DOI: https://doi.org/10.17816/fm16228 EDN: GSJYFC

Establishing Genetic Relationship Between a Surrogate Mother and a Child Using Histological Placental Blocks: A Series of Case Reports

Andrey V. Konovalenko[1,2], Irina I. Kukharenok[1]

[1] Bureau of Forensic Medical Examination, Saint Petersburg, Russia

[2] Saint-Petersburg State Pediatric Medical University, Saint Petersburg, Russia

ABSTRACT

Assisted reproductive technologies are now widely available, and the demand for this type of medical service is growing, necessitating legal control in compliance with the legislation of the Russian Federation.

This publication was prompted by criminal investigations conducted by the Investigative Committee of Russia, which commissioned expert examinations to determine the genetic relationship between a surrogate mother and the child she delivered. The article presents a novel methodology for effectively addressing challenging forensic tasks related to determining a newborn's biological origin.

Three expert examinations used paraffin-embedded blocks and histological sections of placental tissue, along with reference samples of buccal epithelial cells and blood. Microscopic examination of the histological sections was performed to identify placental components.

Molecular genetic techniques were used to identify maternal and fetal DNA in the provided biological samples, as well as for comparative analysis. These included DNA extraction and quantification, real-time polymerase chain reaction, electrophoretic separation of amplification products, and subsequent analysis.

The examinations made it possible to localize and label the maternal and fetal parts of the placenta within the histological blocks. The children's blood samples and the surrogate mothers' buccal epithelial cells were genotyped, and genetic profiles of the labeled samples were determined.

In one of the three cases studied, a comparison of the obtained genotypes revealed a discrepancy between the genetic profiles of the child's blood and the fetal part of the placenta. In the other two cases, the genetic profiles were confirmed to be identical. This observation underscores the importance of utilizing placental tissue to avoid erroneous conclusions when establishing maternity in cases involving surrogate mothers. This approach allows the experts to confirm that a specific infant was actually born by the surrogate mother in question.

Keywords: molecular genetic analysis; surrogacy; surrogate mother; placenta; histological blocks; paraffin-embedded blocks; case report.

To cite this article:

Konovalenko AV, Kukharenok II. Establishing Genetic Relationship Between a Surrogate Mother and a Child Using Histological Placental Blocks: A Series of Case Reports. *Russian Journal of Forensic Medicine.* 2025;11(2):166–175. DOI: 10.17816/fm16228 EDN: GSJYFC

Submitted: 10.12.2024 **Accepted:** 22.04.2025 **Published online:** 28.07.2025

DOI: https://doi.org/10.17816/fm16228 EDN: GSJYFC

Установление генетического родства между суррогатной матерью и ребёнком при исследовании гистологических блоков плаценты: серия клинических случаев

А.В. Коноваленко[1,2], И.И. Кухарёнок[1]

[1] Бюро судебно-медицинской экспертизы, Санкт-Петербург, Россия;
[2] Санкт-Петербургский государственный педиатрический медицинский университет, Санкт-Петербург, Россия

АННОТАЦИЯ

Актуальность представленной статьи обусловлена широкой доступностью вспомогательных репродуктивных технологий и возрастающим спросом на данный вид медицинских услуг, в том числе с учётом необходимости правового регулирования их применения в соответствии с законодательством Российской Федерации.

Поводом для написания данной публикации стали уголовные дела, расследуемые Следственным комитетом Российской Федерации, в рамках которых назначили экспертизы по установлению генетического родства между суррогатной матерью и рождённым ею ребенком. В статье представлен оригинальный методический подход, позволяющий эффективно решать сложные экспертные задачи, связанные с определением биологического происхождения новорождённого.

При проведении трёх экспертиз использовали парафиновые блоки и гистологические срезы плацент, а также сравнительные образцы буккального эпителия и крови. Микроскопическое исследование гистологических срезов проводили с целью определения локализации частей плацент.

Для идентификации ДНК матери и ребёнка в предоставленных биологических объектах, а также для сравнительного анализа применяли молекулярно-генетические методы исследования: выделение и определение концентрации ДНК, проведение полимеразной цепной реакции в режиме реального времени, электрофоретическое фракционирование продуктов амплификации и их дальнейший анализ.

В результате выполненных исследований определено расположение в гистологических блоках материнской и плодной частей плацент, проведена их маркировка. Получены генотипы образцов крови детей и буккального эпителия суррогатных матерей, а также генетические профили промаркированных объектов.

Сравнительный анализ установленных генотипов показал, что в одном из трёх рассматриваемых случаев обнаружено несоответствие генетических профилей в образце крови ребёнка и в плодной части плаценты. В двух других случаях зафиксирована тождественность аналогичных исследуемых профилей.

Данное наблюдение подчёркивает значимость использования тканей плаценты во избежание ошибочных выводов в установлении родства с суррогатной матерью, позволяющее эксперту подтвердить, что конкретный младенец рождён данной женщиной в указанных родах.

Ключевые слова: молекулярно-генетическое исследование; суррогатное материнство; суррогатная мать; плацента; гистологические блоки; парафиновые блоки; клинический случай.

Как цитировать:
Коноваленко А.В., Кухарёнок И.И. Установление генетического родства между суррогатной матерью и ребёнком при исследовании гистологических блоков плаценты: серия клинических слечаев // Судебная медицина. 2025. Т. 11, № 2. С. 166–175. DOI: 10.17816/fm16228 EDN: GSJYFC

Рукопись получена: 10.12.2024 **Рукопись одобрена:** 22.04.2025 **Опубликована online:** 28.07.2025

DOI: https://doi.org/10.17816/fm16228 EDN: GSJYFC

利用胎盘组织学石蜡块鉴定代孕母亲与新生儿的遗传亲子关系：系列临床病例

Andrey V. Konovalenko[1,2], Irina I. Kukharenok[1]

[1] Bureau of Forensic Medical Examination, Saint Petersburg, Russia
[2] Saint-Petersburg State Pediatric Medical University, Saint Petersburg, Russia

摘要

本文的现实意义在于，辅助生殖技术的广泛可及性以及对此类医疗服务需求的不断增长，同时还需考虑依照俄罗斯联邦法律对其应用进行法律规范的必要性。

本文的撰写缘于俄罗斯联邦侦查委员会侦办的几起刑事案件，在案件中指定进行鉴定，以确定代孕母亲与其所生婴儿之间的遗传亲子关系。文中提出了一种原创性的方法学途径，可有效解决与确定新生儿生物学来源相关的复杂鉴定任务。

在三例鉴定中，使用了胎盘的石蜡包埋块和组织学切片，以及颊黏膜和血液的对比样本。对胎盘组织学切片进行显微镜检查，以确定胎盘各部分的定位。

为鉴定母亲和婴儿在所提供生物学样本中的DNA，并进行比较分析，采用了分子遗传学方法，包括DNA的提取与浓度测定、实时聚合酶链式反应、扩增产物的电泳分离及其后续分析。

研究确定了在组织蜡块中母体部分和胎儿部分的定位，并对其进行了标记。获得了儿童血液样本和代孕母亲颊黏膜样本的基因型，以及已标记对象的遗传图谱。

比较分析结果显示，在所分析的三例中，有一例新生儿血液样本与胎盘的胎儿部分的遗传图谱不相符。在其余两例中，所检遗传谱型完全一致。

该观察结果强调了在鉴定代孕母亲与新生儿亲子关系时使用胎盘组织的重要性，可避免作出错误结论，并使鉴定专家确认特定新生儿确系由该女性在所述分娩中所生。

关键词：分子遗传学研究；代孕；代孕母亲；胎盘；组织学块；石蜡包埋块；临床病例。

引用本文：
Konovalenko AV, Kukharenok II. 利用胎盘组织学石蜡块鉴定代孕母亲与新生儿的遗传亲子关系：系列临床病例. *Russian Journal of Forensic Medicine.* 2025;11(2):166–175. DOI: 10.17816/fm16228 EDN: GSJYFC

收到： 10.12.2024 **接受：** 22.04.2025 **发布日期：** 28.07.2025

INTRODUCTION

Every year, the number of children born via surrogacy increases worldwide.[1] This can be explained by the growing interest in starting a family among those with various types of infertility. Improved quality and availability of reproductive medicine, embryology, and pharmacology, along with advancements in clinical laboratory tests and the widespread use of assisted reproductive technology, including in vitro fertilization (IVF), also play a role [1].

Russia actively promotes medical tourism for foreign citizens. Reproductive medicine centers provide services to individuals with infertility from foreign countries where certain techniques, such as surrogacy, are unavailable or illegal [2]. For example, Chinese patients actively use these services. IVF and other types of assisted reproductive technology are not prohibited in China; however, their regulation has not been formalized [3].

There are two types of surrogacy based on the source of the oocyte used for fertilization. Conventional surrogacy uses the surrogate mother's oocyte, making her the child's biological mother and providing a genetic relationship. In gestational surrogacy, the implanted embryo is obtained through donor oocyte fertilization; in these cases, the surrogate mother and the child will not be genetically related [4].

In 1995, the D.O. Ott Research Institute of Obstetrics, Gynecology, and Reproductology in St. Petersburg implemented the first gestational surrogacy program,[2] which is the only type of surrogacy approved in Russia. The legal framework for surrogacy was established in 2011–2013.[3,4,5]

From the legal standpoint, surrogacy refers to childbearing and delivery under a contract between the surrogate mother who carries the child following donor embryo implantation and the potential parents whose sex cells were used for fertilization.[5] Cases where a surrogate mother simultaneously acts as an oocyte donor (i.e., the newborn's biological mother) and then transfers the child to other persons for remuneration under the pretense of a surrogacy program can be classified as illegal. Such cases are considered as a transaction to buy and sell a person (a newborn).[4]

This highlights the relevance of establishing a genetic relationship between a surrogate mother and the child she delivered, given the increasingly strict regulation of surrogacy.

The absence of a common mixed blood flow in the placenta and its separation into fetal and maternal components allows obtaining individual genetic profiles that unequivocally prove a woman's biological relationship with the child she gave birth to [5].

This work presents three cases that demonstrate challenges in expert evaluation when using different biological materials as reference samples.

Case Description

The article discusses three cases of forensic molecular genetic examination conducted in 2023–2024, which were initiated by Russia's Investigative Committee.

Several years ago, IVF procedures involving foreign citizens as sperm donors were performed in St. Petersburg. The children were subsequently adopted by their biological parents and relocated to other countries. The investigators argued that the newborns were biological children of women who carried them (i.e., surrogate mothers), which may constitute a violation of the existing Russian legislation. As a result, criminal cases were launched, and genetic examinations were performed to establish the relationship between surrogate mothers and the children they delivered.

Forensic Examinations

In Russia, blood samples are collected from newborns to test for genetic abnormalities. Furthermore, placenta and umbilical cord samples are taken for histopathological examinations to detect intrauterine abnormalities.[6] These biological samples are retained for some time and can be used for molecular genetic testing.

- The following was provided for the forensic examinations in question:
- Three samples of buccal epithelium obtained from surrogate mothers K., E., and D. during the preliminary investigation;
- Three blood samples from newborns, which were dried on special filter cards;

Paraffin blocks with placenta samples from surrogate mothers K., E., and D. obtained after delivery.

To enable an objective examination with clear conclusions, the histopathological analysis involved establishing

[1] Preliminary Document No. 10 of March 2012 for the Attention of the Council of April 2012 on General Affairs and Policy of the Conference [Internet]. Hague: Permanent Bureau of the Hague Conference on Private International Law, 2012–2024. Available at: https://assets.hcch.net/docs/. Accessed on: December 10, 2024.

[2] Surrogacy in Russia [Internet]. In: Wikipedia. 2022–. Available at: https://ru.wikipedia.org/wiki/. Accessed on: December 10, 2024.

[3] Order of the Ministry of Health of the Russian Federation No. 107n of August 30, 2012, On the Use of Assisted Reproductive Technology, Contraindications, and Limitations (annulled). Available at: https://base.garant.ru/70318364/. Accessed on: December 10, 2024.

[4] Federal Law of the Russian Federation No. 323-FZ of November 21, 2011, On Fundamental Healthcare Principles in the Russian Federation. Available at: http://www.rosminzdrav.ru/documents/7025-federalnyy-zakon-323-fz-ot-21-noyabrya-2011-g. Accessed on: December 10, 2024.

[5] Order of the Ministry of Health of the Russian Federation No. 803n, On the Use of Assisted Reproductive Technology, Contraindications, and Limitations. Available at: https://www.garant.ru/products/ipo/prime/doc/74676088/. Accessed on: December 10, 2024.

[6] Order of the Ministry of Health of the Russian Federation No. 274n of April 21, 2022, On Approval of the Procedure for Medical Care in Patients With Congenital and/or Hereditary Disorders. Available at: https://base.garant.ru/404987183/. Accessed on: December 10, 2024.

DOI: https://doi.org/10.17816/fm16228

the position of maternal and fetal fragments in paraffin blocks with placenta samples and labeling them.

During the histopathological examination, the provided paraffin blocks were used to prepare serial sections on a Leica SM2000R® sliding microtome (Leica Biosystems, Germany). The sections were stained with hematoxylin and eosin using a Leica ST5010® autostainer (Leica Biosystems, Germany). During microscopy, the maternal and fetal portions of the placenta were labeled.

During molecular genetic testing, DNA was isolated from paraffin blocks using the Thermo Scientific® GeneJET FFPE DNA Purification Kit (Thermo Fisher Scientific Baltics UAB, Lithuania), as well as from buccal epithelium of surrogate mothers K., E., and D. and blood samples of the children using 5% Chelex-100 suspension (Bio-Rad, USA).

The template activity of DNA samples was assessed by polymerase chain reaction using the Quantifiler TRIO DNA Quantification Kit® (Applied Biosystems, USA) on a QuantStudio® 5 System amplifier (Applied Biosystems, USA) with the HID Real-Time PCR Analysis Software v1.3 (Applied Biosystems, USA).

Chromosomal DNA genotyping was performed using the COrDIS Expert 26® reagent kit for a multiplex assay of 26 human DNA markers (Gordiz, Russia). The kit includes 22 pairs of autosomal loci, sex-specific loci SRY, Yindel, and DYS391, and a segment of the amelogenin gene on chromosomes X and Y. GeneMapper® ID Software v3.2 and ID-X v1.6 (Applied Biosystems, USA) were used for the analysis.

Molecular Genetic Testing Findings

Total cellular DNA was isolated from biological samples (histological blocks) of the maternal and fetal portions of the placenta from surrogate mothers K., E., and D. according to the labeling of histological sections (Fig. 1), as well as from buccal epithelium samples of surrogate mothers K., E., and D. and blood samples of the children. The DNA was examined using identifying molecular genetic systems based on chromosomal DNA amplified fragment length polymorphism (AFLP). Furthermore, a comparative assessment of these samples was performed.

Male and female sex was reported for two and one genetic profile of the fetal portion of the placenta, respectively. Alleles absent in the genotypes of surrogate mothers K., E., and D. were identified based on short tandem repeat (STR) loci, indicating that they originated from other women (i.e., biological mothers of the newborns). Therefore, surrogate mothers K., E., and D. were ruled out as biological mothers of children whose fetal portions of the placenta were examined. The analysis confirmed that other women were the biological mothers of the newborns whose genetic material was identified in fetal portions of the placenta from surrogate mothers K., E., and D.

Each sample of the DNA isolated from maternal portions of the placenta from surrogate mothers K. and E. is a mixture of two individual DNAs (male and female).

Furthermore, the genetic profile of the maternal portion of the placenta from surrogate mother D. was completely identical to the AFLP profile of her buccal epithelium sample.

The analysis of autosomal genetic characteristics revealed that maternal portions of the placenta from surrogate mothers K. and E. may contain the genetic material of these surrogate mothers and a male individual (newborn), whose genetic material is present in the fetal portion of the placenta from surrogate mothers K. and E., respectively.

The genetic profiles of blood samples from children born from surrogate mothers E. and D. were completely identical to the genotypes identified in fetal portions of the respective placenta samples.

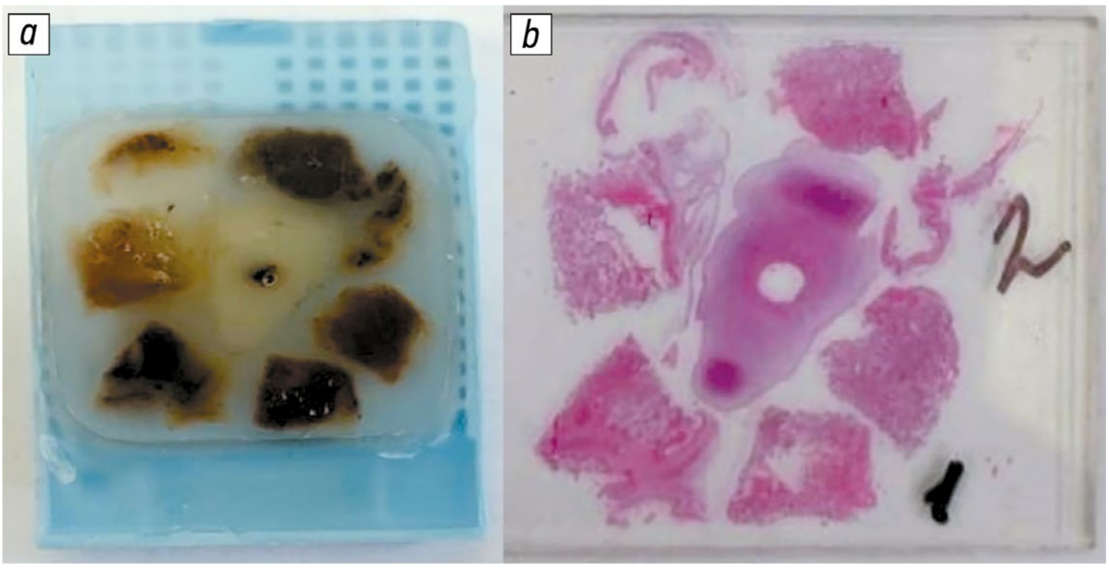

Fig. 1. Positions of labeled objects: a, on a paraffin block with placenta tissues; b, on a histological section (hematoxylin and eosin staining): 1, fetal portion of the placenta; 2, maternal portion of the placenta.

The genetic profile of the fetal portion of the placenta from surrogate mother D. contains an individual female DNA. Alleles absent in the genotype of surrogate mother D. were identified based on STR loci, indicating that they originated from other women (i.e., the biological mother of the newborn). Therefore, surrogate mother D. was ruled out as the biological mother of the child she delivered. Furthermore, the genetic profile of the maternal portion of the placenta from surrogate mother D. was completely identical to the AFLP profile of her buccal epithelium sample. In this case, the genetic profile of the provided child's blood sample is completely identical to the genotype found in the fetal portion of the placenta from surrogate mother D.

The genetic profile of the fetal portion of the placenta from surrogate mother E. contained an individual female DNA. Alleles absent in the genotype of surrogate mother E. were identified based on STR loci, indicating that they originated from other women (i.e., the biological mother of the newborn). Therefore, surrogate mother E. was ruled out as the biological mother of the child she delivered. The DNA sample isolated from the maternal portion of the placenta from surrogate mother E. is a mixture of two individual DNAs (male and female). The genetic testing revealed that this mixture may contain the genetic material of surrogate mother E. and a male individual (newborn), whose genetic material is present in the fetal portion of the placenta from surrogate mother E. In this case, the genetic profile of the provided child's blood sample is completely identical to the genotype found in the fetal portion of the placenta.

The genetic profiles of blood samples from children born from surrogate mothers E. and D., respectively, were completely identical to the genotypes identified in fetal portions of the respective placenta samples.

The allele combinations identified in DNA samples isolated from paraffin blocks of placenta tissues from surrogate mothers D. and E., as well as from buccal epithelium samples of surrogate mothers D. and E. and blood samples of the children, are presented in Tables 1 and 2, respectively.

Table 1. Genotypic allele combinations of DNA profiles based on amplified fragment length polymorphism identified during biological material examinations (surrogate mother D.)

Locus	Objects			
	Buccal epithelium sample, surrogate mother D.	Maternal portion of the placenta	Fetal portion of the placenta	Child's blood sample
AMEL	XX	XX	XX	XX
SRY	—	—	—	—
D3S1358	14.17	14.17	17.18	17.18
TH01	9.9.3	9.9.3	8.9	8.9
D12S391	17.18	17.18	18.20	18.20
D5S818	12.13	12.13	10.11	10.11
TPOX	10.11	10.11	8.9	8.9
Yindel	—	—	—	—
D2S441	11.14	11.14	11.11	11.11
D7S820	9.10	9.10	8.11	8.11
D13S317	11.13	11.13	8.11	8.11
FGA	23.24	23.24	19.23	19.23
D22S1045	12.15	12.15	15.16	15.16
D18S51	15.18	15.18	17.20	17.20
D16S539	11.12	11.12	9.13	9.13
D8S1179	12.16	12.16	11.13	11.13
CSF1PO	10.11	10.11	11.12	11.12
D6S1043	11.12	11.12	11.12	11.12
vWA	14.16	14.16	16.17	16.17
D21S11	27.28	27.28	29.29	29.29
SE33	16.23.2	16.23.2	19.23.2	19.23.2
D10S1248	13.16	13.16	13.14	13.14
D1S1656	15.3.16.3	15.3.16.3	13.15.3	13.15.3
D19S433	16.16	16.16	13.14	13.14
D2S1338	17.20	17.20	17.18	17.18
DYS391	—	—	—	—

Table 2. Genotypic allele combinations of DNA profiles based on amplified fragment length polymorphism identified during biological material examinations (surrogate mother E.)

Locus	Objects			
	Buccal epithelium sample, surrogate mother D.	Maternal portion of the placenta	Fetal portion of the placenta	Child's blood sample
AMEL	XX	XY	XY	XY
SRY	—	+	+	+
D3S1358	15.17	15.16.17.18	16.18	16.18
TH01	6.9.3	6.7.9.9.3	7.9	7.9
D12S391	18.19	18.19.20	20.20	20.20
D5S818	11.11	11.12	11.12	11.12
TPOX	8.11	8.9.11	8.*	8.9
Yindel	—	1	1	1
D2S441	11.11.3	11.11.3	11.11	11.11
D7S820	9.10	8.9.10.11	8.11	8.11
D13S317	11.13	8.11.13	8.11	8.11
FGA	22.25	19.22.25	19.23	19.23
D22S1045	15.16	15.16	15.16	15.16
D18S51	14.18	14.15.18	14.15	14.15
D16S539	9.11	9.11.12	9.12	9.12
D8S1179	13.15	13.15	13.15	13.15
CSF1PO	10.11	10.11	11.12	11.12
D6S1043	12.20	20.*	12.*	12.20
vWA	14.16	14.16.17	16.17	16.17
D21S11	30.30.2	29.30.30.2.32.2	29.32.2	29.32.2
SE33	17.34.2	14.17.27.2.34.2	14.27.2	14.27.2
D10S1248	12.13	12.13.14.15	14.15	14.15
D1S1656	13.17.3	13.17.3.18.3	13.18.3	13.18.3
D19S433	13.16	13.14.16	13.14	13.14
D2S1338	13.18	13.18	17.18	17.18
DYS391	—	—	11	11

Note. *, any allele of this locus.

The genetic profile of the fetal portion of the placenta from surrogate mother K. contains an individual male DNA. Alleles absent in the genotype of surrogate mother K. were identified based on STR loci, indicating that they originated from other women (i.e., the biological mother of the newborn). Therefore, surrogate mother K. was ruled out as the biological mother of the child she delivered. The DNA sample isolated from the maternal portion of the placenta from surrogate mother K. is a mixture of two individual DNAs (male and female). The genetic testing revealed that this mixture may contain the genetic material of surrogate mother K. and a male individual (newborn), whose genetic material is present in the fetal portion of the placenta from surrogate mother K.

However, the DNA isolated from the blood sample of the child presumably born from surrogate mother K. was female, which contradicts the examination concept. A comparison between the genotype identified in the provided child's blood sample and the AFLP DNK profile of the fetal portion of the placenta from surrogate mother K. showed mismatching genetic traits. Therefore, the genetic material in the placenta from surrogate mother K. and the provided child's blood sample is from different persons. Thus, the blood sample does not belong to the child delivered by surrogate mother K.

The allele combinations identified in DNA samples isolated from paraffin blocks of placenta tissues from surrogate mother K., as well as from buccal epithelium samples of surrogate mother K. and blood samples of the child, are presented in Table 3.

DISCUSSION

This molecular genetic examination of placenta tissues can confirm or rule out the biological relationship in order to meet the legal requirements for surrogacy. The fetal

Table 3. Genotypic allele combinations of DNA profiles based on amplified fragment length polymorphism identified during biological material examinations (surrogate mother K.)

Locus	Objects			
	Buccal epithelium sample, surrogate mother D.	Maternal portion of the placenta	Fetal portion of the placenta	Child's blood sample
AMEL	XX	XY	XY	XX
SRY	—	+	+	—
D3S1358	15.17	15.17	15.17	15.15
TH01	9.3.9.3	7.9.9.3	7.9	6.7
D12S391	18.22	18.22.23	18.23	19.23
D5S818	12.13	12.13	12.13	11.12
TPOX	8.8	8.8	8.11	8.8
Yindel	—	2	2	—
D2S441	13.14	13.14	14.14	10.13
D7S820	9.10	9.10.11	10.11	9.10
D13S317	9.9	9.12	12.12	11.12
FGA	19.21	18.19.21.24	18.24	21.24
D22S1045	11.16	11.16	11.16	15.16
D18S51	15.16	15.16.17	16.17	14.15
D16S539	12.13	8.10.12.13	8.10	12.12
D8S1179	13.14	9.13.14	9.13	13.13
CSF1PO	10.10	10.11.12	12.12	9.11
D6S1043	11.17	11.13.17	11.13	12.19
vWA	18.20	16.18.19.20	16.19	17.17
D21S11	29.31.2	28.29.31.2	28.31.2	28.30.2
SE33	27.2.29.2	22.2.27.27.2.29.2	22.2.27	15.21
D10S1248	14.15	14.15.16	14.16	13.15
D1S1656	12.17	11.12.17	11.12	12.17.3
D19S433	13.15	13.14.14.2.15	14.14.2	13.14
D2S1338	25.25	23.25	23.23	18.24
DYS391	—	10	10	—

and maternal portions of the placenta contain the material of genetically unrelated individuals (in gestational surrogacy). However, placenta samples must be used in molecular genetic testing to confirm that a surrogate mother delivered a particular child. Alleles that differ from the surrogate mother's genetic traits were identified in the fetal and maternal portions of the placenta, indicating that they may have originated from the biological mother. The use of placenta tissues as samples of the newborn's biological materials confirms that the surrogate mother is not biologically related to the child. This child was born from a particular surrogate mother; however, despite the genetic differences, they are not biologically related.

Molecular genetic testing of placenta samples allows confirming the source of the paraffin-embedded biological material, enabling the expert to confirm that the child was born from this particular woman.

Furthermore, a comparison with a sample from a person who is not directly related to the surrogate mother will rule her out as the biological mother. This could lead the investigators to erroneous conclusions.

The presented case highlights the importance of ruling out errors (including human errors, deliberate substitution of a sample, etc.) when establishing the genetic relationship using placenta tissues as reference samples. Notably, such cases have not previously been addressed in scientific publications.

CONCLUSION

All three cases rule out surrogate mothers as biological mothers of the children they delivered, which meets the requirement of Russian legislation. However, one of these cases demonstrates mismatching DNA profiles of the provided reference sample of the newborn and the true genotype of the child delivered by this particular surrogate mother.

Therefore, paraffin-embedded placenta samples can be used to rule out errors in establishing maternity in nonobvious cases.

The examinations allowed the investigators to determine the true origin of the children relocated from Russia by biological parents who adopted them, as well as rule out any violations of legislation by surrogate mothers.

ADDITIONAL INFORMATION

Author contributions: A.V. Konovalenko: conceptualization, investigation, writing—review & editing; I.I. Kukharenok: investigation, writing—original draft, writing—review & editing. All the authors approved the version of the manuscript to be published and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Acknowledgments: The authors express their special gratitude to Professor P.L. Ivanov for his invaluable support and guidance during the manuscript preparation, as well as to A.F. Titievskaya, Head of the Forensic Histology Department of the Bureau of Forensic Medical Examination (St. Petersburg), for her cooperation with this work.

Ethics approval: Not applicable.

Consent for publication: Written informed consent was not obtained from the individuals or their legal representatives for the publication of expert case materials, as it was not possible to establish contact with them. All data presented are anonymized, and no photographs are published.

Funding sources: No funding.

Disclosure of interests: The authors have no relationships, activities, or interests for the last three years related to for-profit or not-for-profit third parties whose interests may be affected by the content of the article.

Statement of originality: No previously published materials (text, figures, or data) were used in this work.

Data availability statement: The editorial policy regarding data sharing does not apply to this work.

Generative AI: No generative artificial intelligence technologies were used to prepare this article.

Provenance and peer-review: This article was submitted unsolicited and reviewed following the standard procedure. The peer review process involved two external reviewers and the in-house scientific editor.

REFERENCES | СПИСОК ЛИТЕРАТУРЫ

1. Kushnir VA, Smith GD, Adashi EY. The Future of IVF: The New Normal in Human Reproduction. *Reproductive Sciences.* 2022;29(3):849–856. doi: 10.1007/s43032-021-00829-3 EDN: VZIFKH

2. You W, Feng J. Legal Regulation of Surrogacy Parentage Determination in China. *Frontiers in Psychology.* 2024;15:1363685. doi: 10.3389/fpsyg.2024.1363685 EDN: RBWMTU

3. Ding C. Surrogacy Litigation in China and Beyond. *J Law Biosci.* 2015;2(1):33–55. doi: 10.1093/jlb/lsu036

4. Golombok S, Readings J, Blake L, et al. Families Created Through Surrogacy: Mother–child Relationships and Children's Psychological Adjustment at Age 7. *Developmental Psychology.* 2011;47(6):1579–1588. doi: 10.1037/a0025292

5. Taylor DJ, Green NPO, Stout GW. *Biological Science.* Soper R, editor. Moscow: Laboratoriya znanii; 2017. Available from: https://docs.yandex.ru/docs/view?tmh (In Russ.)

AUTHORS' INFO

*** Andrey V. Konovalenko,** MD;
address: 10A Ekaterininskiy ave, Saint Petersburg, Russia, 195067;
ORCID: 0009-0002-0306-423X;
e-mail: andrkon1980@mail.ru

Irina I. Kukharenok, MD;
ORCID: 0009-0007-2645-0025;
eLibrary SPIN: 2501-0929;
e-mail: irishka2402@mail.ru

ОБ АВТОРАХ

*** Коноваленко Андрей Валентинович;**
адрес: Россия, 195067, Санкт-Петербург, Екатерининский пр-кт, д. 10 литер А;
ORCID: 0009-0002-0306-423X;
e-mail: andrkon1980@mail.ru

Кухарёнок Ирина Игоревна;
ORCID: 0009-0007-2645-0025;
eLibrary SPIN: 2501-0929;
e-mail: irishka2402@mail.ru

* Corresponding author / Автор, ответственный за переписку