National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Interpretation of the French ban on macro-textured and polyurethane coated breast implants

Dutch National Institute for Public Health and the Environment (RIVM)

A. van Leeuwenhoeklaan 9
3721 MA Bilthoven (NL)
PO Box 1
3720 BA Bilthoven (NL)
www.rivm.nl

T +31 (0)30-2749111
info@rivm.nl

Our reference
061/2019 V&Z AvB/AB/js

As of 5 April, 2019 and as a precautionary measure, the French medical device regulator ANSM has banned the sale and use of breast implants with a rough surface or with a polyurethane coating because of the risk of breast implant-associated anaplastic large cell lymphoma (BIA-ALCL), a very rare form of lymphoma. The French ban[1] is based on a large number of considerations. Based on the underlying information[2] and taking due note of its limitations as described below, the RIVM has reached the following interpretation:

The French ban

- The ANSM sees sufficient indications that Allergan implants with the Biocell structure (hereinafter referred to as “Biocell” implants) present an increased risk of BIA-ALCL and that the macro-texturing of Biocell is a decisive factor in this.[3-22] France has based the ‘macro-texture’ category on the degree of roughness of the surface and/or the production process.[9] Consequently, a number of other implants with a rough surface (including polyurethane (PU)-coated implants) are also banned, based on equivalence according to the French.

Allergan Biocell implants

- The majority of BIA-ALCL cases is found with Biocell implants.[4, 6, 23-25] It is likely that Biocell implants are associated with an increased risk of BIA-ALCL. The manufacturer also reports BIA-ALCL cases in an FDA Post approval study.[26] The exact risk is unknown.

Other implants banned by the French decision

- Cases of BIA-ALCL are also known with other rough surface implants banned by the French decision, however, these implants are used less frequently.[3, 16, 24, 27-28] It is not clear how the degree of texturing affects the occurrence of BIA-ALCL. Hypotheses about this have been described in literature.[29]
- It is not possible to substantiate scientifically whether the other macro-textured implants present a similar risk as Biocell implants due to the small number of BIA-ALCL cases, the limited use of these implants and lack of clarity about the definition of texturing.[13, 16]
- It is also not possible to substantiate scientifically whether PU-coated implants (rough surface, but completely different production process from macro-textured implants) present a similar risk as Biocell implants. However, one study from Australia and New Zealand, shows a risk for PU-coated implants in the same order of magnitude as that of Biocell implants.[24]

Situation in the Netherlands

- The cases identified in the Netherlands confirm the general picture that BIA-ALCL is predominantly found with Biocell implants, but also with other macro-textured implants. PU-coated implants are rarely used in the Netherlands and no cases of BIA–ALCL have been identified with this type of implant.[6, 30-31]

Research question

As of 5 April 2019 and as a precautionary measure, the French medical device regulator ANSM has banned the sale and use of breast implants with a rough surface (macro-texture) or with a polyurethane coating because of the risk of breast implant-associated anaplastic large cell lymphoma (BIA-ALCL). Implants with a smooth surface or a texture applied using a pressure stamping technique are not banned. The RIVM (Dutch National Institute for Public Health and the Environment) has been asked to provide an interpretation of the scientific substantiation of this decision. At the request of the minister, the Dutch Association for Plastic Surgery (NVPC) has in the meantime advised its members against using the implants in question for the time being, pending the RIVM's interpretation.

Study method

A variety of information sources have been used for this study. Scientific literature was consulted, along with confidential technical dossiers from manufacturers and publicly available documents of the meetings organised by the ANSM and the FDA. In addition, the RIVM has obtained information from representatives of the ANSM, the Dutch BIA-ALCL consortium, the NVPC, the Australian regulator TGA and the British advisory group PRASEAG.

Background

ALCL is a very rare form of lymphoma.[6] The first signals of a specific form of ALCL in the vicinity of breast implants (BIA-ALCL) came in 2008. In 2011 the American regulator FDA decided to issue a warning about the risk of developing BIA-ALCL.[32] In the meantime this risk has become generally known and BIA-ALCL has also been included as a very rare side effect in the instructions for use of breast implants. BIA-ALCL is considered at this point an emerging disease: the number of cases reported so far is still very low, however, it is increasing. It often occurs a considerable time after the breast implants have been placed. This varies from a few months to many years after implantation.

The results of a Dutch study into the relationship between ALCL and breast implants was published on 4 January 2018.[6] This study describes 32 cases, showing that although women with breast implants have a risk of getting ALCL that is increased by a factor 400, their risk of getting ALCL is still very low because the disease is so rare. The study also describes a chance of roughly 1 in 7,000 that a woman with a breast implant will develop this disease before reaching the age of 75. BIA-ALCL responds well to treatment if it is discovered in time.

On 19 November 2018, the RIVM organized an international expert meeting on BIA-ALCL.[11]

What was known in November 2018?

During the RIVM meeting on 19 November 2018, various international participants shared their knowledge about ALCL and breast implants, formulated research questions and explored how such research could be carried out. It was recommended inter alia that proper registries should be set up in as many countries as possible using an agreed and harmonized minimum dataset based on the same definitions. Developing an internationally harmonized classification of surface structures was deemed specifically necessary. This was considered a prerequisite to allow potential future determination of links between implant type and the risk of BIA-ALCL. The opinion of the experts attending the meeting was that due to the lack of sufficiently comparable data, a conclusion could not be drawn as to whether there is a causal link between a certain type of breast implant and the risk of BIA-ALCL.

Which different types of textures are used on breast implants?
There is no clear texture-based classification of implants. The NVPC currently uses 4 categories: smooth, micro-textured, macro-textured and PU-coated.

Breast implants have been on the market since the nineteen sixties and their design has been changed a number of times. Texture is applied to the surface to prevent the implant from rotating and to reduce the risk of capsular contracture. The texture is applied with a pressure stamping device, with a range of salt crystals or by applying a polyurethane foam layer.

What new information has been become available since the meeting in November 2018?

In 2019, the IGJ (Dutch Health and Youth Care Inspectorate) reported that a total of 52 cases of ALCL in women with breast implants were known in the Netherlands.[30] Twenty new cases have been identified since the Dutch study on cases until 2016 (data from the BIA-ALCL consortium records, obtained via the IGJ). In February 2019, the FDA reported data on BIA-ALCL.[13] Moreover, an expert meeting was held at the ANSM in February.[12] This was followed in March by an expert meeting at the FDA, at which BIA-ALCL was also discussed.[33-34] In April 2019, Health Canada published new data on BIA-ALCL in Canada.[25] A number of new scientific studies have also been published.[24, 35-51] Data from these studies are included in a table in appendix 1.

The key findings from the new information are:

- New cases of BIA-ALCL have been found in the Netherlands, France, Australia and New Zealand. These cases were found predominantly with macro-textured implants and in particular with Biocell implants, in higher numbers than to be expected based on market share.
- Health Canada reported that also in Canada BIA-ALCL occurred primarily in women with Biocell implants, although these implants represent less than a quarter of the market.

- In the Netherlands, the majority of the recorded cases of BIA-ALCL have been found with macro-textured implants and in particular with Biocell implants. These implants were widely used in the past but did not constitute the largest market share.

Limitations of the available information

- BIA-ALCL is a very rare disease, which makes it a difficult topic for research. Although there are a lot of new publications, the dataset remains limited.
- It can take a long time for BIA-ALCL to develop and women have their implants replaced regularly throughout their lives. The implant may be replaced with one of the same type or another type. The information about the various implants in the patient's case history is often incomplete. If BIA-ALCL has been diagnosed, it is therefore not clear which implant has potentially played a role in BIA-ALCL development.
- There is no unambiguous international texture-based classification of implant types. As a result, data are not well comparable.
- Some publications are based on sales data. Sales data are not verifiable and not necessarily the same as the numbers that are actually implanted.
- Some of the available scientific research has been carried out by scientists with links to manufacturers who market a specific texture.

References

1. Decision ANSM 04/04/2019. Conclusions du CSST.
2. Presentaties bij expert bijeenkomsten, expert advies van CSST, INCA en SOFCPRE, wetenschappelijke publicaties.
3. Brody, G. S.; Deapen, D.; Taylor, C. R.; Pinter-Brown, L.; House-Lightner, S. R.; Andersen, J. S.; Carlson, G.; Lechner, M. G.; Epstein, A. L., Anaplastic large cell lymphoma occurring in women with breast implants: analysis of 173 cases. *Plast Reconstr Surg* **2015,** *135* (3), 695-705.
4. Loch-Wilkinson, A.; Beath, K. J.; Knight, R. J. W.; Wessels, W. L. F.; Magnusson, M.; Papadopoulos, T.; Connell, T.; Lofts, J.; Locke, M.; Hopper, I.; Cooter, R.; Vickery, K.; Joshi, P. A.; Prince, H. M.; Deva, A. K., Breast Implant-Associated Anaplastic Large Cell Lymphoma in Australia and New Zealand: High-Surface-Area Textured Implants Are Associated with Increased Risk. *Plast Reconstr Surg* **2017,** *140* (4), 645-654.
5. Adams, W. P., Jr.; Culbertson, E. J.; Deva, A. K.; M, R. M.; Layt, C.; Jewell, M. L.; Mallucci, P.; Heden, P., Macrotextured Breast Implants with Defined Steps to Minimize Bacterial Contamination around the Device: Experience in 42,000 Implants. *Plast Reconstr Surg* **2017,** *140* (3), 427-431.
6. de Boer, M.; van Leeuwen, F. E.; Hauptmann, M.; Overbeek, L. I. H.; de Boer, J. P.; Hijmering, N. J.; Sernee, A.; Klazen, C. A. H.; Lobbes, M. B. I.; van der Hulst, R.; Rakhorst, H. A.; de Jong, D., Breast Implants and the Risk of Anaplastic Large-Cell Lymphoma in the Breast. *JAMA oncology* **2018,** *4* (3), 335-341.
7. Atlan, M.; Bigerelle, M.; Larreta-garde, V.; Hindie, M.; Heden, P., Characterization of Breast Implant Surfaces, Shapes, and Biomechanics: A Comparison of High Cohesive Anatomically Shaped Textured Silicone, Breast Implants from Three Different Manufacturers. *Aesthetic Plast Surg* **2016,** *40* (1), 89-97.
8. TSSC 7 and 6 February 2018 Presentation Dr Bricout et al. https://www.youtube.com/channel/UCLwzdfn_TDPGz7p7nbDryQ.
9. Rebiere, B.; Petit, E.; Cot, D. *Defenition dúne gamme de texturation pour les implants mammaires (Rev 2)*; Institut Européen des Membranes: Montpellier, 2018.
10. Institut National du Cancer (INCa), Breast Implant-Associated Anaplastic Large Cell Lymphomas, an expert opinion. 2015.
11. RIVM Summary International Expert Meeting on BIA-ALCL - November 19th 2018. https://www.rivm.nl/documenten/summary-international-expert-meeting-on-bia-alcl-november-19th-2018.

12. ANSM Consultation publique sur la place et l'utilisation des implants mammaires texturés en chirurgie esthétique et reconstructrice - Communiqué. https://ansm.sante.fr/S-informer/Communiques-Communiques-Points-presse/Consultation-publique-sur-la-place-et-l-utilisation-des-implants-mammaires-textures-en-chirurgie-esthetique-et-reconstructrice-Communique.

13. FDA Breast Implant Associated-Anaplastic Large Cell Lymphoma (BIA-ALCL) - Letter to Health Care Providers. https://www.fda.gov/MedicalDevices/Safety/LetterstoHealthCareProviders/ucm630863.htm (accessed 25-04-2019)).

14. FDA 5 Things to Know About Breast Implants. https://www.fda.gov/ForConsumers/ConsumerUpdates/ucm338144.htm (accessed 25-04-2019)).

15. Doren, E. L.; Miranda, R. N.; Selber, J. C.; Garvey, P. B.; Liu, J.; Medeiros, L. J.; Butler, C. E.; Clemens, M. W., U.S. Epidemiology of Breast Implant-Associated Anaplastic Large Cell Lymphoma. *Plast Reconstr Surg* **2017,** *139* (5), 1042-1050.

16. Institut National du Cancer (INCa), Lymphomes Anaplastiques A Grandes Cellules Associes A Un Implant Mammaire, Avis d'experts. 2019.

17. ANSM, Analyse des cas de lymphomes anaplasiques à grandes cellules associés aux implants mammaires (LAGC-AIM). 2018.

18. TSSC, Compte-rendu du CSST « implant mammaire et lymphome à grandes cellules » 19/06/15.

19. TSSC, Compte-rendu du CSST « implant mammaire et lymphome à grandes cellules » 27/03/15.

20. TSSC, Compte-rendu du CSST « implant mammaire et lymphome à grandes cellules » 17/04/15.

21. TSSC, Comité Scientifique Spécialisé Temporaire « Lymphome à grandes cellules et port d'implant mammaire, bilan des actions et actualisation des recommandations » 02 février 2018.

22. SOFCPRE RECOMMANDATIONS du Directoire Professionnel des Plasticiens relatives aux implants mammaires et au risque de LAGC. https://www.chirurgiens-esthetiques-plasticiens.com/actualite-lacg-aim-les-reponses-a-vos-questions/ (accessed 25-04-2019)).

23. Brody, G. S., Anaplastic Large Cell Lymphoma Occurring in Women with Breast Implants: Analysis of 173 Cases. *Plast Reconstr Surg* **2015,** *136* (4), 553e-4e.

24. Magnusson, M.; Beath, K.; Cooter, R.; Locke, M.; Prince, H. M.; Elder, E.; Deva, A. K., SPECIAL UPDATE: The epidemiology of Breast Implant Associated Large Cell Lymphoma in Australia and New Zealand confirms the highest risk for grade 4 surface breast implants. *Plast Reconstr Surg* **2019**.

25. Health Canada Health Canada advises Allergan of its intent to suspend its licences for Biocell breast implants as a precautionary measure https://healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2019/69520a-eng.php.

26. McGuire, P.; Reisman, N. R.; Murphy, D. K., Risk Factor Analysis for Capsular Contracture, Malposition, and Late Seroma in Subjects Receiving Natrelle 410 Form-Stable Silicone Breast Implants. *Plast Reconstr Surg* **2017,** *139* (1), 1-9.

27. Becherer, B. E., Dutch Breast Implant Registry (DBIR) Annual report 2015-2017. 2018.

28. FDA Medical Device Reports of Breast Implant-Associated Anaplastic Large Cell Lymphoma. https://www.fda.gov/medical-devices/breast-implants/medical-device-reports-breast-implant-associated-anaplastic-large-cell-lymphoma (accessed 25-04-2019)).

29. Rastogi, P.; Riordan, E.; Moon, D.; Deva, A. K., Theories of Etiopathogenesis of Breast Implant–Associated Anaplastic Large Cell Lymphoma. **2019,** *143* (3S), 23S-29S.

30. IGJ Borstimplantaten en Grootcellig Anaplastisch Lymfoom (ALCL). https://www.igj.nl/onderwerpen/borstimplantaten/grootcellig-anaplastisch-lymfoom-alcl.

31. BIA-ALCL consortium via IGJ.

32. FDA Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL). https://www.fda.gov/medicaldevices/productsandmedicalprocedures/implantsandprosthetics/breastimplants/ucm239995.htm (accessed 25-04-2019)).

33. FDA 2019 Meeting Materials of the General and Plastic Surgery Devices Panel. https://www.fda.gov/AdvisoryCommittees/CommitteesMeetingMaterials/MedicalDevices/MedicalDevicesAdvisoryCommittee/GeneralandPlasticSurgeryDevicesPanel/ucm632855.htm (accessed 25-04-2019)).

34. Rakhorst, H. A.; Cooter, R.; Hopper, I.; Mureau, M. A. M.; Perks, G.; Stark, B.; Pince, H. M.; Deva, A., Submission to the United States Food & Drug Administration on the Safety of Breast Implants. ICOBRA: 2018.

35. Van Natta, B. W., Determining the True Incidence of Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL): The Need for Accurate Data. *Aesthetic surgery journal* **2019**.

36. Shauly, O.; Gould, D. J.; Siddiqi, I.; Patel, K. M.; Carey, J., The First Reported Case of Gluteal Implant-Associated Anaplastic Large Cell Lymphoma (ALCL). *Aesthetic surgery journal* **2019**.

37. Roberts, J. M.; Carr, L. W.; Jones, A.; Schilling, A.; Mackay, D. R.; Potochny, J. D., "A Prospective Approach to Inform and Treat 1,340 Patients at Risk for BIA-ALCL.". *Plast Reconstr Surg* **2019**.

38. Munhoz, A. M., The Functional Influence of Breast Implant Outer Shell Morphology on Bacterial Attachment and Growth. *Plast Reconstr Surg* **2019**.

39. Miranda, R. N.; Medeiros, L. J.; Ferrufino-Schmidt, M. C.; Keech, J. A., Jr.; Brody, G. S.; de Jong, D.; Dogan, A.; Clemens, M. W., Pioneers of Breast Implant-Associated Anaplastic Large Cell Lymphoma: History from Case Report to Global Recognition. *Plast Reconstr Surg* **2019,** *143* (3S A Review of Breast Implant-Associated Anaplastic Large Cell Lymphoma), 7s-14s.

40. McCarthy, C. M.; Loyo-Berrios, N.; Qureshi, A. A.; Mullen, E.; Gordillo, G.; Pusic, A. L.; Ashar, B. S.; Sommers, K.; Clemens, M. W., Patient Registry and Outcomes for Breast Implants and Anaplastic Large Cell Lymphoma Etiology and Epidemiology (PROFILE): Initial Report of Findings, 2012-2018. *Plast Reconstr Surg* **2019,** *143* (3S A Review of Breast Implant-Associated Anaplastic Large Cell Lymphoma), 65s-73s.

41. Lamaris, G. A.; Butler, C. E.; Deva, A. K.; Miranda, R. N.; Hunt, K. K.; Connell, T.; Lipa, J. E.; Clemens, M. W., Breast Reconstruction Following Breast Implant-Associated Anaplastic Large Cell Lymphoma. *Plast Reconstr Surg* **2019,** *143* (3S A Review of Breast Implant-Associated Anaplastic Large Cell Lymphoma), 51s-58s.

42. Har-Shai, L.; Har-Shai, Y.; Metanes, I.; Schindler, Y.; Sabo, E.; Preis, M., Composite breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) and extra-nodal marginal zone lymphoma (MZL) in the capsule of a silicone breast implant. *Autoimmunity reviews* **2019,** *18* (5), 556-557.

43. Fitzal, F.; Turner, S. D.; Kenner, L., Is breast implant-associated anaplastic large cell lymphoma a hazard of breast implant surgery? *Open biology* **2019,** *9* (4), 190006.

44. Coroneos, C. J.; Selber, J. C.; Offodile, A. C., 2nd; Butler, C. E.; Clemens, M. W., US FDA Breast Implant Postapproval Studies: Long-term Outcomes in 99,993 Patients. *Annals of surgery* **2019,** *269* (1), 30-36.

45. Collett, D. J.; Rakhorst, H.; Lennox, P.; Magnusson, M.; Cooter, R.; Deva, A. K., Current Risk Estimate of Breast Implant-Associated Anaplastic Large Cell Lymphoma in Textured Breast Implants. *Plast Reconstr Surg* **2019,** *143* (3S A Review of Breast Implant-Associated Anaplastic Large Cell Lymphoma), 30s-40s.

46. Carr, L. W.; Roberts, J.; Potochny, J. D., How Breast Implant Surface Type Is Influenced by Breast Implant-associated Anaplastic Large Cell Lymphoma: A Survey of the American Society of Plastic Surgeons. *Ann Plast Surg* **2019,** *82* (4S Suppl 3), S208-s211.

47. Calobrace, M. B., Response to "Determining the True Incidence of Breast Implant-Associated Anaplastic Large Cell Lymphoma (BIA-ALCL): The Need for Accurate Data". *Aesthetic surgery journal* **2019**.

48. Ali, N.; Sindhu, K.; Bakst, R. L., A Rare Case of a Transgender Female With Breast Implant-Associated Anaplastic Large Cell Lymphoma Treated With Radiotherapy and a Review of the Literature. *J Investig Med High Impact Case Rep* **2019,** *7*, 2324709619842192.

49. Collins, M. S.; Miranda, R. N.; Medeiros, L. J.; Silva de Meneses, M. P.; Iyer, S. P.; Butler, C. E.; Liu, J.; Clemens, M. W., Characteristics and Treatment of Advanced Breast Implant–Associated Anaplastic Large Cell Lymphoma. **2019,** *143* (3S), 41S-50S.

50. Di Napoli, A., Achieving Reliable Diagnosis in Late Breast Implant Seromas: From Reactive to Anaplastic Large Cell Lymphoma. **2019,** *143* (3S), 15S-22S.

51. Clemens, M. W.; Deva, A. K., Introduction to "A Review of Breast Implant–Associated Anaplastic Large Cell Lymphoma". **2019,** *143* (3S), 5S.

RIVM - Appendix Interpretation of the French ban on macro-textured and polyurethane coated breast implants

Reference	Country	Publication	Number of cases	Smooth	Texture unknown	Textured (micro, macro and PU)	Macro-textured	Poly-Urethane (PU) coated	Market share textured implants	Comments
BIA-ALCL consortium via IGJ (1, 2)	The Netherlands	End 2018	52 (including 2 unconfirmed cases)	0	9/50 (18%)	41/50 (82%)	39/50 (78%); 33/50 (66%) is Biocell	0	45% of implants sold between 2010 and 2015 was macro-textured, 54% was micro-textured (3). Total of implanted implants between April 1st 2015 and March 23rd 2019: Macro-textured: 38% Micro-textured: 50% PU: 4.5% Smooth: 4.4% (4).	- Macro-texture determined based on categories provided by NVPC (4). - For some of the cases, implant history of the patients is not available. - Most BIA-ALCL cases occur with macro-textured/Biocell implants. This is more than can be expected based on market share.

ANSM (5, 6)	France	July 2018 – and update ANSM 2019	80 implants in 50 patients; 9 new patients	0	22/80 (27,5%)	58/80 (72,5%)	47/80 (59%) Biocell. Other macro-textured implants are unknown	1/80 (1%)	Market between 2007 and 2016: Textured: 85% Smooth: 13% PU: 2% Market in 2018 (7): Macro-textured comparable to Biocell: 27% Other textures: 45% Smooth: 25% PU: 3%	- Of the 9 new ALCL cases, both implant specifications and implant history are not available. - For a significant part of the 80 implants in 50 women, information about texturing of the implants is not available. - Most BIA-ALCL cases occur with macro-textured/Biocell implants. This is more than can be expected based on market share.
Magnus-sen et al. (8)	Australia and New Zealand	April 2019	110 implants in 81 patients	5/110 (5%)	0	105/110 (95%)	61/110 (55%) Biocell*	25/110 (23%)	Australia states that the market is comparable to that in the Netherlands (9). Implant specific risks based on sales data between 1999 and 2015: Silimed PU vs. Mentor Siltex: 23.4 times higher risk; Biocell vs. Mentor Siltex: 16.5 times higher risk.	- All patients with exposure to smooth implants had exposure to textured implants prior or subsequent to these implants. - Australia and New Zealand are the only countries that report about multiple cases with PU coated implants. - Implant specific risks were calculated over only a small number of cases. - No implant specific risks could be calculated for implants other than Biocell, Silimed PU and Mentor Siltex as sales data were not available.

										- Most BIA-ALCL cases occur with Biocell implants. This is more than can be expected based on market share.
Health Canada (10, 11)	Canada	April 2019	28	0	2/28 (7%)	26/28 (93%)	24/28 (86%) Biocell	0	There are 3 manufacturers with authorized licenses of breast implants for sale in Canada: Allergan, Mentor and IDEAL Implant. Of all breast implants sold over the past 10 years, 25% were textured implants (12).	- The implant history of the patients is not available. - Most BIA-ALCL cases occur with Biocell implants. This is more than can be expected based on market share.
McGuire et al. 2017, Calobrace 2019 (13, 14)	USA	April 2019 17656 partici-pants in study with only Biocell	8	N/A	N/A	8/8 (100%)	8/8 (100%)	N/A	N/A	- FDA post approval study with only Biocell implants (17656 participants). - At the time of the original McGuire publication in 2017, 4 cases were known. - In April 2019, Calobrace reported an update of 4 additional cases in a letter to the editor – no (peer-reviewed) study with original data.
McCarthy et al. (15)	USA	April 2019	89	4/89 (4%)	15/89 (17%)	70/89 (79%)	Unknown	Unknown	There are 4 manufacturers on the USA market: Allergan, Mentor, Sientra, and IDEAL implants. For implants for cosmetic use, the overall proportion of cases using textured implants increased from 2.3% in 2011 to 13.0% in 2015 (16).	- All patients with exposure to smooth implants had exposure to textured implants prior or subsequent to these implants. - Most BIA-ALCL cases occur with textured implants. This is more than can be expected based on market share.

FDA (17)	World	February 2019	457	24/457 (5%)	123/457 (27%)	310/457 (68%)	Unknown	Unknown	Worldwide, large variation in market.	- For a significant part of the cases both implant specifications and implant history were not available. - Because data are worldwide, there are possible duplicates with cases addressed in other sources. - Most BIA-ALCL cases occur with textured implants.

* According to Magnussen et al. (8) Nagor (7 BIA-ALCL cases) is a micro-textured implant, whereas it is macro-textured according to the ANSM.

1. BIA-ALCL consortium via IGJ.
2. IGJ. Borstimplantaten en Grootcellig Anaplastisch Lymfoom (ALCL) 2019 [Available from: https://www.igj.nl/onderwerpen/borstimplantaten/grootcellig-anaplastisch-lymfoom-alcl.
3. de Boer M, van Leeuwen FE, Hauptmann M, Overbeek LIH, de Boer JP, Hijmering NJ, et al. Breast Implants and the Risk of Anaplastic Large-Cell Lymphoma in the Breast. JAMA oncology. 2018;4(3):335-41.
4. Personal communication NVPC. April 2019.
5. ANSM. Analyse des cas de lymphomes anaplasiques à grandes cellules associés aux implants mammaires (LAGC-AIM). 2018.
6. ANSM. Website ANSM: Actualisation du nombre de cas : 59 cas de LAGC sont recensés à l'ANSM entre 2011 et mars 2019. Accessed April 25th 2019 2019 [Available from: https://www.ansm.sante.fr/Activites/Surveillance-des-dispositifs-medicaux-implantables/Surveillance-des-protheses-mammaires/(offset)/0.
7. Petit Dejeuner presse 4 april 2019 [Available from: https://ansm.sante.fr/Mediatheque/Fichiers/Infos-de-securite/Communiques-de-presse/2019/Petit-dejeuner-Presse-Implants-mammaires.
8. Magnusson M, Beath K, Cooter R, Locke M, Prince HM, Elder E, et al. SPECIAL UPDATE: The epidemiology of Breast Implant Associated Large Cell Lymphoma in Australia and New Zealand confirms the highest risk for grade 4 surface breast implants. Plast Reconstr Surg. 2019.
9. Personal communication Australian Therapeutic Goods Administration (TGA). April 2019.
10. Canada H. Health Canada advises Allergan of its intent to suspend its licences for Biocell breast implants as a precautionary measure 2019 [Available from: https://healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2019/69520a-eng.php.
11. FDA. 2019 Meeting Materials of the General and Plastic Surgery Devices Panel 2019 [Available from: https://www.fda.gov/AdvisoryCommittees/CommitteesMeetingMaterials/MedicalDevices/MedicalDevicesAdvisoryCommittee/GeneralandPlasticSurgeryDevicesPanel/ucm632855.htm.
12. Canada. Health Canada. Summary Safety Review - Breast Implants - Assessing the potential risk of cancer (Breast implant associated-anaplastic large cell lymphoma). November 24, 2017. [Available from: https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/safety-reviews/breast-implants-assessing-potential-risk-cancer.html.
13. Calobrace MB, Schwartz MR, Zeidler KR, Pittman TA, Cohen R, Stevens WG. Long-Term Safety of Textured and Smooth Breast Implants. Aesthetic surgery journal. 2017;38(1):38-48.
14. McGuire P, Reisman NR, Murphy DK. Risk Factor Analysis for Capsular Contracture, Malposition, and Late Seroma in Subjects Receiving Natrelle 410 Form-Stable Silicone Breast Implants. Plast Reconstr Surg. 2017;139(1):1-9.
15. McCarthy CM, Loyo-Berrios N, Qureshi AA, Mullen E, Gordillo G, Pusic AL, et al. Patient Registry and Outcomes for Breast Implants and Anaplastic Large Cell Lymphoma Etiology and Epidemiology (PROFILE): Initial Report of Findings, 2012-2018. Plast Reconstr Surg. 2019;143(3S A Review of Breast Implant-Associated Anaplastic Large Cell Lymphoma):65s-73s.

16. Tandon VJ, DeLong MR, Ballard TN, Clemens MW, Brandt KE, Kenkel JM, et al. Evolving Trends in Textured Implant Use for Cosmetic Augmentation in the United States. Plast Reconstr Surg. 2018;142(6):1456-61.
17. FDA. Medical Device Reports of Breast Implant-Associated Anaplastic Large Cell Lymphoma 2019 [Available from: https://www.fda.gov/medical-devices/breast-implants/medical-device-reports-breast-implant-associated-anaplastic-large-cell-lymphoma.