

Public Discourse on Stem Cell Research in Russia: Evolution of the Agenda

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Abstract

This paper studies the evolution of the media discussion surrounding stem cell research in Russia from 2001 until the issuance of the first national law in 2016 and its impact on stem cell's 'social career' in the public discourse. It analyses how the interaction of different media frames stigmatized either the biomedical technology, or the expert community. It is argued that the regulatory framework in Russia lags behind technological developments in the country and mostly reacts to signs of fraudulent actions from drug makers or practitioners. Moral issues, in contrast to the international discourse, have been not the main reason in Russia.

Keywords: Russia, stem cell research, media discourse, agenda setting, framing, science and technology governance.

Introduction

Stem cell research ranks among the most controversially discussed topics in science (Nippert, 2002; Brown, 2003; Kitzinger, 2008). Therapies based on stem cells promise cures for a wide range of diseases, and for some give hope for eternal youth. Still, the thought of a scientist experimenting with human embryos or creating genetically modified human beings is as frightening today as was young Mary Shelley's creation of Frankenstein at the beginning of the 19th century. The trade-off between health benefits and fears of unrestricted

science is the subject of a public debate, the outcome of which will shape institutional environments and legislation.

The example of such outcome happened in 2016, when the Russian Federation launched its first piece of legislation to regulate the use of stem cell research for medical applications. The law was issued mainly due to misuse and unethical practice in the field, which was attracting media attention and shaped public opinion. The media has a strong interpretive function in such public



discourses about scientific issues. Hence, this paper analyses the media coverage of stem-cell research and therapy and studies its impact on stem cell's 'social career' in the public discourse in Russia. The time frame of this study is marked by the first mentioning of stem-cell research until the issuance of the first national law in 2016. Russia provides a particularly interesting case as its institutional environment has developed independently from the Western settings. Furthermore, Russia has been the breeding ground for some of the most significant scientific discoveries in the past few centuries. This tradition of scientific excellence and well-rooted technocratic thinking provides an interesting example both for the perception of science and for the role of the media in the country. On the other hand, studies on Russia's critical media discourse around scientific hazards in general and stem cell research in particular are very scarce (see Astakhova, 2013; Kozhemyakin and Medkova, 2013).

A better understanding of such discourses is of great academic interest as they profoundly shape the future of certain fields in science and technology as they negotiate visions of the potential social benefits and risks of such scientific and technological advances. In other words, the future of science and technology builds on such contested claims and counterclaims over its potential (Brown et al., 2000). The public discourse on new scientific discoveries and emerging technologies is non-trivial as it is shaped by the historical experience, the dominant culture and the political system in a country (Gottweis and Prainsack, 2006) and, therefore, may significantly vary from one society to another. Differences in these discourses and their geneses are of great academic interest as they help to explain the social expectations and distinctive features of existing policy frameworks that deal with emerging controversies around recent scientific developments (see, for example, Kamenova and Caulfield, 2015; Petersen et al., 2017; Kamenova, 2017).

Role of the media in shaping public discourse

The dialogue between science and the greater society is mediated by a variety of communication

channels, among which mass media play a crucial role in informing the wider audience with respect to the current policy agenda. However, in contemporary societies, where interactions between different groups of actors produce multifaceted discourses on highly knowledge-intensive topics, the role of the media exceeds mere information diffusion. Through sectioning and filtering of information, it takes a very proactive role, which has long been a subject of academic research (Lippmann, 1922; Becker and Murphy, 1993; Dyck et al., 2013).

Extensive coverage of a particular topic alerts news recipients to an issue raised (McCombs and Shaw, 1972; Cohen, 1985; Elliott, 2012) and increases the importance of such a topic on the list of public priorities (for an overview see McCombs and Shaw, 1993). For example, Nisbet and Lewenstein (2002) showed that debates on stem cells in the US Congress and the White House received great media coverage, while discussions at a lower administrative level attracted attention of only small professional communities (Maynard-Moody, 1995). It has, furthermore, been recognised that the agenda set by the media greatly influences decisions by policy-makers (Caspi, 1982; Bennett and Entman, 2001; Nisbet et al., 2003; Schäfer, 2011). The way in which the media present a particular topic shapes the perception of recipients and sets the tone in which proposed solutions are negotiated (Gibbons, 1999; Nisbet et al., 2003; Holliman, 2004; Bauer, 2005; Kitzinger and Williams, 2005; Weingart et al., 2008; Schäfer, 2009; Haran and Kitzinger, 2009; Zajc and Erjavec, 2014). Thereby, the media might stigmatise certain scientific activities (such as human embryo research) or support the sentiments about future research (Frickel et al., 2010). Consequently, the media frame the public discourse around dominant narratives (Hall, 2006) and convert complex scientific findings into a sequential series of events (McComas & Shanahan, 1999; Boomgaarden and de Vreese, 2007)¹. Due to the crucial role of public discourses in policy decision making, there is an increasing interest of factors that influence the course of the debate (Gregory and Miller, 1998; Weingart, 1998; Weingart et al., 2008; Rödder, 2009; Rödder and Schäfer, 2010; Schäfer, 2011; Hug, 2013; Saniei, 2013).

Specifics of the Russian Federation

Historically, though, the greatest attempts to influence the media came from national leaders. As such, the instrumentalisation of the media for political objectives has a long history in Russia and evolved from almost total control of all media channels in the Soviet period to a greater and more lasting freedom of the press after 1985, when Mikhail Gorbachev introduced principles of 'openness' and 'transparency' (Brooks, 2000). Journalists were given greater independence in choosing what to report on whilst still enjoying the economic security provided by subsidies (Hagstrom 2000; Ryabov 2004). For Yeltsin, freedom of the media was a baseline value (Gessen, 2000) as largely one means to an end: to replace the communist ideology. Nevertheless, the economic situation of independent media production started to deteriorate, as government backing broke away and advertising revenues were slow. Some newspapers fell into the hands of oligarchs, who pursued personal interests (Zassoursky, 1999, 2004; Belin, 2002; Fadin, 2002; Ledeneva, 2013; Pallin, 2017; Skillen, 2017). Putin strengthened central institutions in order to reestablish 'order'. Consequently, self-censorship became a growing phenomenon at privately owned media outlets (Belin, 2002; Schimpfoss and Yablokov, 2014). The state has ever since extended its hold over former independent media producers. See, for example, the case of NTV (Lipman and McFaul, 2001) coverage of politically and socially sensitive matters (such as the Chechnya war or the submarine Kursk), as well as issues pertaining to anti-terrorism regulations and state secrets (Albats, 2001) and the annexation of Crimea (Zeveleva, 2018). In contemporary Russia, public discussions allow for vivid debates (McNair, 2000; Mickiewicz, 2000, Kosmodemyanskaya, 2014; Sologug and Yakimova, 2016; Kazun, 2017). This is especially true for the field of science, an area of great public interest in Russia.

Stem cell research and its regulation in Russia

For the purpose of this paper we consider stem cells as undifferentiated cellular elements with self-regeneration and differentiation abilities. Depending on the differentiation potential, the literature distinguishes between totipotent, pluri-

potent, and other types (multipotent, oligopotent and unipotent)² of stem cells. The pluripotent stem cells have the highest medical potential due to their capability of differentiating into any cell types. These are embryonic stem cells from blastocysts intracellular mass (obtained from in vitro embryo between the 4th and 7th days of development), as well as stem cells formed in the later stages: the primary embryonic germ cells (gonocytes) and the cells of embryonic tumors³. Besides human embryos, pluripotent cells can be derived from 'adult' specialized cells that have been genetically reprogrammed back into an embryonic stem cell-like state (induced pluripotent stem cells).

Up to 2001, the existing legislation of the Russian Federation did not cover any stem cell related activities. Stem cells were by then considered tissue transplants. The transplantation of human organs and tissues is regulated by the Federal Law № 41801 'On the transplantation of human organs and (or) tissues' (issued December 22, 1992 and edited June 20, 2000). However, according to its 2nd article, the regulation is applied neither to organs or tissues related to the human reproduction process, including reproductive tissues, nor to cord blood and its components. Furthermore, the law did not cover any stem cells derived from embryonic or abortion tissues, umbilical cords, or placentas.

Despite the absence of legal situation, stem cell researchers in Russia were very active and between 1996 and 2001, a total of 15 applications for a Russian patent in the field of stem cell research were approved. Russian researchers were developing stem cell technologies based on fetal tissues (which were subsequently viewed rather critically). In 1999, a patent was granted for an immune-corrective drug based on cell suspension that was obtained from natal cryo-preserved hematopoietic fetal liver cells and/or the human spleen. The drug was considered very promising for treating diabetes.⁴ Another method was patented in 2000 for donor cell preparation from the fetal tissue of aborted fetuses at 17-21 weeks of fetal development.⁵ Clinics (especially private ones) started successfully commercialising stem cell therapy programs (in particular fetal therapy).

Since 2001, a long period of legislation development has started. Table 1 provides informa-

Table 1. Key milestones of the public discourse on stem cells in Russia, 2001 – 2016

Period	Type	Events
2001-2002	Development of legislation	On August 29, 2001, the Russian Ministry of Health issued a new decree № 345 'On the establishment of the Advisory Council for the consideration of scientific research for cellular technologies and their introduction into practical public health'. In 2002 the Advisory Council issued the 'Temporary instruction on the order of research in the field of cellular technologies and their use'. The regulations limited the handling of stem cells to a list of specialised institutions.
2002-2003	The start of the first cord blood stem cell bank and first related legislation	In 2002, the first bank of stem cells of cord blood was established in Russia. On May 29, 2002 the Russian Academy of Medical Sciences launched the research program 'New cell technologies for medicine'. In 2003 the Russian Ministry of Health issued a new Act № 325 'On the development of cellular technology in the Russian Federation', which regulates (1) the formation of a bank of umbilical cord and placental blood for research proposes; (2) the separation and storage of placental blood concentrate; and (3) the formation of a bank for stem cells derived from umbilical or placental blood.
2004	Discussion of black market	In 2004 scientists and clinicians organized a round table discussion at the Sechenov Moscow Medical Academy about the legal aspects of stem cell usage with journalists participation.
2005	First fraudulent actions	In 2005 the sale of the 'anti-ageing' stem cell cosmetic 'Stvolamin' started.
2007	Further legislation	On January 22, a decree № 30 'On the regulation of medical activity licensing' was issued which required that each organization held a license to use cell technologies (including sampling, transporting and storage of hematopoietic stem cells, and the use of cellular technology).
2008	First public scandal	The manufacturer of 'Stvolamin' was blamed for fraud in production and selling.
2010-2011	First introduction of a specialised legal framework	On 6 December 2010, the first version of the federal law was published. The Article 9 Section 2 banned "the use of cells of human embryo or fetus for the preparation of cell lines intended for the biomedical cellular technologies development". This version was much criticized by experts because of the absence of clear definitions, rules and general illiteracy. After a public hearing the draft law was sent for the revision. In 2011, the Russian Academy of Medical Sciences and in the approved the revised version. However, it was not accepted.
2012	Second fraudulent action	Citizens found barrels with aborted human embryos in the forest near Nevyansk (a small town in the Sverdlovsk region of Russia).
2013-2016	Development of the specialized legal framework	In 2013, the Russian Ministry of Health published next version of the draft law 'On the circulation of biomedical cell products' and organized public hearings. The draft law did not pass the expertise too. In 2015, the Civic Chamber of the Russian Federation held public hearing with experts and public activists to discuss the next version of the draft law 'On Biomedical Cellular Products'. Following the discussion with the participation of the representative of the Ministry of Health, it was decided to create a working group, which would work on improving the draft law together with the department and the relevant committee of the Russian State Duma [the lower house of Parliament]. In 2016, the law was finally accepted.

tion on key changes and important events in the public discourse on stem cell research in Russia.

Over the course of years, researchers and clinicians had been acting in a legal vacuum. The results of our previous study (Polyakova, 2008, 2011) shed light on the main problems in stem cell research in Russia up to 2009, i.e. until the moment when the need for a specialised legal framework appeared on the political agenda.

In this research we studied social context and institutional organisation of stem cell research in Russia. We conducted 22 in-depth elite interviews with Russian scientists, clinicians and executives of private institutions, such as cord blood banks and biotechnology companies dealing with stem cells⁶. All experts agreed to participate in the research and to use the content of the interview anonymously. The list of experts is given in Appendix 1.

We discovered several interrelated internal and external problems in the field of stem cell research. The first one was the low level of the clinical trials culture in Russia:

When these researchers talk about improvement, they take oncological patients at the last stage who will die anyway (usually homeless people, chronic alcoholics). They take the last stage of cirrhosis, and the person is kept alive on glucose and blood transfusions for 3-4 months. They administer these cells, and the patient shows improvement - maybe it is because (s)he does not drink in the clinic, or because of some vitamins. Supposedly two of seven patients lived 2 or 3 months longer. That's all based on empirical evidence'. . .When you start to investigate, then there is no paper trail. No protocols, no registration. This is very important. (Head of Laboratory, Novosibirsk)

The second one was the promotion of stem cells as a remedy for various diseases and the non-specific application of particular sources of stem cells:

We began to use bone marrow cells for everything: cirrhosis, diabetes, everything. (Head of Laboratory, Novosibirsk)

In the 1990s, the current director of the Institute X founded the department. They injected 'cocktails' of fetal tissues from placentas. This is not regulated. . . I asked one doctor: "Are you sure that you inject

something that will show a specific result?" He answered me: "There are so many useful cells. We inject them all." (Clinician, National Medical Research Center, Moscow)

The third problem was the absence of strict rules and standards for stem cell research. It had several negative consequences.

Firstly, it created favourable conditions for the fraudulent schemes:

There is no regulation for using stem cells... you just have to apply for a licence and you can administer the therapy to anyone who agrees to it. (Head of Laboratory, Moscow)

Secondly, it hindered the progress of biotechnology in Russia. Existed legislation and standards for work with pharmaceuticals and for the transplantation of human organs and tissues were unsuitable for stem cell research - which complicated the organisation and documentation of clinical trials:

We have a license for the treatment of hematological diseases, to work with blood and bone marrow samples, for the isolation of stem cells from peripheral blood, etc. Such methods are legally approved. But if we want to use stem cells of bone marrow, for example, to treat liver cirrhosis, we are not allowed to do this, because legally we go beyond hematology - which is not a part of cell research. Therefore, the suggested method is not considered conventional and, therefore, should be licensed. Obtaining such a license, however, is not an easy task for bureaucratic reasons. (Deputy Director for Science Research Institute, Novosibirsk)

Thirdly, the lack of legislation had a negative effect on social status of stem cell researchers. The whole field of stem cell research was in the 'grey zone':

It is now the third year that we work on state contracts and we conduct clinical trials that are not regulated. The state wants the product and the medical technology. So, what should we do? Refuse to work until there is a law protecting us? This will make the whole science stop. (Researcher, biotechnology company, Moscow)

By 2008 a market for medical technologies related to the use of stem cells had emerged in Russia. It included at least three areas. The first one was based on the use of 'classical methods' – those legally allowed in clinical practice (for example, bone marrow transplantations in the treatment of certain types of cancer). The second area targets experimental methods. Problems, described above, became particularly apparent in this area. The third area comprises fraudulent schemes. In such cases, stem cells were not used at all.

Methodology

This paper studies the media coverage of stem cell research in Russia over a 15-year period from 2001 until the end of 2016, when the law 'On the circulation of biomedical cell products' was came into effect (it entered into force on January 1, 2017). Its Article 3 Section 5 sets out "the ban on using cell products for development, production and application if the biomedical material was derived from the interruption or disruption of the development of a human embryo or fetus."

Media reports, as any other historic documentation, only reveals parts and aspects of how policies come into place or how they are acted upon. Also, not everything that took place in the time span of this paper was covered by the media. Furthermore, media reports cannot be taken at face value and require an independent source for triangulation. In this regard, we did secondary analysis of interviews with experts from science, technology and medicine (collected within the framework of specialized survey in 2008 (Polyakova, 2008, 2011)).

The interviews provided very valuable contextual data, which was useful in interpreting specific events or scientific activities. The interviews were particularly helpful in identifying the early developments of stem cell research and applications in a legislative vacuum. At the same time, the narratives of the experts interviewed provided the background against which we could compare the integrity of media coverage (media discourse vs. expert discourse). Based on these interviews, we carefully approximated the key problems and controversies in stem cell research in Russia through content analysis.

The use of narratives to analyze historical sources in sociological research looks back on

a long tradition (e.g. Franzosi, 1998). Such a methodological approach requires methodological rigor in order to meet scientific requirements in exposing generalizable patterns that inform beyond the setting of the present paper (e.g. Polletta et al., 2011; White, 1987). This rigor commands a careful organization and structuring of the material at hand in order to connect collected narratives and media reports to a chronologically presented line of events. The ultimate end of this paper is to reconstruct and conceptualize media coverage in order to understand policy action (the issuance of the piece of legislation in relation to these earlier events).

We made use of the Factiva database,⁷ which contains over 32000 national, international and regional media sources from 200 countries in 28 languages. In particular, it covers all major Russian newspapers, journals, news feeds, leading news and business websites, as well as transcripts of broadcast news channels. A detailed description of the largest by coverage Russian offline and online media used in this research is provided in Appendix 2.

Factiva though only contains 21 transcripts of TV programs on stem cell research for the period from 2010 to 2016. We hence used in addition the online library of Russian language media 'Public.Ru'. We chose key federal TV channels that are broadcasted into all Russian regions: 'First channel' [Первый канал], 'Russia' [Россия], 'TV Center' [ТВ Центр], NTV [НТВ] and 'REN TV' [РЕН ТВ]. Those federal TV channels are key to transport the government's view on the subject matter.

The content analysis of media reports comprised of two stages. In the first stage, we studied the dynamics of the media coverage, using the keyword 'stem cells' and its derivatives ('stem cell' or 'embryonic stem cell' or 'fetal stem cell') for the period from 1997 to 2016 in the Factiva⁸ and from 2005 to 2016 in Public.Ru. Thereby, we could estimate the scale of media coverage of stem cell research in Russia. In the second stage, we studied the controversial issues raised by the Russian media before passing the law that prohibited certain areas of stem cell research. To identify these articles, we developed the list of keywords and examined the articles' content. We compared all reports (total of 401) from 1997 to

2004 and compared them to the insights from the expert interviews. We focused on the content of the media communications and paid attention to specific terms or phrases, which would reveal a more critical stance towards stem cell research. This procedure revealed thematic differences between media coverage and the opinion of scientists. Thereby, we identified around 100 keywords and phrases associated with controversies in stem cell research. As the first keyword list was based on popular buzzwords, we further refined our keyword search and focused mainly on words that correlated strongly with negative views on stem cells. The final list included 385 keywords stressing four contested areas in the field of stem cell research in Russia:

- the absence of regulation in Russia (e.g.: uncontrolled and/or illegal use of stem cells in medicine, unregulated market);
- unethical behaviour of researchers or specialists, clinics or other institutions who offer stem cell therapy (e.g.: falsification, charlatan(s), unethical medical application, borderline bid);
- moral issues (e.g.: commercialisation of abortions, cannibalism);

- side effects (e.g.: risky method of treatment, stem cells of unknown sources or which provoke cancer).

Thereby we could identify the critical messages in media communications which built the basis for further analysis. The list of keywords is available upon request.

Findings

The growth of media attention to stem cells

The first publication on stem cells included in the database 'Factiva' appeared in 1997. Initially, the level of media attention to stem cell issues was very low (see Fig. 1). Often the term 'stem cell' appeared together with 'cloning'. As the number of messages regarding stem cell research increased, so did the share of such reports using both the terms 'stem cells' and 'cloning'. However, from 2010 onwards these publications did not exceed 10% of the relevant entries in the database 'Factiva'. The topic of stem cells has become an object of independent interest in the media.

Most of media stem cell coverage served an informative purpose only. They did not analyse this area and its problems. For example, 23% (4186 of 17906) of the analysed articles in the 'Factiva'

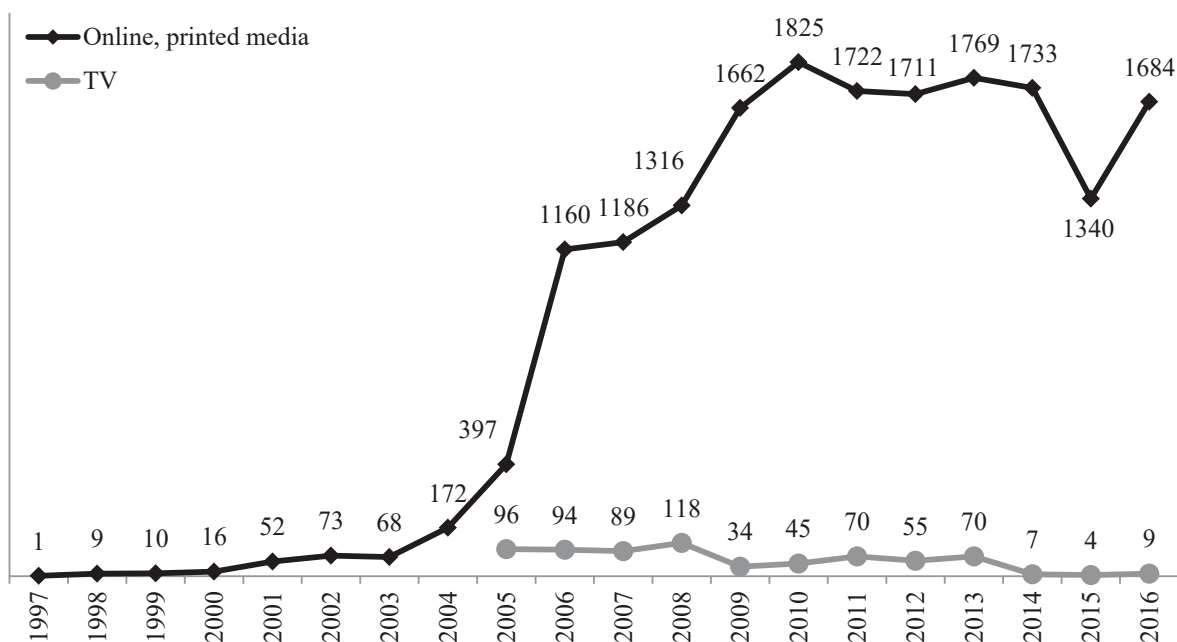


Figure 1. Media coverage of stem cell issues during 1997-2016 (messages per year)

database were devoted to scientific achievements or Nobel Prizes for discoveries related to stem cells, 15% (2623 of 17906) covered industrial applications, and 6% (1040 of 17906) – reported on the Russian Human Stem Cell Institute. In Public. Ru, 36% of entries about stem cells covered scientific achievements and 17% positive cases of treatment of incurable (or seriously ill) patients. Together with the ‘naked’ outline of the facts, these messages were embedded in the discourse of positive expectations and hope.

The potential of cellular transplantology is enormous. Only 1% of normal cells, transplanted into a sick organism, can completely restore the functioning of damaged organs. (Independent newspaper [Независимая газета], 24.04.1998)

(...) Moscow physicians have artificially grown stem cells and are ready to inject them. (...) All organs can heal. It restores memory, and heals neuroses and depressions, etc. Soon it will be possible to bank individual stem cells and, if necessary, inject them into the person who needs treatment.

Theoretically, such cell therapy can prolong a person's life by 15-20 years. (Moscow Komsomolets [Московский Комсомолец], 19.11.2001)

The market of stem-cell drugs should increase from \$80-100 mln. in 2009 to \$ 855 mln. in 2011. (Kommersant [Коммерсант], 13.09.2009)

Israeli clinics use stem cells in the treatment of cancer and rare blood diseases. (Medical newspaper [Медицинская газета], 12.02.2016)

These reports stressed the potential of stem cells for medicine (treatment of incurable diseases, cultivation of tissues/organs, revitalisation/rejuvenation) and portrayed stem cell therapy as a ‘panacea’ for all imaginable diseases. Like the situation in other countries Russian media have rarely critically reflected on the hype surrounding breakthroughs in stem cell research, thus reinforcing the expectations about the future implication of this innovation (Frickel et al., 2010; Kamenova, 2017).

From 2004 to 2006, media coverage grew exponentially⁹. In 2004 the coverage of stem cell research and therapies more than doubled compared to 2003. In the next two years the number of contributions stayed constant. The

growth in media coverage was linked to several approved legal documents regulating stem cell activities, as well as to the establishment of the first banks of stem cells of cord blood (in 2003-2004, see Table 1). Due to the increased media attention (Internet, newspapers and TV), by 2008 52% of the Russian population was aware of stem cells (Public Opinion Foundation, 2008).

Media coverage of stem cells issues in TV and other media indeed differ. While TV attention peaked between 2005-2008, the Internet and printed media attention to the topic reached its high only later (Figure 1). The topic has lost attraction for the official media (represented by TV) mainly in 2009 when Russian authorities announced the issue of a proposed law that would solve problems in current stem cells research.

Since 2010, the articles on stem cells have slightly decreased in numbers, most likely triggered by policy changes in this field to tackle controversial issues. A noticeable decline of interest can be seen in 2014, when attention shifted to the armed conflict in the east of Ukraine. From 2014 to 2015 media coverage was down substantially (by 23%), but then the level of media attention to stem cells grew up again.

Negative media frames

Science journalists often incline to accept an optimistic scientific agenda (Nisbet et al., 2003). Only 2% (311 of 17906) of the analysed online and printed media contributions in the time period covered by the present study were at least partly critical. The same indicator was slightly higher at 12% for TV coverage (86 out of 691), but low in comparison to results from other countries (Kamenova and Caulfield, 2015; Kamenova, 2017). We suppose that this very low level of attention to the controversies was one of the reasons why the authorities responded with such a time delay.

Most of the critical reports on TV (67%) were broadcasted in 2005-2008 (before the draft legislation), whereas 56% of the articles between 2009-2016 took a critical stance.

At the same time, the critical coverage of the Russian media became more diverse and did not focus exclusively on hESC (human embryonic stem cells) research but included its regulation and ethical positions (Maynard-Moody, 1995;

Brown, 2003; Brown et al., 2003; Nisbet et al., 2003; Saniei, 2013; Kitzinger and Williams, 2005; Gottweis and Prainsack, 2006; Lovell-Badge, 2008; Haran and Kitzinger, 2009; Elliott, 2012; Kamenova and Caulfield, 2015; Kamenova 2017).

In the next section, we will demonstrate that the media discourse on stem cells in Russia raised moral issues of hESCs research and fetal therapy, as well as issues with the professional community and commercialization practice in general. Critical articles contained information pertaining to problems in the field and controversial issues: 64% (or 200) on moral issues, 39% (or 119) on the challenges for professional expertise in terms of commercialisation of stem cells, and 37% (or 116) on the risk of side effects. The density of critical discourse in online and printed media vs TV programs is shown in Figure 2.

Ethical issues of stem cell therapy

hESCs research and fetal therapy was vividly discussed against ethical, moral, religious and legal backgrounds (Table 2). However, the ethical discourse, entirely or along with other contexts, remained dominant (90,5% of articles). Thereby, Russia’s reports were in line with the international discourse (see for example, Kitzinger and Williams, 2005).

This direction of the critical discourse developed out of critical reflections on moral issues of the use of human embryos and fetal tissues in stem cell research and spanned the topic over to the commodification of human embryos and fetuses. Ethical arguments were based on the moral or religious discourse and were linked to the ‘blastocyst’, the same status as the ‘living Baby’ (Medical Post [Медицинская газета], 17.03.2006). The use of fetal stem cells was seen as inadmissible, as this would raise incentives for medical practitioners to conduct more abortions. “We will turn the killed children into spare parts for humans”, was stated in the newspaper Profile([Профиль], 03.07.2006). Thus, the use of human embryos and aborted fetuses in stem cell research was presented as ‘murder and cannibalism’.

Since 2001, the Russian media have started to raise questions with respect to the moral status of human embryos. Interest in the ethics and/or morality of stem cell research/technology in the Russian media echoed the coverage of similar public debates in the US and statements by the Catholic Church against the use of human embryos in stem cell research.

The peak of media coverage was reached between 2006-2010 in online and printed media and in 2007-2008 and 2012 on TV (Table 2). The media coverage of stem cell technologies became

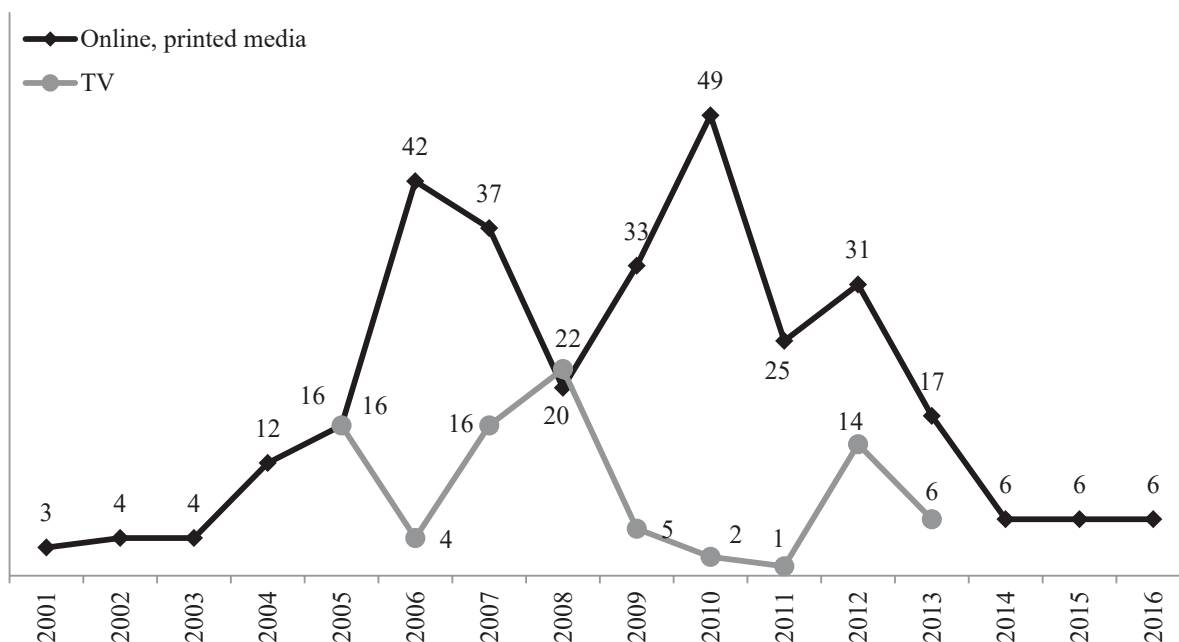


Figure 2. Media coverage of controversial stem cell issues during 2001-2016 (messages per year)

Table 2. Media coverage of controversial issues of hESCs research and fetal therapy during 2001–2016 (publications per year)*

Contexts	Frames	Topics	2001-2005		2006		2007		2008		2009		2010		2011-2012		2013		2014-2016		Total		
			1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	
Moral/ethical Religious	The use of human embryos and fetal tissues is murder and cannibalism Mixing man and animal is unethical	Moral status of human embryos	13	7	2	19	2	22	17	5	2	16	1	14	17	8	12	0	1	0	119	37	
			4	0	6	0	3	0	6	1	4	0	7	0	5	0	3	0	0	0	38	1	
Rational	The research on embryos is unnecessary because there are alternative way	Moral estimation of fetal therapy	5	0	6	0	1	3	0	0	2	0	2	0	4	2	1	0	0	0	27	5	
		Position of religious leaders	3	0	11	0	2	0	2	6	6	0	3	0	10	0	0	0	0	0	0	37	6
		The creation of hybrid embryos as a source of hESCs	0	0	2	0	3	1	8	0	0	1	0	0	0	0	0	0	0	2	0	9	9
		Adult SCs VS. ESCs	6	0	3	1	6	3	1	0	2	0	2	0	1	3	0	2	0	2	0	26	4
International	Mixed frames Experiments with embryonic stem cells are illegal in many countries	The discovery that mature cells can be reprogrammed to become pluripotent and further surveys	1	0	6	0	9	8	3	0	4	0	6	0	5	6	8	0	1	0	43	14	
		A technique of generating hESCs without destroying embryos	0	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2
Legal	The use of human embryos (or hybrid embryos) and fetal tissues is illegal in Russia	US debate	10	2	8	0	8	4	1	0	5	0	1	0	3	0	0	0	0	0	36	6	
		Other countries	3	0	3	0	4	0	1	2	0	2	0	2	0	6	1	0	0	0	0	20	2
Other		The Russian State Duma [the lower house of Parliament] introduced a bill prohibiting the use human embryo or fetus as a source of stem cells	0	0	0	0	0	0	0	0	0	0	1	0	7	0	1	0	2	0	11	0	
Total number of articles per year			28	4	2	0	5	0	3	1	3	4	1	1	1	0	3	0	1	0	22	10	
			28	8	29	2	28	18	12	13	23	5	31	1	26	10	15	0	8	0	200	57	

*Often one article combined several contexts and topics.

** In 2011, TV programs did not cover moral controversies in stem cell research.

more sophisticated. In 2006, the number of articles concerning stem cells in general almost tripled compared to 2005. In this year the ethical discussion in the media was triggered by four news topics: (1) the policy decisions of the then-President of the US, George W. Bush (he vetoed a bill that would have eased restrictions on federal funding for embryonic stem cell research), (2) the condemnation of the use of human embryos for research purposes by religious leaders, (3) the discovery of the iPSCs (induced pluripotent stem cells) technology which allows specialised adult cells to be genetically 'reprogrammed' to assume an embryonic stem cell-like state, which eliminated the need for human embryos, and (4) the emergence of alternative techniques for obtaining human embryonic stem cells (the creation of hybrid embryos as a source of hESCs and a technique of generating hESCs from single blastomeres without using embryos).

By the end of 2008, the media had stigmatized both embryonic stem cell research and fetal therapy as something immoral, non-essential and unacceptable in other countries. It is interesting that moral discourse was based on rather secular than religious argumentation (Table 2). Moreover, in this period journalists cited primarily foreign clerics.

In 2009, the need for a legal framework moved up high on the priority ladder of the policy agenda. In the next year, it was announced that obtaining stem cells from the human embryo or fetus would be banned (Table 1). Since 2011, the number of articles per year containing arguments against embryonic stem cell research has started to decline. In general, media coverage of hESC research (including positive and neutral articles) fell from 248 in 2009 to only 79 in 2016. Since 2012, this concept has completely disappeared from TV discourse. Thus, this field of research had been identified as especially problematic and had become a part of undone science or forbidden knowledge (Frickel et al., 2003)

Challenges for professional expertise

As mentioned before, biomedical research and stem-cell research in particular acted in an undefined space in Russia. The various commercialisation attempts of stem cell therapy under such

conditions attracted attention of the media and triggered the discussion: 38% of online and print media, 47% of TV programs were devoted to the issues of legitimacy and professional ethics.

The media used terms like 'black market' and 'illegal activity' to describe these events. Almost half the articles (53 out of 119 articles and 19 out of 40 TV programs) were hyping the emergence of a black market for stem cells in Russia, whereas half the number of articles (20) compared the situation to other countries. Reports on the opening of criminal investigations and the revocations of licences in this field strengthened further the negative tone.

Stem cell therapy became a fashion medical service in different types of clinics and cosmetological centers. Media questioned the epistemic authority of such organisations and professionals and contested their technical capabilities to provide stem cell therapy.

In Russia, there are no legal restrictions to work with embryonic stem cells. (...) Anyone who wants to offer cell rejuvenation/revitalisation can do it. (...) But what are these cells? (...) many cosmetological centres and clinics offer "tissue therapy" (a mix of fetal tissues)(...) If the procedure is carried out by non-professionals, then there is a big risk of infection. ("The price of eternal youth" Gazeta [Газета], 5 May 2004)

There are hundreds of clinics and beauty salons across the country, which offer rejuvenation for 30 thousand dollars. This week, the Federal Service for Supervision of Health in conjunction with the Attorney General's Office checked 42 Moscow organizations that use stem cell technologies. As a result, almost all tested clinics had their licences for medical activity suspended. Only five public clinics have the right to work with stem cells. (REN TV, 7 April 2005)

Moreover, on the hype of stem cell technology and imperfect legal framework created favorable conditions for a fraud in Russia that triggered a vivid debate (38 out of 119 articles and 8 out of 40 TV programs) on stem cell therapy commercialization. For example, in 2005, the 'anti-ageing' drug 'Stvolamin'¹⁰ had entered the market that allegedly contained stem cells. In 2008, the manufacturer of 'Stvolamin' was accused of fraudulent

action regarding production and commercialization of the drug. Media reported: “the many swindlers who began to treat people with God knows what” (Moscow News [Московские новости], 10.04.2012). Consequently, episodes of fraud in other countries appeared much less in the Russian media (12 articles).

Articles about the commercialisation of stem cell therapy were often based on investigative journalism with headings, such as “Buy cells cheap” (Ogonek [Огонек], 16 February 2004) or “Stem cells: hope or illusion” (Arguments and Facts [Аргументы и факты], 7 July 2004). They warned the population about potential risks and provided recommendations by experts on how to avoid swindlers. Often, journalists included information from conferences and other scientific events. For example, in an attempt by scientists to intervene and redirect the attention of society to the actual problems with respect to stem cell therapy, scientists and clinicians organised a round table discussion at the Sechenov Moscow Medical Academy at the end of 2004¹¹. This event was widely covered in the media (though relevant reports are not included in the Factiva base) and became a starting point for a critical reflection initiated by the scientific community. Participants of the round table stressed that numerous organisations offering stem cell therapy did not have a licence.

The media attention was focused on the legal status of stem cell research in Russia so much so that other aspects were left out. For example, in the year 2012, barrels with aborted human embryos were discovered in the forest near Nevyansk (in the Sverdlovsk region of Russia). Most likely, it was a violation of the rules for the disposal of medical waste.

Perhaps, the reason is the Russian negligence. There is an assumption that one health facility shipped the goods to another, which refused to accept it. And then the doctors decided to throw the embryos into the forest. (REN TV, 23 July 2012)

This biological medical waste belongs to three hospitals at least. It seems that the organization that deals with the disposal of this medical biological waste has not met its legal requirements. (First channel [‘Первый канал’], 23 July 2012)

This specific event was very provocative from both a legal and moral point of view. However, the media did not discuss the moral aspects of the behaviour of researchers and clinicians but instead journalists asked if the material has been used for illegal stem cell therapy: “Most likely, this is the concealment of criminal activity. It is possible that they were expecting an inspection, so they quickly got rid of the material evidences” (API-Ural [АПИ-Урал], 24.07.2012). The scandal in Nevyansk strengthened the notion of criminal wrongdoing in stem cell research.

Journalists questioned the legitimacy of organisations, which were offering stem cell therapy. For example, during an interview with the Russian Business Consulting (RBC) journal, the General Director of the Human Stem Cells Institute clarified that “as a rule, such organisations [that offer stem cells therapy] are licensed to work with cord blood, and not with the application of stem cell technologies” (RBC, 14.11.2012).

Controversies around the commercialisation of stem cell therapy proved to be a less popular topic (12 out of 119 articles, 0 TV coverage). Such media reports drew attention to the matters of the violation of the standards of good laboratory, clinical and manufacturing practice for business purposes in Russia: free participation in clinical trials and informed consent of the donors.

Thousands of offers in the internet promise patients the treatment of the most severe pathologies and cardinal rejuvenation and do not explain what type and what sources of stem cells they use. Medical and scientific centers do not even hide behind the status of ‘scientific research’. (GZT.ru, 06.12.2010)

The texts of Russian authors virtually don’t mention obtaining informed consent from the donors for the isolation of stem cells from cord blood (or other tissues) and their further use... Although hundreds of studies have already been conducted on the use of stem cells in the treatment of various diseases, the research literature contains no guidelines or best practices. Moreover, the therapies that are on offer in Russia stand in stark contrast to international rules. (Medical Post [Медицинская газета], 17.03.2006)

Media attention to the famous South Korean scientist Hwang Woo-Suk, charged with falsifying stem cell research the charge of falsification stem cell research, further discredited the credibility of stem cell researchers, but in broader context (13 articles and 7 TV programs).

This discourse surely affected the behavior of researchers and clinicians. This part of the media discussion discredited the credibility and standing of medical organisations and specialists, involved in clinical use of stem cells. In 2010, a documentary film ‘Rejuvenation by death’, aired by ‘Ren-TV’, reported on criminal activities in therapies with fetal stem cells.¹² This film was widely advertised in the media.

Articles devoted to the negative aspects of business activities with stem cells give the impression that the expert community was not able to enforce professional ethics. “Scientists ask to strengthen the laws and to control charlatans” (News World [Мир новостей], 25.07.2006). The weakness of the expert community and its disunity revealed itself in statements of the authorities published in the media as well:

According to Deputy Minister of Health and Social Development of the Russian Federation, V. Skvortsova, due to the absence of a consolidated expert community minor studies become priority and often duplicate each other. (Medical Post [Медицинская газета], 06.04.2012)

Side effects of stem cell therapy

The risks and potential side effects of stem cell therapy was covered by 116 out of 311 online and print articles and 13 out of 86 TV-broadcasts . Almost half of the articles emphasised the cancer risk after stem cell therapy (49 out of 116).

The influence of stem cells on the human body has not yet been properly studied. Stanislav Sadalsky [an actor] recently posted in his blog that his famous colleagues, who died of cancer, underwent treatment with ‘miracle injections’. He says that Anna Samokhina, Alexander Abdulov, Lyubov Polishchuk and Oleg Yankovsky [well-known actors] rejuvenated with the help of stem cells and it prolonged their lives. (Evening Kazan [Вечерняя Казань], 11.05.2012)

“The use of stem cells for rejuvenation can lead to serious complications. None of these technologies have been cleared in terms of safety. Stem cell injections at best threaten to intoxicate a healthy body, and at worst can lead to serious diseases. There are hints that stem cells can provoke the growth of cancerous tumours,” said the head of the Pharmaceuticals Registration Department, Sergei Tkachenko. (TASS, 31.03.2005)

Last year, dozens of laboratories that allegedly administered stem cell (and other cells) rejuvenators were shut down in Russia. Some of these creams and injections caused irreversible side effects, such as scars on the skin, cancer, etc. Soon a legislation on biomedical cellular technologies will be introduced to put an end to such practices. (Moscow Komsomolets [Московский комсомолец], 02.02.2011)

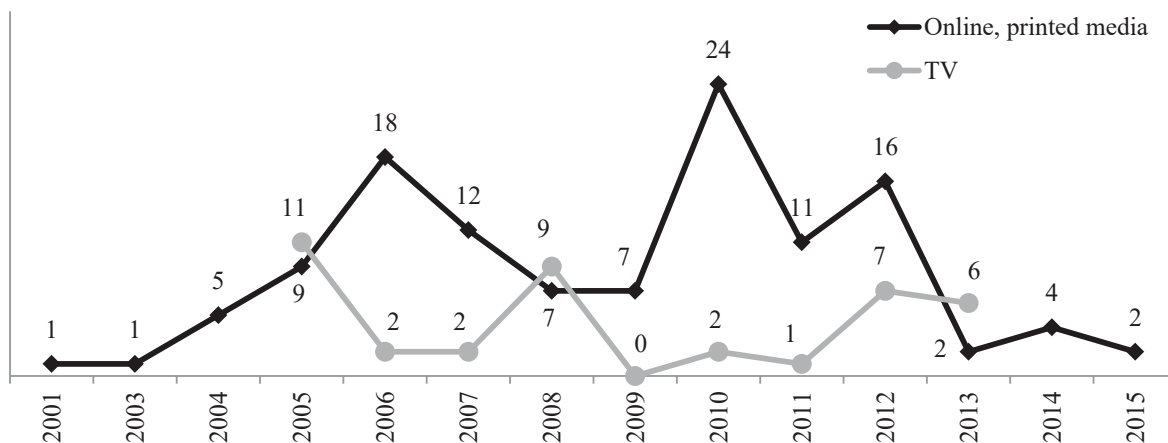


Figure 3. Media coverage of problems related to stem cell therapy commercialisation (messages per year)

Table 3. Media coverage of stem cell therapy risks during 2003-2016 (publications per year)

1. Online, printed media
2. TV

	2002-2005		2006		2007		2008		2009		2010		2011		2012		2013		2014-2016		Total	
Stem cells cause tumour growth and even cancer	3		0		6		1		3		12		2		5	3	1	3	0		33	6
Stem cells cause cancer	3		0		5		1		3		12		2		4	3	0	3	0		30	6
Embryonic and fetal stem cells cause tumour growth and even cancer	6		9		3		1		3		4		2		1		1		1		31	0
Embryonic and fetal stem cells cause cancer	5		5		1		1		1		4		1		0		1		0		19	0
Stem cells are dangerous (without specification)	6	2	7		3		4		1		3		0		2		0		2		28	2
Cancer stem cells	0		2		1		0	3	1		3		5		5		0		5		22	3
Stem cells of unknown sources are dangerous	3		2		0		0		0		4	1	1		2		0		0		12	1
Fetal therapy is dangerous	3	1	2		0		0		3		3		0		1		0		0		12	1
IPS cells can cause cancer	0		0		2	1	2		2		0		1		1		0		0		8	1
Efficiency is not obvious	1		0		0		1		0		2		0		0		1		0		5	0
Total articles per year	13	2	17		11	1	6	3	11		24	1	11		12	3	3	3	8		116	13

More than one third of articles about the cancer risk after stem cell therapy (19 out of 49) contain information about the cancer risk of ESCs and/or fetal stem cell rejuvenation and treatment. Such reports added to the moral stigma of ESCs and/or fetal stem cell research.

It should be noted, that journalists often mistakenly confused the term 'embryonic stem cells' with 'fetal stem cells'. Meanwhile, ESCs were not even the object of clinical trials either in Russia or other countries. This terminological confusion further discredited the work of researchers and painted a bleak picture of unscrupulous physicians using untested treatments.

From the title it becomes clear that the 'donors' are unborn children. I saw refrigerators with 'material' in one of these laboratories - this is a ghastly sight. (Sobesednik [Собеседник], 28.04.2010)

There is a peculiar modality of 'embryonic therapy' in Russia. Stem cells are isolated from the abortive material and injected into the patient. This method has two disadvantages. Firstly, there is a risk of infection if the material has been handled

improperly. Secondly, there is a possibility of tumorigenesis due to uncontrolled cell division. (Itogi [Итоги], 23.11.2004)

It is about the autologous cells and certainly not the embryonic cells obtained in abortions. (Culture [Культура], 18.09.2015)

Media activity thematising cancer risks related to stem cell therapy peaked in 2010 (Table 3), soon after the need for a specialised legal framework had been recognised in 2009. In 2010, the media honed in on the post of Russian actor Stanislav Sadalsky, who wrote in his blog, that several Russian movie stars had undergone rejuvenation treatment involving stem cells before they died of cancer. Also in 2010, the Russian Ministry of Health published the first version of the draft law 'On the circulation of biomedical cell products.' Since 2011, the issue of stem cell therapy's cancer risks has been disappearing from the media, and by 2014 it had disappeared altogether.

Interestingly, the majority of the articles (68%) on stem cells primarily focus on one specific issue,

leaving many others aside. Among the articles on ethical dilemmas in the field of stem cell research only 22% touch on the theme of the negative consequences of commercialising stem cell technologies and challenges for professional expertise, 28% focus on possible side effects. At the same time, more than a third (37%) of articles on the commercialisation of stem cells are concerned with moral issues and 43% discuss the negative effect of stem cell therapy on the human body.

The group of newspaper articles discussing side effects of stem cell therapy demonstrate a more comprehensive understanding of the situation regarding the use of stem cells at that time in Russia. Almost half (47%) of the publications refer to ethical debates concerning stem cells, too. In general, this is due to the fact that a large proportion of such reports are devoted to fetal stem cell therapy in Russia. Also, two-fifths (44%) of the publications cover the legal status of stem cell treatment in Russia.

In sum, media discussion surrounding stem cells started to decrease from 2011 onwards - after the first version of the draft law 'On the circulation of biomedical cell products' had been published in 2010. Official paperwork developed along with a growing level of the bureaucratisation of experts and their activities in the field of stem cell research and treatments. New technical details were regularly brought to the discussion by representatives of the scientific community and hampered the formation of a desirable consensus about basic terms and definitions, thus slowing down negotiation processes. Six years later, in 2016, the law 'On the circulation of biomedical cell products' was finally accepted. The law roughly reflects the development of the industry in the US 10 years ago and is close to the ideological position of the then-President of the US, George W. Bush. What a coincidence, given that the Russian media widely covered the US debate surrounding hESC research.

Nevertheless, the text of the law reflects all dominant narratives in the media. Firstly, it lifted an important area of medical technology out of the 'black market'. In particular, it regulates the development, research, expertise, state registration, production, quality control, sale, use, storage, transportation, import to / export from Russian,

destruction of biomedical cellular products which are intended for prevention, diagnosis and treatment of diseases of the patient, as well as the donation of biological material for the production of biomedical cell products.

Secondly, the law drew attention to the role of professional expertise and prohibits the manufacture of falsified biomedical cell products (for example, like 'Stvolamin') and to violate the standards of good laboratory, clinical, and manufacturing practice (article 35, item 5).

Thirdly, the law removes the most problematic ethic challenge of human stem cell research. The Article 3 Section 5 sets out "the ban on using cell products for development, production and application if the biomedical material was derived from the interruption or disruption of the development of a human embryo or fetus."

Fourthly, the law provides a set of requirements for all manipulations with cell cultures intended for patients. Before passing of the bill, such procedures as genetic modification of cells, cell culture process, etc. were practically not controlled, which created risks for patients and contested the effectiveness of the treatment. The law establishes that medical staff needs specialized qualification to work with cell products, as well as it introduces the condition of compulsory life and health insurance for a patient participating in clinical trials. Contrary to the expert community, the media paid more attention to the ethical issues of hESC research and fetal therapy¹³. As a result, the media discussion framed the treatment with hESC and fetal stem cells as an illegal and unethical practice. It also showed, that the expert community was, at that time, not able to execute effective control over its members (professionals).

Discussion and conclusions

As previous studies have shown (Gstraunthaler and Day, 2008; Tateno and Yokoyama, 2013), media communication is increasingly becoming the medium of choice for the risk assessment associated with newly emerging technologies. Such perceptions are often shaped by collective experiences around major catastrophic events, among which the nuclear accidents in Chernobyl and on Three Mile Island, the disaster at Fukushima, as

well as Hurricane Katrina can serve as examples (Gamson and Modigliani, 1989; Triandafyllidou, 1995; Boomgaarden and de Vreese, 2007; Barnes et al., 2008; Greenberg and Truelove, 2011).

The fragile interplay between science, technology and society is especially easy to disrupt when a controversy is associated with a high level of uncertainty. In that case, different regulatory mechanisms can be applied before a consensus is achieved. In the case of the public debates on stem cells, we observe a variety of reactions. In the USA, scientists were for a long time almost cut off from public funding for ethical reasons (e.g. see CNN, 2009; Wadman, 2011). Other countries have gone as far as forbidding research in certain fields. While the UK approved research on embryonic stem cells derived in vitro (Lovell-Badge, 2008) and UK scientists has recently gained license to edit genes in human embryos (Callaway, 2016), Austria prohibits the use of human embryos for cell line production, but allows importing the cell lines, and Lithuania forbids any work with embryonic stem cells altogether (Mlsna, 2011).

This research contributes to the conception of 'forbidden knowledge' and 'undone science' (Frickel et al., 2010; Hess, 2007), demonstrating how the interaction of different media frames enhanced each other, stigmatizing either the biomedical technology, or the whole expert community (not only particular scientists and clinicians).

In this paper, we studied the evolution of the Russian media discourse on stem cell research and its correspondence to the key lines of the policy agenda. We focused on the role of the media in the overall framing of the public discourse about stem cells. The Russian community of scientists and clinical practitioners set the pace for the development of the public discourse, as they started first to patent and then to commercialise the newly developed technologies. The media drew the attention of both the public and policy-makers to controversial activities involving stem cell research and the commercialisation of stem cell therapy in Russia. First, media coverage led to the filling of the gaps in the present legislation and drew attention to the absence of strict and transparent rules for stem cell research and clinical practice. Next, the media highlighted the health

risks linked to stem cell therapies. These concerns were both connected to commercialisation activities in a legal vacuum and the risks associated with the use of fetal tissues in stem cell therapy.

The scandal involving the drug 'Stvolamin' became a prime example of connecting the notion of 'stem cells' with criminal activities. Besides issues around commercialisation, the media covered ethical issues related to the use of human embryos and fetal tissues as a source of stem cells. In this case, such activity was framed as illegal despite the existence of a patented drug based on fetal tissue suspension and the method of preparation of cells transplanted from aborted fetuses. Once the topic had been framed in a negative way, there was no sensitivity towards such important details.

The subsequent ban was justified not so much by moral controversies but by fears of criminal activities. It helped to demarcate stem cell technologies from illegal and morally controversial medical activities.

The discourse on moral issues with respect to stem cells was also associated with criminal activity in research, except for coverage of international debate. Moral issues pertaining to the use of stem cell technology at no time played a crucial role in its legitimation / delegitimation. This puts the public discourse in Russia in contrast to most countries that have thus far been covered by academic literature. For instance, in the US, the government played a moderator role between the scientific community and mainly religiously oriented interest groups (Wertz, 2002). In Germany, public authorities and the scientific community worked closely together to convince German citizens of the positive outcomes of stem cell research (Rippe and Schöne-Seifert, 1991). The Australian experience demonstrated that the mobilisation of science and scientific knowledge in public debates on embryonic stem cell research led to the liberalising of regulation governing stem cell research (Lysaght and Kerridge, 2012).

Instead of shaping the way of development, the legislation was largely concerned with the prevention of criminal activities and to provide retrospective legitimacy to common practice.

This paper sheds light on the Russian discourse and thereby offers insights that stand in contrast

to the well-researched areas of stem cell discourses in other countries. It would be interesting to learn more about the public discourse and the role of policy-makers in other countries in a similar position as Russia.

Acknowledgments

The article was prepared within the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE).

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Notes

- 1 Media communication theory discusses the selective and polarising presentation of information under the concept of framing (Petersen, 2001; Scheufele and Tewksbury, 2007; Geels and Verhees, 2011).
- 2 The classification is based on the following sources: Stem Cell Classification // Source: Brown University Biology and Medicine URL from 13.09.2018 http://biomed.brown.edu/Courses/BI108/BI108_2002_Groups/pancstems/stemcell/stemcellsclassversatility.htm
- 3 Murnaghan I. Pluripotent Stem Cells // Source: the ExploreStemCells website. URL from 20.08.2018 <<http://www.explorestemcells.co.uk/pluripotentstemcells.html>>
- 4 Russian patents No. 2126260 RU, IPC A61K035/28 A61K035/407 A61K035/48 A61K035/54. Lekarstvennyj preparat immunokorregirujushhego dejstva na osnove kletocnoj suspenzii i sposob lechenija saharnogo diabeta s ispolzovaniem etogo preparata (<http://www.findpatent.ru/patent/212/2126260.html>).
- 5 Russian patent No. 2160112, RU, IPC A61K35/48. Sposob prigotovlenija kletocnogo transplantata iz fetalnyh tkanej (Dismissed from 27.04.2012) (<http://www.findpatent.ru/patent/216/2160112.html>).
- 6 The last five interviewees from 22 repeated the same concepts and themes are already discussed. Consequently, no additional interviews were needed.
- 7 <https://global.factiva.com/sb/default.aspx?Inep=hp> - subscription to the data source has been provided by the National Research University Higher School of Economics.
- 8 We got information from the database for 1997-2016 on 29 August 2017. Before 1997, there were no publications about stem cells in the library. Earlier reports are not included in Factiva.
- 9 Here we mean growth in percentage terms.
- 10 The name of the drug 'Stvolamin' is consonant with the Russian word for 'stem' (stvolovoi).
- 11 Osnovnye rezultaty 'kruglogo stola' v MMA im. Sechenova 23.11.2004, posvjashhennogo zakonodatelnyj aspektam ispolzovania stvolovyh kletok, (<http://www.mma.ru/events/44638/>) (Accessed on 14.10.2014)
- 12 We are not sure how accurate the film is from a scientific point of view. Moreover, it contained technical mistakes (for example, in the classification of stem cells). Nevertheless, it contributes in framing the discourse around stem cells.
- 13 Unlike the media, experts did not give negative characteristics of ESCs. On the contrary they described their prospects in medicine.

Appendix 1. The list of experts

	Institution	Position	Gender	Scientific degree, title*
Novosibirsk				
1	Research Institute, Siberian Branch of the Russian Academy of Sciences	Head of Laboratory	Man	Doctor of Biology, professor
2	Research Institute, Siberian Branch of the Russian Academy of Sciences	Senior research fellow	Man	Candidate of Biology
3	Research Institute, Siberian Branch of the Russian Academy of Medical Sciences	Research fellow	Woman	Candidate of Biology
4	Research Institute, Siberian Branch of the Russian Academy of Medical Sciences	Deputy Director, Head of Laboratory	Woman	Doctor of Medicine, professor
5	Research Institute, Siberian Branch of the Russian Academy of Medical Sciences	Senior research fellow, clinician, Chief of Department, Deputy Director	Woman	Candidate of Medicine
6	Research Institute, Siberian Branch of the Russian Academy of Medical Sciences	Intern	Man	-
7	Research Institute, Siberian Branch of the Russian Academy of Medical Sciences	Director, Head of Laboratory	Man	Doctor of Medicine, academician, professor
8	Research Institute of the Ministry of Health of Russia	Neurosurgeon	Man	-
9	Biomedical Research Center of the Ministry of Health of Russia	Leading research fellow	Man	Doctor of Medicine, academician, professor
10	Center for Bone Marrow Transplantation, Siberian Branch of the Russian Academy of Medical Sciences	Director	Man	Doctor of Medicine, professor
11	Scientific and Clinical Center	Director	Man	-

	Institution	Position	Gender	Scientific degree, title*
Moscow				
12	Federal Research Center, Ministry of Health of the Russian Federation	Leading research fellow	Man	Doctor of Biology
13	Research Institute, Russian Academy of Sciences	Head of Laboratory	Man	Doctor of Biology, professor
14	Research Institute, Russian Academy of Science	Deputy Director	Man	Doctor of Biology, professor
15	Research Institute, Russian Academy of Science	Research fellow	Woman	Doctor of Biology
16	Research Institute, Russian Academy of Science	Head of Laboratory	Man	Doctor of Biology, professor
17	Research Institute, Russian Academy of Sciences; biotechnology company	Senior research fellow	Man	Candidate of Medicine
18	Biotechnology company	Director	Man	Doctor of Biology
19	Clinic	Deputy Director	Man	Doctor of Medicine, professor
20	Clinic	Executive Director	Man	
21	Biotechnology company	Director	Man	Candidate of Medicine
22	Research Center, Russian Academy of Medical Sciences	Clinician	Woman	Candidate of Medicine

* According to the International Standard Classification of Education (ISCED) 2011, Candidate of Biology/ Medicine belongs to ISCED level 8 – ‘doctoral or equivalent’, together with PhD, DPhil, D.Lit, D.Sc, LL.D, Doctorate or similar. Doctor of Biology/Medicine is a post-doctoral degree given to reflect second advanced research qualifications or higher doctorates in ISCED 2011.

Appendix 2. Description of key Russian newspapers used in media analysis

Name	Description and historical facts	Coverage	Print run	Audience	Audience size	Additional comments
Komsomolskaya Pravda (KP)	<p>Soviet and Russian daily social and political newspaper. It was established in 1925 as the official organ of the Komsomol. The newspaper published many popular science and adventure articles. Young Soviet writers and poets were published in the newspaper. In the period of Perestroika the newspaper began to publish social-critical articles. In 1990 it reached print run the largest print run in the world (22,37 million copies). On August 21, the newspaper published the entire chronicle of the August Putsch as a historical document. After Perestroika the newspaper was privatized and changed its conception to entertaining. Since 1997 it has had an online version, since 2009 – radio station. In 2010 the TV channel 'Komsomolskaya Pravda' was launched, but it stopped broadcasting in 2014.</p>	85 Russian regions and 47 countries	<p>Daily KP – 655 ths. copies Weekly KP – 2.2 mln. copies</p>	18+	<p>Kp.ru – 44,5 mln. per month Printed projects – 9,9 mln. per week</p>	№1 in the rating of favorite newspapers of Russians (OMI, 2014-2018)
Moskovski' Komsomolets (MK)	<p>It was established in 1919 by the Moscow Regional and City Committee of the Komsomol. From the end of the 1970s till the beginning of the 1980s, it published articles devoted to semi-underground issues (informal youth movements, rock music, western cinema, etc.). After Perestroika the newspaper was privatized.</p>		<p>Daily MK – 700 ths. copies Weekly MK – 230 ths. copies Weekly MK-region – 1 mln. copies</p>	16+	<p>Mk.ru – 18 mln. per month Daily MK – 949 ths. per issue Weekly MK – 390,3 ths. per issue Weekly MK-region – 1,3 mln. per issue</p>	№4 in the rating of favorite newspapers of Russians (OMI, 2014-2018)

Name	Description and historical facts	Coverage	Print run	Audience	Audience size	Additional comments
Nezavisimaya Gazeta (NG)	Established by the Moscow City Council in August 1990 and was registered in the State Committee of the USSR. First editor-in-chief intended to create an independent newspaper. In 1995-2005 it was controlled by B. Berezovskiy (Soviet and Russian businessman, political figure, opponent of V. Putin since 2000). In August 2005 it was sold to K. Remchukov (in this period he was undersecretary of economic development Minister G. Gref). Journalists, politicians and public figures have repeatedly accused NG of publishing biased political articles. In March 2010 NG published the article of M. Hodorkovskiy "Legalized Violence" that criticised the Russian law enforcement system.		Daily NG (6 days per week) – 55 ths.	Web audience: 87% - men 47% aged 45+ and 31% 25-34 y.o. 29% - Moscow, 10% St.Petersburg 34% middle income, 51% upper middle income	Ng.ru – 650 ths. per week	
Rossiyskaya gazeta (RG)	Official newspaper of the Russian Government. It was established in 1990. Before taking a legal force state documents are published in RG.		Daily RG – 160 ths. copies Weekly 3,3 mln.	25-55 y.o. Higher education Middle and upper middle income	RG.ru – 29 mln. per month Daily RG – 760 ths. per issue	
Argumenty i fakty (AIF)	The newspaper has been established in 1978. Initially it was a news-bulletin for lecturers, propagandists, political informers and agitators. Since 1988 it has become a newspaper. In May 1990, AIF entered into the Guinness Book of Records as the newspaper with the largest print run (33,5 mln. copies), the audience size was more than 100 mln. people. In 2014 the newspaper was bought by Moscow Government because of high level of indebtedness of publishing house AIF.		Weekly newspaper, 1,5 mln. copies		6,7 mln.	