UNDERSTANDING SCIENCE DENIAL FROM BOURDIEU'S FIELDS THEORY AND THE TRANSVERSE SCIENCE PERSPECTIVE

COMPREENDENDO O NEGACIONISMO CIENTÍFICO A PARTIR DA TEORIA DOS CAMPOS DE BOURDIEU E DA PERSPECTIVA TRANSVERSALISTA DA CIÊNCIA

ENTENDER EL NEGACIONISMO CIENTÍFICO DESDE LA TEORÍA DE LOS CAMPOS DE BOURDIEU Y LA PERSPECTIVA TRANSVERSALISTA DE LA CIENCIA

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ABSTRACT: The phosphoethanolamine episode, one of the first and most institutionalized cases of scientific denialism, is the subject of this article as it illustrates political interference in science. We study the case from published studies, official documents, materials produced by the press, as well as posts on social networks, through field theory and the transverse science perspective, which point to the relationships between fields that go beyond internal criteria. As a result, we can understand scientific denialism as a transversal phenomenon of interpenetration between fields. We discuss denialism as a result of the weakening of the boundaries of the scientific field, pointing to its heteronomy, and we try to illustrate how this case extrapolated the internal dynamics of the scientific field, bringing transversal dynamics as important forces of dispute in this episode (such as legal and media) and we show the interpenetrating relationships between the scientific field and other social microcosms.

KEYWORDS: Science denial. Transverse perspective. Bourdieu's field theory. Borders. Autonomy.

***RESUMO**: O episódio da fosfoetanolamina, um dos primeiros e mais institucionalizados casos de negacionismo científico, é objeto deste artigo por ilustrar a ingerência política na ciência. Neste artigo estudamos o caso a partir de estudos publicados, documentos oficiais, materiais produzidos pela imprensa, assim como postagens em redes sociais, por meio da teoria dos campos e da perspectiva da ciência transversalista, que apontam para as relações entre campos que extrapolam critérios internos ao campo científico. Como resultado, podemos compreender o negacionismo científico como um fenômeno transversalista de interpenetração entre campos. Discutimos o negacionismo como decorrência do enfraquecimento das fronteiras do campo científico apontando para sua heteronomia e procuramos ilustrar como esse caso extrapolou as dinâmicas internas do campo científico, trazendo dinâmicas transversais como forças importantes de disputa neste episódio (como a jurídica e midiática) e mostramos as relações de interpenetração entre o campo científico e os outros microcosmos sociais.*

***PALAVRAS-CHAVE**: Negacionismo científico. Perspectiva transversalista. Teoria dos campos de Bourdieu. Fronteiras. Autonomia.*

***RESUMEN**: El episodio de la fosfoetanolamina, uno de los primeros y más institucionalizados casos de negación científica, es el tema de este artículo. Estudiamos el caso a partir de artículos publicados, documentos oficiales, materiales producidos por la prensa, así como publicaciones en redes sociales, a través de la teoría de campos y la perspectiva de la ciencia transversalista, que apuntan a las relaciones entre campos que van más allá de los criterios internos al campo científico. En consecuencia, podemos entender el negacionismo científico como un fenómeno transversal de interpenetración entre campos. Discutimos el negacionismo como resultado del debilitamiento de los límites del campo científico, apuntando a su heteronomía, y tratamos de ilustrar cómo este caso extrapoló su dinámica interna, trayendo dinámicas transversales como importantes fuerzas de disputa en este episodio. (como el legal y el mediático) y mostramos las interpenetrantes relaciones entre el campo científico y otros microcosmos sociales.*

***PALABRAS CLAVE**: Negacionismo científico. Perspectiva transversalista. Teoría de los campos de Bourdieu. Fronteras. Autonimía.*

Introduction

Two recent national episodes, apparently unconnected, point to the same tension between scientific denialism and politics. In 2016, Law 13,269 was passed, which authorized the use of synthetic phosphoethanolamine by patients diagnosed with cancer, even though scientists have not tested and validated this substance (BRASIL, 2016). In 2020, an information note from the Ministry of Health recommended treatment with chloroquine for cases of Covid-19, despite the lack of positive results on the effectiveness of the medicine (BRASIL, 2020). In both cases, we observe a political interference in science that marks two fundamental episodes in the scenario of Brazilian scientific denialism.

The scientific developments produced, analyzed from a sociological perspective, reveal the influx of social and cultural circumstances in stimulating the large volume of investigations and channeling research interests. Analyzing the Royal Society between the years 1661-1662 and 1686-1687, Merton (1968) showed, from one of the most detailed sociological studies on science and technology in seventeenth-century England, that the problems faced by scientists were linked directly or indirectly to military needs, navigation, requirements of some industry and mainly mining. In that period, society still had strong expectations and beliefs in the benefits of science. Subsequently, several episodes led to crises in the public perception of science and belief in its positive contributions to society, such as chemical weapons and environmental pollution. According to Marcos Nobre, interviewed by Andrade (2019), science was unable to recover the prestige it enjoyed before the cold war with the genome project, whose adherence and social legitimacy was much lower than the previous one. The philosopher claims that the association between science and political power contributed to the perception of corruption in both fields, with politics contaminating science.

The results of the C&T Public Perception survey, by the Center for Strategic Studies and Management, between the 2010 and 2019 editions, effectively point to a drop in confidence in the positive effects of science and the work of scientists; while also indicating that, in 2019, politicians are the least reliable sources of scientific knowledge and journalists and doctors (not scientists) the most reliable sources. Furthermore, science's relationships with private interests may contribute to this crisis of confidence in science. Schin (2000) analyzes the French scientific field and highlights the emergence and strengthening of a profile of researchers whose production is totally focused on the interests of private companies even when they work in public spaces of scientific production.

The Bourdian sociology of science is based on the analysis of the scientific field as a structured space of positions whose internal disputes over specific capital define a set of values and specific practices that contribute to the delimitation of the boundaries of this field. In the social sciences, for example, a strong "politicization" points to the heteronomy of the field, in which external/political problems are expressed internally (BOURDIEU, 2004). On the other hand, for Bourdieu (2004) the natural sciences tend to have greater power of refraction in the face of interests external to the field, with more marked borders and greater autonomy. "If you try to tell biologists that one of their discoveries is left-wing or right-wing, Catholic or non-Catholic, you will elicit frank hilarity" (BOURDIEU, 2004, p. 22, our translation).

In the two episodes cited at the beginning of this article, we clearly observe a weakening of the boundaries of the natural sciences, opening up space for interests and values from the political field. For Bourdieu (2013), questioning the limits of the field is questioning its autonomy; the border not being a real line, but an object of dispute in the field and, consequently, an object of study as adopted in this article.

However, despite the potency of Bourdieu's sociology of science, the limits of the field concept and its difficulty in mobilization are recognized by Bourdieu (2013) and his critics (LAHIRE, 2002; PETERS, 2013). The main aspect pointed out by critics of the concept of field, proposed by Bourdieu (2011), refers to a supposed limitation to encompass the complexity of social relations in current times. That's why:

> [...] it is not necessary to be a Latourian or a Deleuzian to recognize that the concept of field, although it is taken by Bourdieu as referring to a reality perpetually in movement and historically updated in a continuous way by its constituent "particles" (including in what concerns to its formally or informally established limits), has, however, a connotation of relative "closure" and coherence (well-marked borders, certain stability, etc.) that seems inadequate to capture the enormous multiplexity, flexibility, fluidity, contingency and instability of the contemporary issues of social relationships in times of heightened globalization and expanding post-Fordist world capitalism (PETERS, 2013, p. 68, our translation).

In the same sense, Shinn and Ragouet (2008, p. 11, our translation) propose overcoming these limits by complementing Bourdian theory through a transversalist perspective capable of "building a framework of analysis that would allow apprehending the relative autonomy of the scientific field as a result of transversal forces that cross it and connect it to other social fields". One of the assumptions of this perspective is that there are relationships of interdependence between the scientific field and other fields that lead to an autonomy that is always relative,

including regulatory mechanisms of its own and those of other fields (SHINN; RAGOUET, 2008).

This proposition is anchored in the Bourdian perspective, even though it complements it to capture the complexity of today. Thus, the transversalist approach seeks to identify in the fields: "(1) their internal dynamics and (2) the emergence of transversal dynamics, but which also aims to (3) restore the interpenetration relations between the scientific field and other social microcosms" (SHINN; RAGOUET, 2008, p. 136, our translation). This model starts from the premise that practitioners focus on the development of generic instrumentations that serve several fields, that they act in "interstitial arenas" and do not "stop at institutional and cognitive boundaries" (SHINN; RAGOUET, 2008, p. 146, our translation).

In the present work, we intend to invest in the analysis of the relationship between fields, precisely the scientific and the political, considering possible complements of the transversalist perspective, based on the investigation of a recent episode in Brazilian history: phosphoethanolamine as a treatment against cancer. This study is based on empirical data such as the results of published studies, official material documents produced by the press, as well as posts on social networks. The two cases cited initially show similarities that will be resumed in the final considerations of this article, comparing phosphoethanolamine with chloroquine indicated as an early treatment for Covid-19, with our analysis focusing on phosphoethanolamine in order to deepen this study and respect the limits of this publication.

Problem and hypothesis

Considering, therefore, the theoretical premise that to understand interactions between people or to explain a specific event/episode it is necessary to examine the social space where such interactions and events occur, the proposed question is whether the notion of relative autonomy of scientific fields and political can help in understanding the phenomenon of scientific denialism and post-truth. Our hypothesis is that the transversalist notion of scientific activity can contribute to the understanding of the process of "production of truth" (fake news).

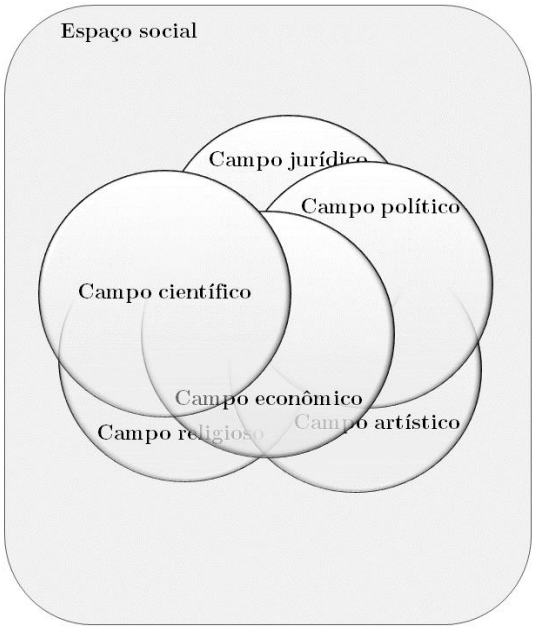
Data and methods

The data used in this study can be divided into two groups: the first formed by articles from the literature, official documents and news published by the main communication vehicles; and the second consisting of posts published on the social network Twitter. The first group of data serves to reconstruct the history of the phosphoethanolamine approval episode, extracting information on dates and on the agents in the scientific and political fields with greater involvement and prominence in the case. The second set of data makes it possible to analyze the repercussion of the most striking facts of the episode on social networks, measuring the capillarity of the speeches and actions of scientists and politicians in the more general social space.

We used a qualitative approach to treat data from the first group, document analysis. This investigation methodology adopts specific procedures with the aim of examining and understanding the content of documents of the most varied types, and from them, obtaining the most significant information (LIMA JÚNIOR *et al.*, 2021). We used a quali-quanti approach to the data obtained from posts on social networks, which is typical of the text mining technique. With the support of the R programming environment (R CORE TEAM, 2022) we perform analyzes based on text manipulation (SILGE; ROBINSON, 2017).

Whether in document analysis or text mining, both approaches had Bourdieu's theory of fields (2004) as a theoretical background and its complementation from the transversalist perspective of Shinn and Ragounet (2008). To reinforce our understanding of the articulation between theoretical and methodological aspects, we present Figure 1, which represents the relationship between the different fields present in the more general social space. In this image, we indicate the relative autonomy of the scientific field, impacted by the transversal action of other social fields that cross it. This notion is fundamental for a complete understanding of the analysis results presented in the next section.

Figure 1 – Representation of relationships between fields in social space



Source: Prepared by the authors

The case of phosphoethanolamine

The chemist, professor and researcher at the University of São Paulo, Gilberto Orivaldo Chierice, from the area of analytical chemistry and polymer technology, began studies on phosphoethanolamine in 1990, distributing it to cancer patients without Anvisa approval from 1995 onwards (BASTOS, 2020; GIORDAN *et al.*, 2017). This distribution continued, without Ethics Committee approval or a clinical trial protocol, until 2014 when Chierice retired (BASTOS, 2020). According to Bastos (2020), during this period two patent applications were filed by the chemist and were rejected by the National Institute of Industrial Property (INPI). Until this moment, the episode can be well understood from the notion of scientific field proposed by Bourdieu (2004). The field's internal regulatory mechanisms did not at any time attribute the scientific validity sought by Chierice. Within the scientific field, agents are in constant competition for the monopoly of scientific competence (BOURDIEU, 2004). Without approval from the Ethics Committee, clinical study protocol or patent granted, it is clear that field agents did not attribute to Chierice's work any status of scientific "truth". More in-depth studies on the configuration of the academic field, which are beyond the scope of this article, could help to elucidate this lack of scientific capital that the case evidenced. But the case of phosphoethanolamine becomes relevant from the moment the discussion goes beyond the boundaries of the scientific field.

Unable to continue distribution due to the removal from the university, Chierice sought out the media in 2014 – specifically the Programa do Ratinho together with then-Federal Deputy Jair Bolsonaro – to publicize his discovery of the "cure for cancer" and several personal reports of supposedly cured patients started to appear on social networks, mainly YouTube. The public appeal generated led to the development of research financed by the Health Department of the State of São Paulo, seeking to identify the composition of the substance and its effectiveness. Technical reports, mainly developed by Luiz Carlos Dias (2017) at the request of the Ministry of Science, proved the absence of antitumor effects and variations in the weight of the capsules and many impurities were also identified. At this moment, we begin to see evidence of the transversalist notion of science proposed by Shinn and Ragouet (2008), particularly the relationship of interdependence between the scientific field and other social microcosms. The dissemination of the case by the media with the support of agents from the political field generated a "disruption" in the broader social fabric, resulting in pressure for the development of new research. Studies by Luiz Dias (2017) and the production of results published in technical reports effectively show the interference of other fields within the scientific field, in addition to showing the greater scientific capital and prestige of this second researcher involved in the case. Even if internally the issue of phosphoethanolamine had already been overcome within the rules laid down in the scientific field, this apparently was not enough to prevent the effervescence of the theme in the public sphere.

Thus, even without proof, Law 13,269/16, resulting from three projects presented by Jair Bolsonaro, was approved in the Chamber of Deputies and sanctioned by then-president Dilma Roussef (BRASIL, 2016). The approval of a substance without any evidence produced by the scientific field that would suggest its effectiveness could indicate a migratory flow of concepts across social fields (SHINN; ROUANET, 2008). However, in May 2016, the Federal Supreme Court (STF, Portuguese initials) declared the unconstitutionality of Law 13,629 (BRASIL, 2016), showing that in fact, despite the comings and goings of "concepts", an intellectual convergence that transcends disciplinary boundaries ends up prevailing.

This brief description initially explains the presence and strong performance of the then federal deputy Bolsonaro in the case, repeating strategies for using the media and common sense notions to defend anti-scientific positions; we also highlight the interference of politics in science by funding research and encouraging the approval of study protocols without the substance having fulfilled the minimum requirements that point to its antitumor potential;

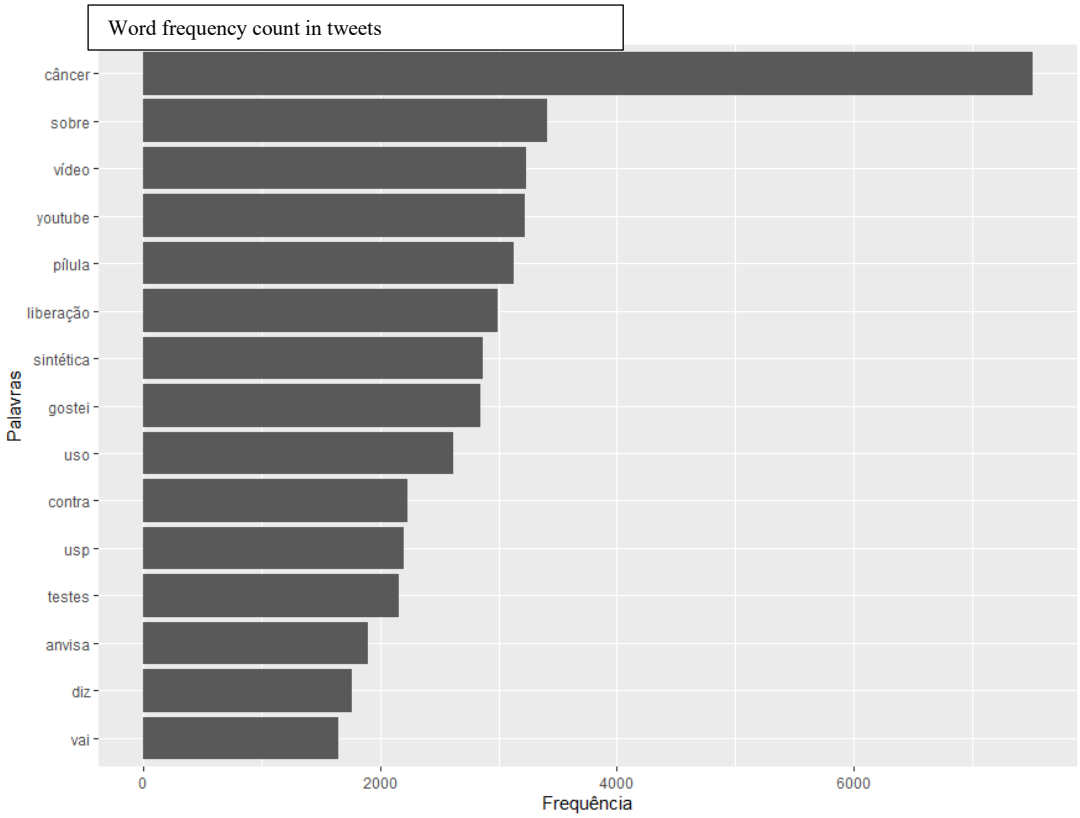
finally, the legal field was mobilized to superimpose scientific methods and values and was later responsible for recovering the scientific position on the subject.

In order to seek more empirical data on the transversal relationship between the scientific field and other social microcosms, we then proceeded to the analysis of social networks. After delimiting the time frame of the investigation by consulting the periods of greatest search for the term 'phosphoethanolamine' on Google, we analyzed the social network Twitter between Sep/2015 and Sep/2016, selecting all tweets posted containing the term 'phosphoethanolamine'. The search resulted in 31,490 posts. The first analysis performed was counting the frequency of words in tweets. Excluding the search term, present in all posts, figure 3 shows the fifteen most frequent words.

We note that after the term 'cancer', naturally associated with the specific case, mentions appear of 'video' and 'youtube', which are terms, in general, that are not part of the "scientific language". Next, there are mentions of the fact of the political dispute over the release of the synthetic phosphoethanolamine pill. The final block of terms clearly refers to the role of the scientific field, identified by the terms 'usp', 'tests' and also 'anvisa'. This first analysis reveals how the episode apparently had repercussions in part of the general social space. We say part of the social space because the people who frequent social networks do not correspond to the entire population.

This result on the most frequent words in Twitter posts suggests that the arguments and discourses produced by science did not have the same impact as those coming from other social microcosms. As we have seen, Chierice's participation in television programs and the support of parliamentarians generated a wave of denial in relation to the results previously produced by science.

Figure 2 – Most frequent terms in tweets selected due containing the term 'phosphoethanolamine'



Source: Devised by the authors based on data from Twitter

After analyzing the frequency of isolated terms, we proceed to the investigation of bigrams, which are contiguous sequences of two terms from a given text sample, in this case tweets. It is possible to note that the network of words associated with the term 'phosphoethanolamine' consists of three major branches. The most frequent, located at the bottom of the network, seems to indicate a branch very close to political discourses. It is possible to understand that the speeches of this branch would be like "release of phosphoethanolamine by the ministry of health", or "ministry authorizes the use of the phosphoethanolamine pill".

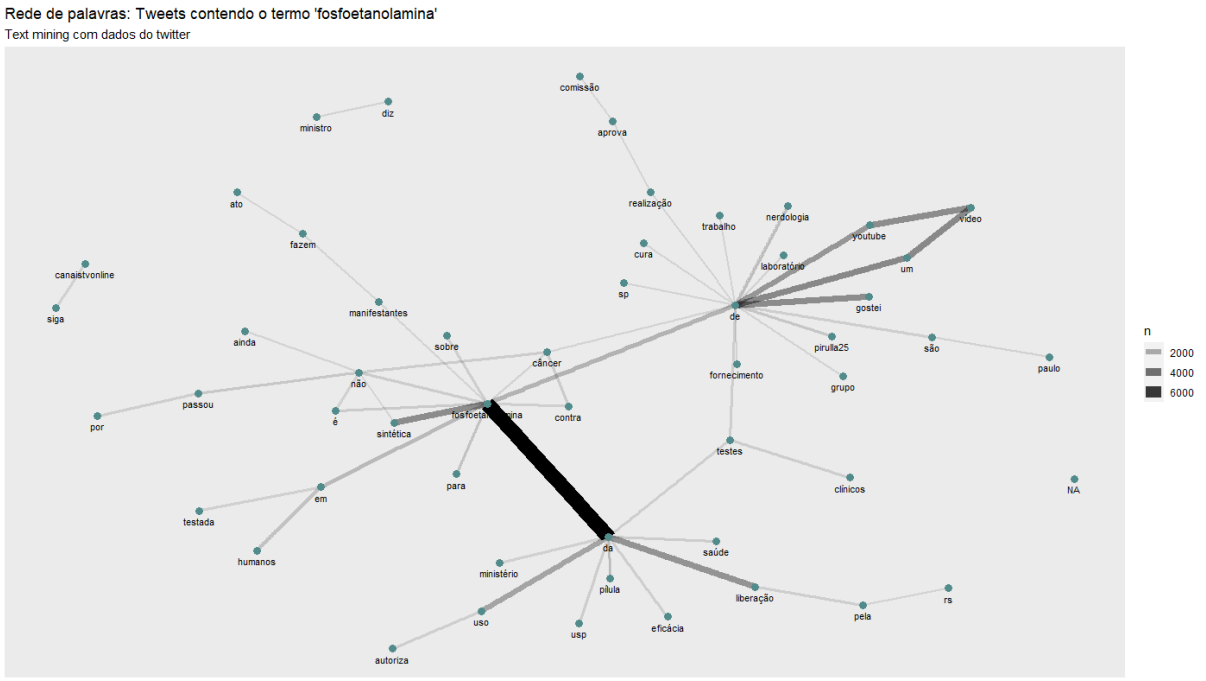
The second branch, located on the left side of the network, seems to indicate discourses close to the scientific field, for example, "phosphoethanolamine has not yet been tested in humans". However, this "scientific" branch is associated with intrinsically political terms, such as the mention of the acts of demonstrators for the release of phosphoethanolamine.

The third branch, located on the right side of the network, is closely associated with the means of dissemination of the episode, which, due to the high frequency of terms, reveals the

role of 'youtube' videos. We also identified very popular dissemination channels, such as 'nerdologia' and 'pirulla25'.

This word network analysis well illustrates the complexity of current times and how scientific concepts, here characterized by the term phosphoethanolamine, are appropriated and reflected in the broader social space, beyond the boundaries of disciplinary fields. This complexity cannot be removed from the screen in sociological analyses. It is necessary to understand how this transversality of fields impacts the productions and appropriations of the scientific field, as we seek to explore in the analysis of this episode.

Figure 3 – Network of words (bigrams) constructed from tweets containing the term 'phosphoethanolamine'



Source: Devised by the authors from data from Twitter

Finally, below we present a table with the ten most “popular” tweets of the 14th and 15th of April 2016, shortly after the then President Dilma sanctioned the law 13,269/16 (BRASIL, 2016) releasing the use of the so-called “cancer pill”. By “popular” we mean the posts with the most shares and likes.

Frame 1 – Ten most popular tweets in the 24 hours following the enactment of Law 13,269/16

Profile	Tweets
@BolsonaroSP	I bet a lot that Jornal Nacional will not mention the name of Jair Bolsonaro now when talking about the release of phosphoethanolamine (cancer pill).
@RevistaEpoca	Examination shows multiplication of tumors even after the use of phosphoethanolamine (Available in: https://t.co/ftKplOM8kI; https://t.co/igE5B9NV9H)
@JornalOGlobo	Anvisa criticizes President Dilma's decision to release phosphoethanolamine (Available in: https://t.co/jweHlPxSJm https://t.co/woHG9U6AZS)
@VEJA	"Cancer pill" puts the population at risk, says Anvisa (Available in: https://t.co/xc6Lc5gpMi)
@Cardoso	Scientists researching whether phosphoethanolamine cures impeachment.
@RonaldoGogoni	Cancer patient undergoes "treatment" with phosphoethanolamine. Two months later, the obvious: metastasis and death (Available in: https://t.co/cIGbYvZ0Ph)
@garotasemfio	This phosphoethanolamine story is an impressive snowball of mistakes that nobody stopped, and turned into what it is now.
@CBNoficial	Luis Fernando Correia - Brazil embarrasses itself within world science by authorizing phosphoethanolamine (Available in: https://t.co/vmZdKQvdkU)
@SamanEdu	Dilma Rousseff exceptionally authorizes the use of phosphoethanolamine in the "cancer pill" (Available in: https://t.co/dDBnHSCpPj; https://t.co/JL0cOM3iIv)
@garotasemfio	The cruelest of all is to see people in despair, with terminally ill relatives, begging for medicine. #phosphoethanolamine

Source: Devised by the authors with data from Twitter

We noticed that the repercussion was, in general, quite negative on this social network. It is also necessary to consider the particularity of each social network and the profile of its users, a topic that is beyond the scope of this article, but which could complement our analysis. Apparently, the recommendations produced by agents in the scientific field, reports from the Ministry of Science and the National Health Surveillance Agency (ANVISA, Portuguese initials) had an impact on the social space. This repercussion ended up resulting in the suspension of Law 13,269/16 (BRASIL, 2016) by injunction issued by the Federal Supreme Court (STF) the following month. As mentioned by Shinn and Rouanet (2008, p. 153, our translation) about the knowledge, techniques and methods of science, "the universal character of its validity appears when several practitioners, enrolled in different domains obtain stable and durable results".

Final considerations

In this article, we analyze the case of phosphoethanolamine, one of the most institutionalized cases of scientific denialism in Brazil, through the theory of fields and the perspective of transversal science, which point to relations between fields that go beyond criteria internal to the scientific field. Starting from the transversalist perspective, we discuss the weakening of the frontiers of the scientific field pointing to its heteronomy and we try to illustrate how this case extrapolated the internal dynamics of the scientific field, bringing transversal dynamics as important forces of dispute in this episode (such as the legal and media) and we show the interpenetration relations between the scientific field and other social microcosms.

This case has important similarities with another one even more recently in the Brazilian context: the indication of chloroquine as an early treatment for Covid-19. Despite the lack of evidence produced by science on the effectiveness of the drug, agents in the political field, not coincidentally led by then President Jair Bolsonaro, demanded the recommendation of chloroquine by the State, resulting in Note n. 9/2020 SE/GAB/SE/MS (BRASIL, 2020) with guidelines from the Ministry of Health for handling the drug. As we have seen, the notion of transversal science helps us to understand these episodes (SHINN; ROUANET, 2008).

In both cases, we can understand scientific denialism as a transversal phenomenon of interpenetration between fields, which goes beyond the internal dynamics of the scientific field, pointing to the interference of dynamics in other fields. These other fields do not reconfigure the scientific field or dispute its scientific capital, but contribute to its heteronomy by defining as scientific elements that go beyond the field's internal dynamics. It is important to highlight that not all forms of heteronomy and interpenetration of fields necessarily point to negative implications such as those we have observed as a result of denialism. A greater social concern, for example with the production of low-cost or off-patent drugs, could motivate this heteronomy of the scientific field towards the benefit of the population; however, this is not the type of phenomenon we have observed in scientific production in the capitalist system.

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