Dangers of Clostridial Infection after Mifepristone Ingestion for Induced Abortion: A Public Health Concern

What are Clostridial bacteria that cause infections after induced abortions?

Clostridium sordellii (also called *Paeniclostridium sordellii*) and *Clostridium perfringens* are anaerobic spore-forming bacteria that can cause life-threatening infections after induced abortions.

- *C. sordellii* can cause fatal toxic shock syndrome (TSS) and *C. perfringens* causes a gangrenous infection called necrotizing fasciitis.
- *C. sordellii* and other Clostridium species have been found in the normal vaginal flora in 8%-18% of women.[1]
- Lethal and hemorrhagic toxins are responsible for the virulence of *C. sordellii*. Lethal toxin is responsible for most fatal cases but is variably expressed by different C. strains and its effects are altered by environmental conditions.[2]
- Situations which create an environment hospitable to these infections include uterine tissue injured by surgical instruments/trauma, non-viable decidual tissue, other retained pregnancy tissue, or clotted blood.[3] All of these are found in induced abortion, specifically mifepristone and misoprostol-induced (including when an abortion is started with mifepristone and completed surgically)

What are the symptoms and dangers of these infections?

- Women often present *without* fever and with nonspecific symptoms like nausea, vomiting and diarrhea, and often abdominal pain that is not severe.
    - The danger in these symptoms is that they are also symptoms of a mifepristone abortion as well as side effects of misoprostol[4] (nausea and vomiting specifically).
- *C. sordellii* TSS is an acute and rapidly progressive disease that is characterized by a lack of or minimal fever; high heart rate and low blood pressure with no response to intravenous fluids; local swelling at the infected site with subsequent pleural and peritoneal effusions. This condition is fulminant and most often fatal.[5]
- On lab examination, hemoconcentration is often noted with very high white blood cell counts (leukemoid reaction with WBC count often >40k) and an elevated hemoglobin.
- Imaging may show ascites (*C. sordellii*) or gaseous infiltration of the myometrium.

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[1] Department of Health and Human Services Centers for Disease Control and Prevention Food and Drug Administration National Institutes of Health Emerging Clostridial Disease Workshop May 11 2006 Atlanta Georgia. Summary of Proceedings. Accessible at https://concernedwomen.org/images/content/Report_ECDW.pdf

[2] Ibid

[3] Aronoff DM, Marrazzo JM. Infections caused by Clostridium perfringens and Paeniclostridium sordellii after unsafe abortion. Lancet Infect Dis. 2023 Feb;23(2):e48-e55. doi: 10.1016/S1473-3099(22)00590-4. Epub 2022 Sep 22. Erratum in: Lancet Infect Dis. 2022 Nov;22(11):e310. doi: 10.1016/S1473-3099(22)00655-7. PMID: 36155670

[4] Harris LH, Grossman D. Complications of Unsafe and Self-Managed Abortion. N Engl J Med. 2020 Mar 12;382(11):1029-1040. doi: 10.1056/NEJMra1908412. PMID: 32160664

[5] FDA Mifepristone Label. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=61626f72-7469-6f6e-4953-6d7572646572 (last accessed Aug 1, 2025)

- This differs from the normal sepsis picture and requires a high index of suspicion from the treating clinician in order to diagnose and to treat quickly.
- Any delay in care (especially for removal of dead tissue) allows for rapid proliferation of these bacteria in an anaerobic environment, which can then result in the rapid proliferation of toxins, leading to hemodynamic collapse.[6]

Does mifepristone increase a woman's risk of these infections?

- Mifepristone is known to block innate immune responses through its effect on glucocorticoid receptors.[7]
    - This blockade inhibits the secretion of interleukin-10 (IL-10), a crucial anti-inflammatory cytokine, from leukocytes. This inhibition leads to uncontrolled inflammation which impairs the immune response to bacterial infection[8] by creating an imbalance between the pro- and anti-inflammatory cytokines. This imbalance also leads to systemic vasodilation, causing refractory hypotension.
    - Mifepristone's anti-progesterone effects prepare the aborting uterus as an ideal bacterial culture for *C. sordellii* by causing ischemia that leads to necrotic products of conception. Mifepristone's anti-glucocorticoid actions disrupt the hypothalamic pituitary adrenal axis. This process results in a lack of control of the pro-inflammatory cytokine response and allows for the establishment of a nidus of infection with *C. sordellii* and localized secretion of lethal toxin.[9]
- Animal experiments support the hypothesis that mifepristone can facilitate infection and lead to lethal septic shock.
    - One study showed that a single dose of the drug administered to mifepristone-treated mice dramatically increased the mortality rate of septic shock nearly five-fold, decreasing survival from 71% to 15%.[10]
    - Another animal study from 1994 showed that mifepristone is an effective antagonist of the glucocorticoid receptor. This blockade can exacerbate the pathological and pathophysiological changes of sepsis, including a more rapid drop in arterial blood pressure and more severe pathological changes involving multiple organs, especially the lung and small intestine.[11]
- **Under the current dispensing regime, mifepristone is available online with no follow up or readily available clinician which causes a delay in care when women experience complications.**
    - Even when women do have an in person visit to obtain the drugs, abortion facilities often minimize their concerns when they call in with potential complications. Per one study in Obstetrics and Gynecology, a 24 year old woman, who ultimately died from Clostridial sepsis after a mifepristone abortion, contacted her abortion provider with complaints of abdominal pain, vomiting, diarrhea

[6] Aronoff DM, Marrazzo JM. Infections caused by Clostridium perfringens and Paeniclostridium sordellii after unsafe abortion. Lancet Infect Dis. 2023 Feb;23(2):e48-e55. doi: 10.1016/S1473-3099(22)00590-4. Epub 2022 Sep 22. Erratum in: Lancet Infect Dis. 2022 Nov;22(11):e310. doi: 10.1016/S1473-3099(22)00655-7. PMID: 36155670

[7] Murray S, Wooltorton E. Septic shock after medical abortions with mifepristone (Mifeprex, RU 486) and misoprostol. CMAJ. 2005 Aug 30;173(5):485. doi: 10.1503/cmaj.050980. Epub 2005 Aug 10. PMID: 16093445; PMCID: PMC1188182

[8] Miech RP. Pathophysiology of mifepristone-induced septic shock due to Clostridium sordellii. Ann Pharmacother. 2005 Sep;39(9):1483-8. doi: 10.1345/aph.1G189. Epub 2005 Jul 26. PMID: 16046483

[9] From comments of Dr. Ralph Miech. Department of Health and Human Services Centers for Disease Control and Prevention Food and Drug Administration National Institutes of Health Emerging Clostridial Disease Workshop May 11 2006 Atlanta Georgia. Summary of Proceedings.

[10] Lazar G Jr, Lazar G, Agarwal MK. Modification of septic shock in mice by the antiglucocorticoid RU 38486. Circ Shock. 1992 Mar;36(3):180-4. PMID: 1611702

[11] Fan J, Gong XQ, Wu J, Zhang YF, Xu RB. Effect of glucocorticoid receptor (GR) blockade on endotoxemia in rats. Circ Shock. 1994 Feb;42(2):76-82. PMID: 8013064

and chills (which should have alerted them to the possibility of a significant infection) and was "advised to take ibuprofen or hydrocodone as prescribed for pain and to call back if symptoms persisted." She eventually presented to an emergency room as her symptoms had not improved (rather than receiving care from the abortion provider).[12]

- Additionally, many women are being told when they obtain these drugs to say they're having a miscarriage if they need to seek care for complications[13] – causing a further delay as clinicians need to have a high index of suspicion to make this diagnosis expeditiously. This would require them knowing the woman took mifepristone as there **has not been a documented case of *C. sordellii* associated toxic shock syndrome (CSTS) after first trimester miscarriage and only one case of *C. perfringens* fatality in the medical literature**.[14]
- A large records-linkage study in the U.S. Medicaid population demonstrated 83.5% of known mifepristone-induced abortions were miscoded as resulting from miscarriage from 2016-2021.[15]

Could misoprostol be causing these infections?

- It has been proposed that the original regimen for mifepristone and misoprostol, which included vaginal administration of misoprostol, increased the risk of clostridial infections due to the route of administration of misoprostol. This led to the recommended route being changed to buccal in 2006.[16]
- However, more recent reviews find little to no evidence that misoprostol was actually the cause of the increased risk of CSTS.[17],[18] Even after route of administration was changed, deaths from this infection continued.
- Additionally, misoprostol is the recommended first-line agent for cervical ripening in induction of labor and is used commonly in the US, including vaginal administration.[19] If misoprostol, and specifically vaginal

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[12] Cohen AL, Bhatnagar J, Reagan S, Zane SB, D'Angeli MA, Fischer M, Killgore G, Kwan-Gett TS, Blossom DB, Shieh WJ, Guarner J, Jernigan J, Duchin JS, Zaki SR, McDonald LC. Toxic shock associated with Clostridium sordellii and Clostridium perfringens after medical and spontaneous abortion. Obstet Gynecol. 2007 Nov;110(5):1027-33. doi: 10.1097/01.AOG.0000287291.19230.ba. PMID: 17978116

[13] https://lozierinstitute.org/the-state-of-abortion-reporting-in-2024-america-still-striving-toward-a-better-national-standard/ (last accessed Aug 11, 2025)

[14] There has been one documented case of a death from a different type of Clostridial infection (Clostridium septicum) after a first trimester miscarriage. *See: McDonald RE, Moola S. Clostridium septicum infection in a young pregnant patient. BMJ Case Rep. 2012 Jun 5;2012:bcr2012006254. doi: 10.1136/bcr-2012-006254. PMID: 22675151; PMCID: PMC4542887*

[15] Studnicki J, Fisher JW, Cox TL, Cirucci CA, Reardon DC, et al. (2025) Determining the Period Prevalence and Acuity of Emergency Department Visits Following Induced Abortion Mistakenly Identified as Spontaneous Abortion: An Analytic Observational Prospective Cohort Study. J Family Med Prim Care Open Acc 9: 282. DOI: 10.29011/2688-7460.100282

[16] Fjerstad M, Trussell J, Sivin I, Lichtenberg ES, Cullins V. Rates of serious infection after changes in regimens for medical abortion. N Engl J Med. 2009 Jul 9;361(2):145-51. doi: 10.1056/NEJMoa0809146. PMID: 19587339; PMCID: PMC3568698

[17] Aronoff DM, Marrazzo JM. Infections caused by Clostridium perfringens and Paeniclostridium sordellii after unsafe abortion. Lancet Infect Dis. 2023 Feb;23(2):e48-e55. doi: 10.1016/S1473-3099(22)00590-4. Epub 2022 Sep 22. Erratum in: Lancet Infect Dis. 2022 Nov;22(11):e310. doi: 10.1016/S1473-3099(22)00655-7. PMID: 36155670

[18] Cohen AL, Bhatnagar J, Reagan S, Zane SB, D'Angeli MA, Fischer M, Killgore G, Kwan-Gett TS, Blossom DB, Shieh WJ, Guarner J, Jernigan J, Duchin JS, Zaki SR, McDonald LC. Toxic shock associated with Clostridium sordellii and Clostridium perfringens after medical and spontaneous abortion. Obstet Gynecol. 2007 Nov;110(5):1027-33. doi: 10.1097/01.AOG.0000287291.19230.ba. PMID: 17978116

[19] Adhikari, Emily H. MD; McGuire, Jennifer PharmD; Lo, Julie MD; McIntire, Donald D. PhD; Spong, Catherine Y. MD; Nelson, David B. MD. Vaginal Compared With Oral Misoprostol Induction at Term: A Cluster Randomized Controlled Trial. Obstetrics & Gynecology 143(2):p 256-264, February 2024. | DOI: 10.1097/AOG.0000000000005464

misoprostol, significantly increased risk of clostridial sepsis, we would expect to see higher rates of this disease in induced deliveries (see below).

What is the incidence and associated mortality of these infections in obstetric and gynecologic populations?

- From 1977-2001, ten (10) cases were reported in the literature of female genital tract infection and fatal toxic shock syndrome associated with *C. sordellii* (CSTS) among previously healthy women 23-40 years of age. All of these cases resulted in death. Eight occurred after delivery of liveborn new infants, one occurred after a medication abortion, and one was not associated with pregnancy.[20] Since then, there have been 2 additional cases after liveborn vaginal deliveries, one after a cesarean section (who survived)[21], and 2 after second trimester miscarriages.[22]
- From September 2003-June 2005, FDA received reports of four deaths among women in California who had recently undergone abortions with mifepristone and misoprostol. **The time from hospitalization to death was <24 hours.[23]**
- Notable features of clinical course: only one had a fever; all had tachycardia, hypotension, vomiting/diarrhea and severe abdominal pain; 3 had a significantly elevated WBC count.
- Blood cultures on 3 of the patients prior to antibiotics were negative for bacteria but postmortem immunohistochemistry results on uterine tissue were positive in all four patients for Clostridium species. Per the 2006 CDC workshop, "Laboratory confirmation of *C. sordellii* in the four cases resulted from extraordinary efforts by a national reference laboratory," highlighting the difficulty in knowing the true incidence of this infection.
- These reports prompted the CDC to host a special workshop on these infections in 2006 which ultimately led to a black box warning being placed on mifepristone to warn of the risk of these fatal infections.[24]
- **There have been no documented deaths from *C. sordellii* or *C. perfringens* after surgical induced abortions based on our literature review.**

Mortality from Clostridial infections after mifepristone abortion

- *Despite some advances in therapy, mortality from these infections is 70-90%.[25]*

[20] Department of Health and Human Services Centers for Disease Control and Prevention Food and Drug Administration National Institutes of Health Emerging Clostridial Disease Workshop May 11 2006 Atlanta Georgia. Summary of Proceedings.
[21] Elkbuli A, Diaz B, Ehrhardt JD Jr, Hai S, Kaufman S, McKenney M, Boneva D. Survival from Clostridium toxic shock syndrome: Case report and review of the literature. Int J Surg Case Rep. 2018;50:64-67. doi: 10.1016/j.ijscr.2018.07.020. Epub 2018 Jul 29. PMID: 30081323; PMCID: PMC6083381
[22] Ho CS, Bhatnagar J, Cohen AL, Hacker JK, Zane SB, Reagan S, Fischer M, Shieh WJ, Guarner J, Ahmad S, Zaki SR, McDonald LC. Undiagnosed cases of fatal Clostridium-associated toxic shock in Californian women of childbearing age. Am J Obstet Gynecol. 2009 Nov;201(5):459.e1-7. doi: 10.1016/j.ajog.2009.05.023. Epub 2009 Jul 22. PMID: 19628200
[23] Department of Health and Human Services Centers for Disease Control and Prevention Food and Drug Administration National Institutes of Health Emerging Clostridial Disease Workshop May 11 2006 Atlanta Georgia. Summary of Proceedings.
[24] Ibid
[25] Aronoff DM, Marrazzo JM. Infections caused by Clostridium perfringens and Paeniclostridium sordellii after unsafe abortion. Lancet Infect Dis. 2023 Feb;23(2):e48-e55. doi: 10.1016/S1473-3099(22)00590-4. Epub 2022 Sep 22. Erratum in: Lancet Infect Dis. 2022 Nov;22(11):e310. doi: 10.1016/S1473-3099(22)00655-7. PMID: 36155670

- True number of *C. sordellii*-related deaths from induced abortion (and even other causes) are likely underestimated due to limitations of diagnostic methods,[26] a lack of reporting requirements to the CDC and FDA, and a lack of understanding by many clinicians.
- 2009 study of deaths in women of child-bearing age in California found that approximately 1 in 200 deaths were due to CSTS.[27]
- 2010 Commentary in the New England Journal of Medicine (NEJM) quoted a 0.58/100k case fatality rate (CFR) for Clostridial (*sordellii* and *perfringens*) infections after mifepristone-induced abortions.[28]
  - This was even after the route of administration of misoprostol had been changed to buccal (from vaginal) in an attempt to decrease the infection risk.[29]
  - Using this CFR and statistics on mifepristone abortions for 2023[30], we would expect that 3-4 women died from these infections after taking mifepristone in 2023 alone.
- Per the FDA's report on deaths after mifepristone as of 12/31/2024[31] (since its 2000 approval):
  - The most common cause of death from mifepistone is *C. sordellii* infection. [32],[33]
  - 13 of the 36 total deaths reported were listed as from sepsis – 9 had confirmed *C. sordellii*, one *C. perfringens* and two with negative blood cultures and one with no blood culture data. However, in the other deaths, the following causes were identified which are consistent with sepsis – delayed onset toxic shock-like syndrome, septic shock due to necrotizing fasciitis, and sepsis with multiple complications possibly secondary to toxic shock syndrome 82 days after mifepristone. **This would bring the deaths from sepsis up to a total of 16 women in the US that have been *reported* to the FDA.**
  - There was one additional case of death where cause could not be identified as well as one sudden death of undetermined etiology despite performance of an autopsy.
  - The FDA also reports 13 deaths in other countries after mifepristone ingestion – two from sepsis (one proven from *C. sordellii*), one from multisystem organ failure, one from TSS (toxic shock syndrome) due to *C. sordellii* and another case of Clostridial sepsis.
  - Aultman, et al,[34] performed a thorough review of all adverse event reports (AERs) submitted to the FDA from 2000-2019 and noted the following that highlight the deficiencies of the current FAERS database:

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[26] Ho CS, Bhatnagar J, Cohen AL, Hacker JK, Zane SB, Reagan S, Fischer M, Shieh WJ, Guarner J, Ahmad S, Zaki SR, McDonald LC. Undiagnosed cases of fatal Clostridium-associated toxic shock in Californian women of childbearing age. Am J Obstet Gynecol. 2009 Nov;201(5):459.e1-7. doi: 10.1016/j.ajog.2009.05.023. Epub 2009 Jul 22. PMID: 19628200

[27] Ibid

[28] Meites E, Zane S, Gould C; C. sordellii Investigators. Fatal Clostridium sordellii infections after medical abortions. N Engl J Med. 2010 Sep 30;363(14):1382-3. doi: 10.1056/NEJMc1001014. PMID: 20879895

[29] Trussell J, Nucatola D, Fjerstad M, Lichtenberg ES. Reduction in infection-related mortality since modifications in the regimen of medical abortion. Contraception. 2014 Mar;89(3):193-6. doi: 10.1016/j.contraception.2013.11.020. Epub 2013 Dec 11. PMID: 24405798; PMCID: PMC3965643

[30] https://www.guttmacher.org/fact-sheet/induced-abortion-united-states#:~:text=In%202023%2C%20765%20brick%2Dand,807%20such%20clinics%20in%202020.&text=As%20of%20March%202024%2C%20there,had%2063%20clinics%20in%202020 (Accessed Aug 7 2025)

[31] https://www.fda.gov/media/185245/download (Accessed Aug 7 2025)

[32] Aultman K, Cirucci CA, Harrison DJ, Beran BD, Lockwood MD, Seiler S. Deaths and Severe Adverse Events after the use of Mifepristone as an Abortifacient from September 2000 to February 2019. Issues Law Med. 2021 Spring;36(1):3-26. PMID: 33939340

[33] https://www.fda.gov/media/185245/download (Accessed Aug 7 2025)

[34] Aultman K, Cirucci CA, Harrison DJ, Beran BD, Lockwood MD, Seiler S. Deaths and Severe Adverse Events after the use of Mifepristone as an Abortifacient from September 2000 to February 2019. Issues Law Med. 2021 Spring;36(1):3-26. PMID: 33939340

  - Aultman's study reported 20 deaths in the US after mifepristone abortion. 11 of which were categorized as sepsis by the authors. There were 9 cases of confirmed sepsis, 7 of which were from Clostridium sordelli. There were 2 other deaths for which, after reviewing the actual adverse event reports submitted to the FDA, the authors considered likely due to sepsis.
  - Additionally, Aultman's paper noted that complications requiring surgery were treated by the abortion provider only about 40% of the time, highlighting the necessity of treating physicians having full and accurate information about the patient in order to improve patient care and outcomes.
- A 2024 article from the US reports on a death of an adolescent girl from CSTS after a mifepristone abortion at 8 weeks gestation.[35] It is unclear whether this death is included in the FDA's above report.
- **Two recent tragic deaths reported in the media highlight the aggressive and devastating nature of infections after mifepristone abortions:**
  - Alyona Dixon was a 24-year-old woman in Las Vegas who passed away in 2022 after taking mifepristone and misoprostol to induce an abortion in first trimester. 4 days later she presented to the hospital with abdominal pain and vaginal bleeding. At the time, her WBC count was 16.53 and her hemoglobin/hematocrit were 13.4/40.1 (suggestive of hemoconcentration). A urinalysis was consistent with dehydration and an ultrasound showed possible retained tissue. After being discharged with no treatment, she returned to a different hospital the next evening with abdominal pain, nausea/vomiting and diarrhea. Alyona was found to be in acute renal failure with worsened leukocytosis, lactic acidosis and metabolic acidosis. She rapidly worsened to respiratory failure and then cardiac arrest.[36,37]
  - Amber Thurman was a 28-year-old mother in Georgia who also died in 2022 after taking mifepristone and misoprostol for induced abortion at 9 weeks gestation with twins. 5 days later she presented to the hospital with abdominal pain, vomiting, "critically high white blood cell count", hypotension, foul smelling vaginal discharge and retained tissue on ultrasound. She was admitted to the hospital, but a D&C was not done. She progressed to refractory hypotension (despite vasopressors) and multisystem organ failure. 20 hours after presentation, she was finally taken to the OR for a D&C and died on the operating table. Exploratory laparotomy in the OR showed evidence of severe intra-abdominal infection.[38]

Recommended actions to address this public health concern

- Given the aggressive nature of these kinds of infections, which are largely occurring after mifepristone-induced elective abortions, the FDA and CDC should immediately investigate the true incidence of these infections and use that knowledge to direct evidence-based assessment of the overall safety of mifepristone.

- Because these infections have not been documented in first trimester miscarriages (and so suspicion would be low), educate women and the medical community on why it negatively impacts the care women receive for treating physicians not to know that their patient took mifepristone.

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[35] Jacques L, Kelly B, Soehl J, Wagar M, Rhoades J, Cowley ES, Pryde PG, Cutler A, Eschenbach D. Peripartum Uterine Clostridial Myonecrosis: A Report of Two Fatal Cases. WMJ. 2024 Jul;123(3):213-217. PMID: 39024150

[36] https://www.liveaction.org/news/wp-content/uploads/2023/10/Complaint-Filed.pdf (Accessed July 30 2025)

[37] https://www.8newsnow.com/news/local-news/las-vegas-hospital-sued-after-woman-dies-from-septic-abortion-in-2022/ (Accessed July 30 2025)

[38] https://www.propublica.org/article/georgia-abortion-ban-amber-thurman-death (Accessed Aug 7 2025)

- In person follow up on days 3 and 7 after taking mifepristone is essential to ensure that a woman has completed her abortion and to screen for early signs of these life-threatening infections.

- Urgent research is needed into faster identification and treatment of these infections given their high rate of mortality (see attached research agenda for further details and suggestions).

- Reinstate mandatory non-fatal complication reporting following mifepristone-induced abortions to identify severe morbidity from *C. sordellii* that does not lead to death.

- CDC must report pregnancy mortality by specific pregnancy outcome (livebirth, induced abortion, miscarriage, ectopic pregnancy, molar pregnancy, and "unknown outcome of pregnancy"). Then, analyze the trajectories of mortality over the past 20 years (and going forward) for each of these specific outcomes to better inform policy as well as medical practice on the true causes of maternal mortality in the US.

Research Recommendations regarding Clostridial Infections after Induced Abortion

- **Recommended research agenda from May 2006 CDC Working Group (pertinent items only):**
  - Strongly urge CDC to continue to conduct active surveillance and investigations to answer the following questions?
  - What approaches should be taken to determine whether *C. sordellii* cases are actually a widespread problem?
  - Is the current passive pregnancy mortality system adequate to determine abortion deaths?
  - What proportion of the abortion deaths were due to infection or TSS?
  - Develop a new resource for infectious disease clinicians to determine the etiology of unknown pregnancy-related deaths among their patients.
    - For example, IDSOG and the Infectious Disease Society of America could be engaged to inform infectious disease clinicians throughout the country that specimens with an unknown cause of pregnancy-related death can be submitted to a central repository. Experts managing the repository could analyze the specimens to identify microorganisms, determine potential cases of *C. sordellii*-associated TSS, and provide the reporting physician with the findings.
  - Conduct studies to determine whether a continuum of infection is present in the diagnosis, treatment and prevention of clostridial diseases. Use these results to identify opportunities for therapeutic intervention and determine biomarkers to alert clinicians to the need for aggressive intervention early in disease.
  - Perform research for public health to better define the epidemiology of *C. sordellii* and develop appropriate surveillance definitions.
  - Continue to monitor overall clostridial disease rates in pregnant women and other special populations over time.
  - Assess or redesign the current pregnancy mortality surveillance system as a more active tool in identifying risk factors for significant morbidity and mortality related to pregnant women, live births and pregnancy terminations.
  - Ensure that the research agenda clearly distinguishes between "sepsis" and "*C. sordellii*."
  - Ensure that active case finding is representative of pregnancy-associated deaths or severe illness regardless of whether an abortion was performed. Follow-up these cases with an intensive epidemiologic review to identify uncommon factors, laboratory diagnoses and factors other than cultures.
  - Perform research on the role of the media in communicating risk, assisting with case finding, and increasing the transparency of issues from both clinical provider and public health perspectives.
  - Encourage CDC and FDA to jointly develop a consultation resource for emergency room physicians, OB/GYNs and primary care providers who have questions about potential Clostridial cases. For example, practitioners could call a toll-free telephone number to receive accurate information and obtain support on reporting cases.
- **Other proposed areas for future research**
  - Role of selective targeting of toxins using antitoxin-specific antibodies (polyclonal or monoclonal) as treatment.[39]
  - Development of commercially available rapid diagnostic tests for *C. sordellii* and *C. perfringens.*

[39] Aronoff DM, Marrazzo JM. Infections caused by Clostridium perfringens and Paeniclostridium sordellii after unsafe abortion. Lancet Infect Dis. 2023 Feb;23(2):e48-e55. doi: 10.1016/S1473-3099(22)00590-4. Epub 2022 Sep 22. Erratum in: Lancet Infect Dis. 2022 Nov;22(11):e310. doi: 10.1016/S1473-3099(22)00655-7. PMID: 36155670