combatting the widely-held but erroneous idea that "all milk is good because it will be sanitized… which is a magic process that transforms dirty milk into clean, bad milk into good." For their educational mission, inspectors were equipped with traveling laboratories for chemical analysis, sample utensils for hygienic milking, and a collection of literature, educational brochures and construction designs for suitable barns and other facilities. The inspections also kept records covering all the milk producers in the area, so as to systematize efforts to educate them and to document the sanitation advances in each place.

In early 1934, citing the "need to make the milk monitoring apparatus more efficient," the São Paulo government introduced a range of measures that included increasing the regional inspections network to a total of seven and increasing their staff with a permanent laboratory assistant in each one (São Paulo, 19 ene. 1934, artículo 5°). Moreover, from 1935 on, the São Paulo Department of Agriculture had also begun expanding its presence to the dairy farming areas by creating four permanent veterinary stations. The task of these stations was primarily to record the dairy herd in each area, carry out regular veterinary inspections and provide local producers with technical advice about livestock raising, nutrition and care in general (Stephan, Leme, 1936, p.77-80; São Paulo, 5 jul. 1935, artículo 7°). The new presence of government officials in the interior of the state of São Paulo was accompanied by a series of institutional reforms aimed at broadening and professionalizing the inspection mechanisms for the dairy sector and bringing hygiene standards into line with international norms. Thus, after the 1934 reform, the so-called Inspection of the Monitoring of Milk and Dairy Products was given a sizeable laboratory made up of two chemistry sections and one bacteriological one, while the technical and administrative staff was increased to a total of 64 collaborators. Of these, 54 were in charge of service to the city of 64 Paulo, while the remaining ten worked for a branch office in the nearby port city of Santos (São Paulo, 19 ene. 1934, artículo 5°).

Besides these efforts by government authorities, it is also worth indicating the technical advances of dairy companies, even though these were probably due more to competition in the milk market than to new legislation. Leite Vigor acted as a pioneer again; from the early 1930s on, the company had begun reorganizing its production chain. The goal was to speed up transport time and get the milk to the city in raw form and pasteurize it in the city plant, instead of pasteurizing it in the hinterland as has been practiced before. The aim was obviously to improve its bacterial quality and prolong the product's shelf-life once it reached the consumer (Frensel, 1935, p.15 y s.; Quaglia, 1934, p.510). During the 1930s, Leite Vigor's example was imitated by other dairy firms who also invested in modern, low-temperature pasteurizers and other cutting-edge dairy equipment. It should also be mentioned that a series of "refrigeration depots" emerged in the milk-producing areas, in an attempt to improve conservation of the perishable liquid during the first phase of its long journey to the city. These depots were used to store raw milk from local farms, filter it and chill it with ice from dairies in the interior before it traveled on by train (A produção..., 1941, p.11; Neto, 1944, p.31; Lopes, Neto, Franco, 1943, p.155 y s.).

Lastly, it is important to bear in mind that during the 1930s there was a major spurt in road building throughout the state of São Paulo, which for at least some of the "milk routes" made it possible to use trucks with modern tanks that allowed for faster transport of raw milk, thus contributing significantly to improving the quality of the product. According to official records, between 1930 and 1940, the state of São Paulo expanded its road network by over 23,000km, an increase of around 84%, which boosted the existing road network to a total of 51,000km (Andrade, 1950, p.295).

According to the director of the milk inspection service, Alexandre Melo, the combined efforts of state authorities and dairy industry was a reason for pride, because the effects of their work were starting to be reflected in a real improvement of the bacteriological

quality of market milk. Thus, in the early 1930s, when state regulations set the level of contamination of pasteurized milk at a maximum of 500,000 microbes per milliliter, the effective quality of most milk was far from meeting that standard. Melo himself mentioned levels of bacterial contamination of up to 5,000,000 microbes per milliliter. However, in an analysis of 500 tests of pasteurized milk from 1939-1940, a large percentage of the samples fully met the standard. At that point, microbial contamination of type C milk had diminished to an average of 50 to 100,000 microbes, which brought them unquestionably closer to international standards (Melo, 1935, p.9; Morena, 1942, p.80; Melo, 1942, p.9).

Table 1: Evolution of bacteriological standards for milk (germs per milliliter)

Types of milk	1931 Decree no.5.032	1934 Decree no.6.603*	1939 Decree no.10.395	1946 Decree-law no.15.642
Type A (infant's milk)	30,000/ml	-	20,000/ml	500/ml
Type B	-	-	50,000/ml	50,000/ml
Type C	500,000/ml	-	500,000/ml	300,000/ml

***** Instead of fixed standards, the decree let the director of Public Health set the limits "periodically," in accordance with those proposed by the dairy inspection (São Paulo, 11 ago. 1934, artículo 30°).

It is no surprise that the many attempts by government authorities to improve the quality of imported milk also increased the pressure to find a definitive solution to the problem of raw milk produced within the municipal district. Moreover, in November 1937, President Getúlio Vargas (1882-1954) proclaimed the "New State" (*Estado Novo*), a one-man dictatorship that identified tuberculosis as "problem number one in Brazil" in public health terms, and sought to turn the struggle against the disease into his flagship enterprise. Clear evidence of this was the appointment of the physician and tuberculosis specialist João de Barros Barreto (1890-1956) to be the new director of the National Department of Public Health, charged by direct order of the president with designing a national plan to combat the dreadful disease (Sodré, 1938, p.257 y s.). In the case of São Paulo, this new health policy priority was inaugurated in April 1938 with the appointment of the physician and politician Ademar de Barros (1901-1969) as the new state governor. His administration came to be associated, among other things, with an ambitious plan to build a network of sanatoriums for consumptive patients (Bertolli Filho, 2001, p.77-79).

Against this background it is no surprise that Barros' appointment also coincided with a radical shift in official policy regarding the raw milk trade. In 1938, the laboratory of the milk inspection carried out a bacteriological analysis of one hundred samples of raw milk taken from different barns in the municipal district. It is worth stressing that even though this kind of analysis was part of routine procedure for milk inspection at that time, on this occasion everything indicates that the examination was done for political reasons above all. Whatever the case may have been, the analysis showed that virulent tuberculosis bacillae were present in 30% of the tests, which confirmed the alarming results of the last cycle of tuberculin testing. What was new, however, was the conclusion of the study's two authors, the inspection service director, Alexandre Melo, and the bacteriologist Natalino

Mastrofrancisco, who categorically demanded a single solution: immediate implementation of mandatory pasteurization of all dairy milk, in accordance with current legislation (Melo, Mastrofrancisco, 1938, p.27-35).

The corresponding political decision came swiftly. Over the course of 1939, through three consecutive laws, the São Paulo state government introduced new, state-wide regulations for the dairy industry that involved mandatory pasteurization of all three grades of consumer milk (São Paulo, 26 jul. 1939, artículo 264º). While governor Ademar de Barros praised the new regulations as "one of the most decisive factors in the… solution [of the milk problem]" (Sposati, Servilha, Vigevani, 1985, p.64), the previous administration's bill to create an Animal Health Post to continue tuberculin testing was discreetly shelved. On a national level, it is clear that with these measures, the state of São Paulo was now the forerunner in terms of industrial pasteurization of milk in Brazil. A report on the state of affairs in the country's major cities shows that in the late 1930s, even in prosperous regional capitals in the south and southwest such as Belo Horizonte, Niterói, Curitiba, Florianopolis or Porto Alegre, only part of the market milk was being sold in pasteurized form, while in most of the northern and northeastern cities, raw milk from local barns simply dominated the market (Frensel, 1938, p.17-21).

However, it is important to stress that São Paulo's "progress" in terms of milk hygiene was somewhat ambiguous due to a whole series of unwanted effects of the new legislation. In cities in the interior of São Paulo, for example, the most controversial consequence was a substantial rise in milk prices thanks to the emergence of a stately number of new pasteurization plants, which replaced small-scale businesses and became monopolies.[9] According to data from the veterinarian Fidelis Alves Neto, in the first four years after the new legislation went into effect, a total of 25 new dairy plants were constructed in the interior of the state. And even in major cities of around 100 thousand inhabitants, such as Campinas, Santo André, Sorocaba or Riberão Preto, these plants managed to corner the local market, with highly predictable consequences for consumers. As Alves Neto put it (1943, p.55-56): "There could have been no other result; we were obliged to switch from cheap milk to expensive milk even though our standard of living is notoriously low … According to the current legislation, you either drink pasteurized, bottled milk or you don't drink milk…"

In the city of São Paulo, meanwhile, the effects of the new legislation also caused considerable dissatisfaction. The most serious consequences were to the *vaqueiros*, because mandatory pasteurization equated to a ban on their habitual practice of milking cows right in the public, thus eliminating overnight the image, so familiar in the city, of milk cows walking around on the streets (São Paulo, 4 oct. 1939, artículo 28°). In their place, the new regulations confirmed the option of selling barn milk as grade B pasteurized milk. However, the evidence suggests that for the vast majority of cattlemen this option was either not economically attractive or was simply not feasible for logistical reasons. Whatever the case, according to data in the *Revista dos Criadores*, there was a rapid drop in registered urban milk producers, whose numbers fell from a total of 2,232 in 1938 to only 208 in 1941. And, in consistence with this data, the volume of grade B milk in subsequent years never reached more than 15 thousand liters a day, that is, only a quarter

of the amount of raw milk sold previously (A produção..., 1941, p.12; Lopes, Neto, Franco, 1943, p.155; Melo 1947b, p.61).

For consumers, the ban on raw milk meant not only the loss of one purchasing option, but also a price rise, due to the drop in supply (Correio Paulistano, 1940). And meanwhile, everything indicates that even in the early 1940s, the quality and flavor of the industrial product, the only one left on the market, did not match official promises. There are no testimonies from the time as to the organoleptic properties of grade C milk in São Paulo. However, there is abundant evidence of the persistence of grave defects in the production chain of pasteurized milk from the interior, such as antihygienic practices on the farms, precarious means of transportation, lack of refrigeration etc. And not even the most modern stretch of milk's journey from the farming areas to the dairy plants in the city, the railway segment, did guarantee proper conditions. It is true that in 1931 the São Paulo state government had obliged railway companies to acquire modern refrigerator cars and install cold rooms in train stations for storing milk cans. However, in 1936, a report from the Department of Agriculture was still lamenting that even on the main line of supply for the capital of São Paulo, which went through the important dairy regions of the Vale do Paraíba, the responsible railway company was still using carriages that were "common, filthy, and stinking... [and offered] no guarantee for the stability of the product" (Stephan, Leme, 1936, p.58).

The persistence of these problems even into the 1940s is shown, above all, by the high levels of microbial contamination usually seen in the raw milk that reached pasteurization plants in São Paulo. According to official records, the germ count at that point tended to reach figures of 10, 50 and – on very hot days – up to 300 million per milliliter, obviously far above the permitted limits in dairy countries in the north. It is no surprise, therefore, that despite the undeniable sanitation advances in the São Paulo dairy industry, some critics mocked the quality of the final product, labeling it a "microbe cemetery" (Rogick, 1941, p.82; Melo, 1942, p.9; Melo, 1947a, p.44). However, even more worrying to the authorities in charge was a new and clandestine complicity between a considerable number of *vaqueiros* and consumers in some areas of the city. Against all warnings of Alexandre Melo, the director of the milk inspection, who tried to convince the public in press and radio statements of the risks of raw milk and the advantages of pasteurization (Melo, 1940, p.3-6, 1942, p.6 y s.), a veritable black market of raw milk emerged, mostly on the unmonitored peripheries of the vast municipal district. According to estimates by the veterinarian Alves Neto, in 1946, seven years after the raw milk ban, the "clandestine milk" business reached a volume of thirty to forty thousand liters a day, which at that point constituted close to 16% of total milk consumption in the city of São Paulo (Medeiros, 1936, p.16; Neto, 1946, p.27, 1951, p.11).

Final considerations

It is important to stress that the problem of guaranteeing a hygienic milk supply was certainly not specific either to São Paulo or to Latin American cities in general. On the contrary, large cities in northern hemisphere countries that had much longer dairy traditions also had to struggle with the milk question since the end of the nineteenth century, due to

sanitary problems of the milk supply systems, milk's widespread use in artificial lactation and high infant mortality rates, which were seen as a direct consequence of the first two factors (Dwork, 1987; Atkins, 1992; DuPuis, 2002; Valenze, 2011; Smith-Howard, 2014). The great difference, however, lies in the amount of time it took to overcome the crisis and the economic effects caused by this transformation. In the case of the United States – which was clearly a world leader in milk hygiene – since 1917, industrial concentration of the sector, advances in pasteurization technique, and a massive expansion in milk production all took place simultaneously, which meant not only that hygiene and quality deficits were rapidly overcome, but also that milk prices were significantly reduced. These factors, in combination with relentless consumer propaganda, made the 1920s a crucial moment for consolidating cow's milk as the new staple food in US consumers' diet (DuPuis, 2002; Valenze, 2011).

In the case of São Paulo, on the contrary, this study has shown that for more than 15 years, the combined efforts of state authorities and the dairy industry failed to supply a product whose quality and flavor convinced consumers to buy it. Even more problematic was the fact that the industrialization of the supply system imposed through mandatory pasteurization merely raised milk prices and thus reduced milk's attractiveness even further. The causes of this effect must be sought in the limited volume of the milk market and the low elasticity of supply, thanks to backwardness and generalized inefficiency in the production system in the dairy farming areas in the interior. Unlike the United States and other countries with dairy traditions, in the state of São Paulo there was no longstanding experience of dairy farming, so it lacked a solid base of cattle farmers and milk producers willing to adopt modern livestock-rearing methods to boost production (Brinkmann, 2020, p.121-130). As a result, raw milk from the hinterland was still a relatively expensive material, and industrializing milk processing would only make the final product still more costly. It is no surprise, therefore, that in the early 1940s, cow's milk remained a little-used food in the daily diet of São Paulo consumers that barely exceeded 100ml per capita (Amaral, 1945, p.128).

NOTES

[1] Tuberculin inoculation was at the time the state-of-the-art diagnostic method that made it possible to identify animals with tuberculosis in the early stages of the disease, when no external signs were present. In combination with a program of emergency slaughter of infected animals, the tests enabled complete eradication of the disease in a given herd. The method had been developed and successfully implemented in the early 1890s by the Danish veterinarian Bernhard Bang (1848-1932).

[2] In 1901, the very person who discovered the tuberculosis bacillus, German bacteriologist Robert Koch (1843-1910), publicly doubted whether the bovine and human variant were identical and also attacked the theory – widely accepted until that point – that the bacillus was transmissible from animals to humans. Koch's conclusions led to a scientific dispute that divided the international scientific community for many years, causing repercussions even in Brazil.

[3] Until that point, São Paulo city regulations explicitly prohibited the sale of milk imported from other municipal districts.

[4] The companies involved were Companhia Ararense de Leiteria, in the municipal district of Araras, as well as Empreza Cruzeiro de Lacticínios and Indústria Brasil de Lacticínios, in the municipal districts of Cruzeiro and Cachoeira, respectively, in São Paulo's Vale do Paraíba.

[5] The 1911 law contained obvious oversights in terms of defining the chemical constituents of milk. Thus, instead of containing a minimum fat content of 2.5%, the law called for a (chemically impossible) "25%" while the density range was erroneously listed as "1,039-1,033" instead of the correct range of 1,029-1,033.

[6] The other two were Companhia Paulista de Lacticínios, founded by the Libyan businessman Jorge Rubez, and Leite Vigor, founded by German immigrant Otto Rudolf Jordan.

[7] *Caipira* is a pejorative synonym for the mostly mestizo (mixed-race) inhabitants of the vast areas in Brazil's rural hinterland.

[8] The Mogiana Paulista is a coffee-growing area in the northeast of the state of São Paulo; it borders the neighboring state of Minas Gerais.

[9] The new legislation only permitted the sale of raw milk in very small localities, where the market volume did not allow to build a pasteurization facility.

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