

2023

Research Sites



FOCUSED
ULTRASOUND
FOUNDATION

State of Research

Like previous reports, we report on clinical, preclinical, mechanisms of action, and technical research in this section.

In 2022 the field saw gains of 51 new clinical research sites worldwide. The greatest growth was in North America with 25 additional new sites. The United States superseded China as the top country with clinical research growth. There are 77 clinical research sites in the United States compared to 57 in China. In third place, France had 33 clinical trial sites, up significantly from 13 sites the previous year.

IV. Research Sites

- IV. 2 State of Research
- IV. 3 Summary of Types of Research and Treatment Site by Region

Clinical Research

- IV. 4 Sites by Region
- IV. 4 Top Countries for Clinical Research
- IV. 4 Top Countries with Clinical Research Growth
- IV. 5 Sites by Country
- IV. 6 Sites by Indication and Body System
- IV. 7 Sites by Indication and Region
 - IV. 7 Cardiovascular
 - IV. 7 Endocrine disorders
 - IV. 8 Gastrointestinal
 - IV. 8 Miscellaneous
 - IV. 9 Musculoskeletal
 - IV.10 Neurological
 - IV.12 Ophthalmological
 - IV.12 Pulmonary
 - IV.13 Urological
 - IV.14 Women's health

Preclinical Research

- IV.16 Sites by Region
- IV.16 Top Countries for Preclinical Research
- IV.16 Top Countries with Preclinical Research Growth
- IV.17 Sites by Country
- IV.18 Sites by Indication and Body System
- IV.19 Sites by Indication and Region
 - IV. 19 Cardiovascular
 - IV. 20 Endocrine disorders
 - IV.20 Gastrointestinal
 - IV.21 Miscellaneous

- IV.22 Musculoskeletal
- IV.23 Neurological
- IV.25 Ophthalmological
- IV.25 Pulmonary
- IV.26 Urological
- IV.27 Women's health

Mechanisms of Action Research

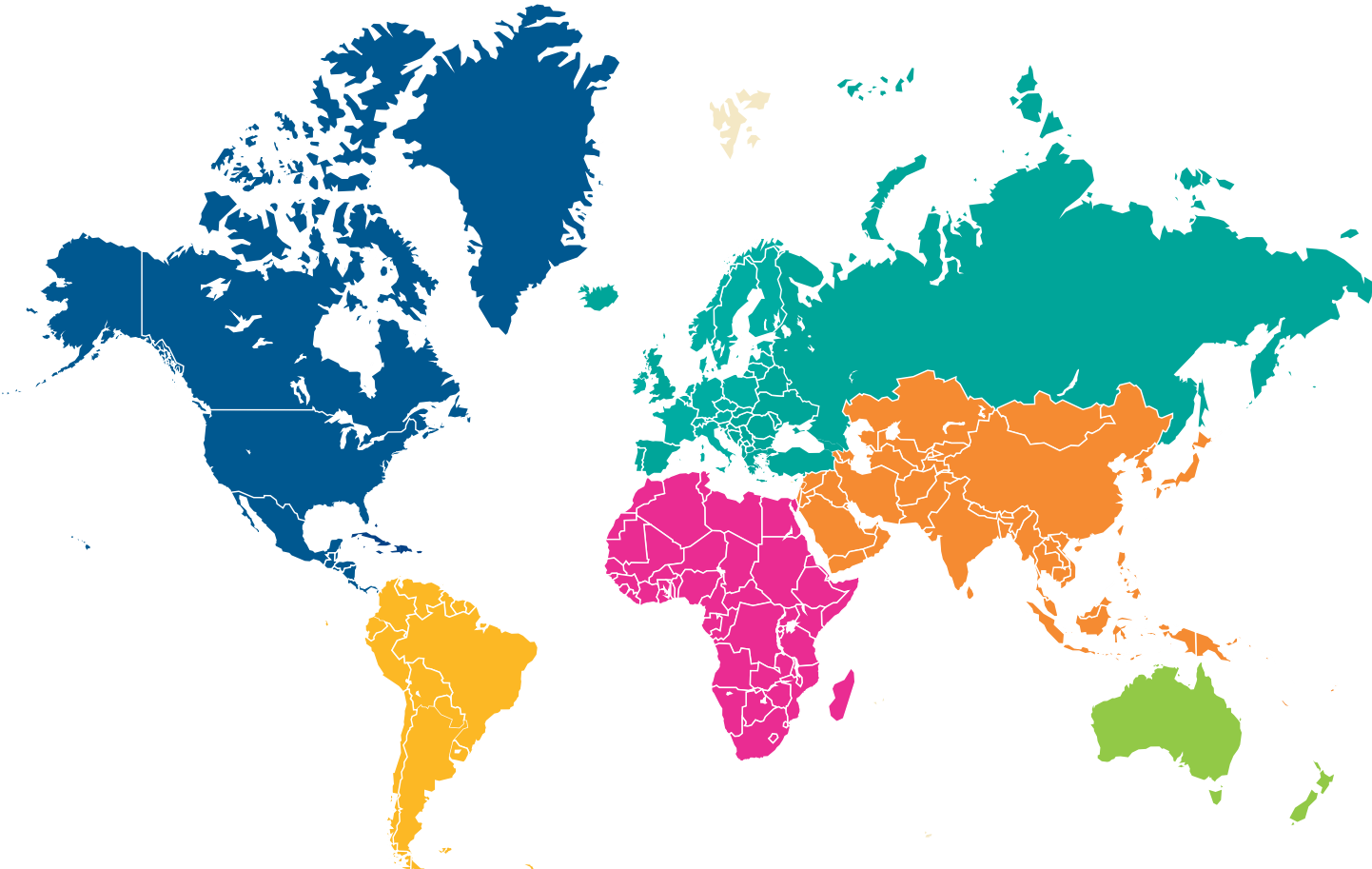
- IV.28 Sites by Country
- IV.28 Top Countries for MOA Research
- IV.28 Top Countries with MOA Research Growth
- IV.29 Sites by Country
- IV.30 Number of Research Sites and Mechanisms of Action under Investigation
 - IV.30 Cardiovascular
 - IV.31 Endocrine disorders
 - IV.32 Gastrointestinal
 - IV.33 Miscellaneous
 - IV.34 Musculoskeletal
 - IV.35 Neurological
 - IV.37 Ophthalmological
 - IV.38 Pulmonary
 - IV.39 Urological
 - IV.40 Women's health

Technical Research

- IV.41 Sites by Region
- IV.41 Top Countries for Technical Research
- IV.41 Top Countries with Technical Research Growth
- IV.42 Sites By Country
- IV.43 Sites
- IV.43 Types

Number of sites

	Total	North America	Europe	Asia	South America	Oceania	Africa
Clinical research	293	85	104	99	—	5	—
Predclinical research	152	69	41	39	—	3	—
Mechanisms of action research	180	80	42	55	—	3	—
Technical research	151	61	49	39	—	2	—





Clinical Research Sites

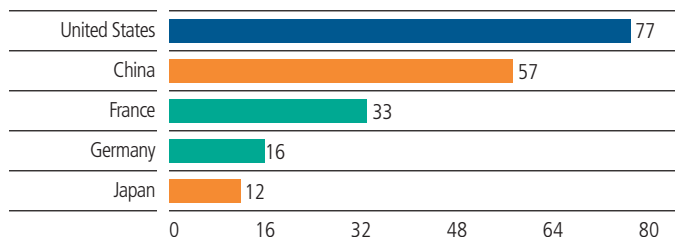
293

Clinical research sites worldwide*



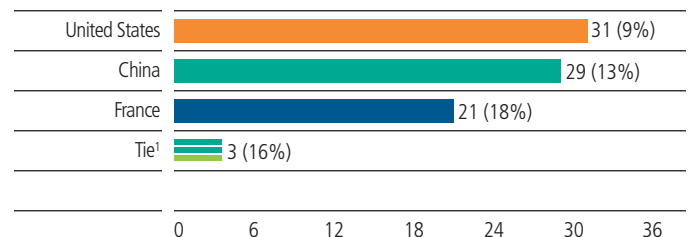
Top Countries for Clinical Research

Number of sites



Top Countries with Clinical Research Growth

Sites added, cumulative 2017 to 2022



Clinical research additional content

For more information about specific clinical research sites and indications, please visit:

www.fusfoundation.org/the-technology/research-sites

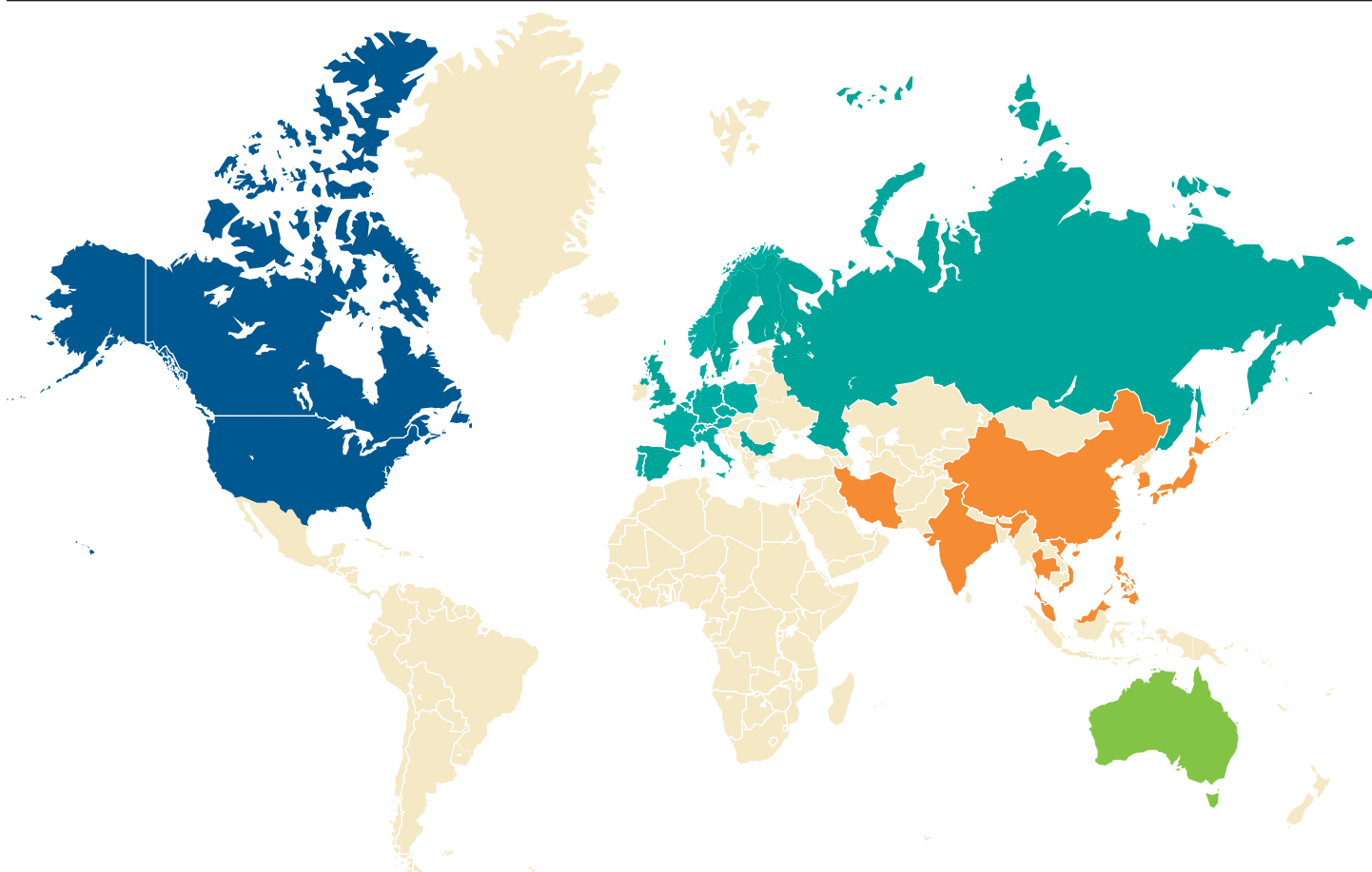
Use the “search by disease research” and/or “search by research stage” dropdown menu.

* Clinical research sites treat patients as part of a clinical study.

¹ Three-way tie: Australia, The Netherlands, and Norway



Clinical Research Sites by Country



North America

8 Canada
77 United States

Europe

1 Austria
2 Belgium
1 Bulgaria
1 Czech Republic
2 Denmark
1 Finland
33 France
16 Germany
11 Italy
5 The Netherlands
5 Norway
1 Poland
1 Portugal

5 Russian Federation

1 Serbia
4 Spain
1 Sweden
4 Switzerland
9 United Kingdom

Asia

57 China
2 India
1 Iran
3 Israel
12 Japan
1 Malaysia
1 Philippines
1 Singapore
11 South Korea
8 Taiwan
1 Thailand
1 Vietnam

Oceania

5 Australia



Clinical Research Sites by Indication and Body System*

97 indications are being researched at clinical sites worldwide.

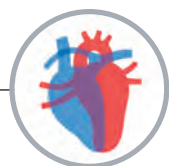
21 Cardiovascular sites 6 indications	10 Endocrine disorders sites 2 indications	56 Gastrointestinal sites 10 indications	11 Miscellaneous sites 9 indications
63 Musculoskeletal sites 12 indications	96 Neurological sites 37 indications	7 Ophthalmological sites 1 indication	2 Pulmonary sites 2 indications
83 Urological sites 6 indications	82 Women's health sites 12 indications		

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary above.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.
 Use the "search by disease research" and/or "search by research stage" dropdown menu.



Clinical Research Sites by Indication and Region*



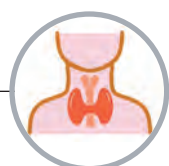
Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Cardiovascular

Cardiac					
Heart valve calcifications	–	9	–	–	9
Peripheral					
Arteriovenous malformations	–	1	–	–	1
Hypertension	–	–	3	–	3
Peripheral artery disease	–	1	–	–	1
Twin-twin transfusion syndrome	–	1	–	–	1
Varicose veins	1	3	2	–	6



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Endocrine disorders

Graves' disease	–	–	1	–	1
Thyroid nodules	–	–	9	–	9

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.


Use the "search by disease research" and/or "search by research stage" dropdown menu.

RESEARCH SITES

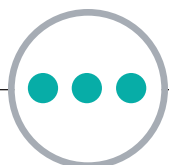


Clinical Research Sites by Indication and Region* continued





Indications	Regions				Totals
	■ N. America	■ Europe	■ Asia	■ Oceania	
Gastrointestinal					
Biliary tract cancer	–	–	1	–	1
Colorectal tumors	–	3	2	–	5
Dental infections	1	–	–	–	1
Esophageal tumors	2	–	–	–	2
Gastric tumors	1	–	–	–	1
Liver metastases	–	4	–	–	4
Liver tumors	9	14	13	–	36
Pancreatic tumors	–	–	4	–	4
Pancreatic tumors, benign	–	–	1	–	1
Pancreatic tumors, malignant	3	14	6	–	23



</

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

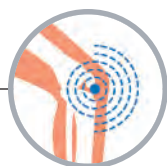
For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the "search by disease research" and/or "search by research stage" dropdown menu.

¹ Protocols inclusive of more than one indication.



Clinical Research Sites by Indication and Region* continued



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Musculoskeletal

Arthritis, facetogenic	7	5	3	—	15
Arthritis, knee	—	—	1	—	1
Arthritis, sacroiliac	1	1	1	—	3
Bone cancer	4	2	1	—	7
Bone metastases	6	12	9	—	27
Bone tumors, benign	—	3	—	—	3
Desmoid tumors	2	5	1	—	8
Osteoid osteoma	3	8	12	—	23
Plantar fasciitis	—	1	—	—	1
Sacral chordoma	—	1	—	—	1
Soft tissue cancer	4	3	—	—	7
Soft tissue tumors, benign	2	5	13	1	21

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Clinical Research Sites by Indication and Region* continued



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Neurological

Movement disorder					
Dystonia	—	1	3	—	4
Dystonia, hand	—	—	1	—	1
Epilepsy	8	—	2	1	11
Essential tremor	6	6	6	—	18
Parkinson's disease, dyskinesia	9	3	4	—	16
Parkinson's disease, tremor	6	6	2	—	14
Tremor, orthostatic	2	—	—	—	2
Neurodegenerative					
Alzheimer's disease	13	—	3	4	20
Amyotrophic lateral sclerosis	1	—	—	—	1
Multiple sclerosis	1	—	—	—	1
Parkinson's disease, underlying cause	1	—	—	—	1
Pain					
Cancer pain	1	—	—	—	1
Neuropathic pain	4	1	2	—	7
Neuropathy	2	—	—	—	2
Painful amputation neuromas	—	—	1	—	1
Trigeminal neuralgia	1	—	—	—	1

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the "search by disease research" and/or "search by research stage" dropdown menu.



Clinical Research Sites by Indication and Region* continued

Indications	Regions				Totals
	<div><div></div>N. America</div>	<div><div></div>Europe</div>	<div><div></div>Asia</div>	<div><div></div>Oceania</div>	
Neurological continued					
Psychiatric					
ADHD	1	—	—	—	1
Anxiety	4	—	—	—	4
Bipolar disorder	1	—	—	—	1
Depression	6	—	5	—	11
Mood disorder	2	—	—	—	2
Obsessive-compulsive disorder	4	—	—	—	4
Opioid and other addictions	—	1	—	—	1
PTSD	1	—	—	—	1
Schizophrenia	—	—	1	—	1
Trauma					
Traumatic brain injury	2	—	1	—	3
Tumor					
Astrocytoma	3	—	—	—	3
Brain metastases, breast cancer	1	—	—	—	1
Brain metastases, lung cancer	4	—	—	—	4
Brain metastases, melanoma	—	1	—	—	1
Brain tumors, general	3	3	—	—	6
Glioblastoma	26	11	5	—	42
Neuroblastoma	1	—	—	—	1
Neurofibromatosis	2	1	—	—	3
Pontine glioma	5	—	—	—	5
Vascular					
Stroke, intracerebral hemorrhage	1	—	—	—	1
Stroke, thromboembolic	2	—	2	—	4

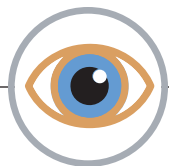
* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Clinical Research Sites by Indication and Region* continued



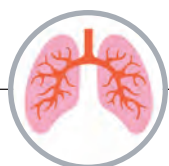
Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Ophthalmological

Glaucoma	1	5	1	–	7
----------	---	---	---	---	----------



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Pulmonary

Lung cancer	1	–	–	–	1
Rhinitis	–	–	1	–	1

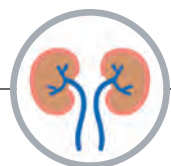
* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Clinical Research Sites by Indication and Region* continued



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Urological

Benign prostatic hyperplasia	–	2	–	–	2
Chyluria	–	–	1	–	1
Kidney disease, acute	–	–	1	–	1
Kidney stones	3	–	–	–	3
Kidney tumors	–	3	12	–	15
Prostate cancer	29	50	9	–	88

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Clinical Research Sites by Indication and Region* continued



Indications	<div>■ N. America</div>	<div>■ Europe</div>	<div>■ Asia</div>	<div>■ Oceania</div>	
Women's health					
Breast tumors, benign	5	1	4	—	10
Breast tumors, malignant	8	8	12	—	28
Cervical tumors	1	2	1	—	4
Ectopic pregnancy	—	—	1	—	1
Endometrial tumors	—	1	—	—	1
Endometriosis	—	1	1	—	2
Lichen sclerosis	—	—	1	—	1
Ovarian tumors	1	1	—	—	2
Retained placenta	—	—	1	—	1
Uterine adenomyosis	—	6	19	2	27
Uterine fibroids	3	20	40	2	65
Vaginal tumors	—	2	—	—	2

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the "search by disease research" and/or "search by research stage" dropdown menu.

Page intentionally left blank



Preclinical Research Sites

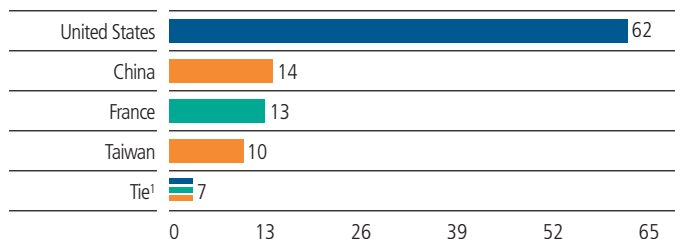
152

Preclinical research sites worldwide*



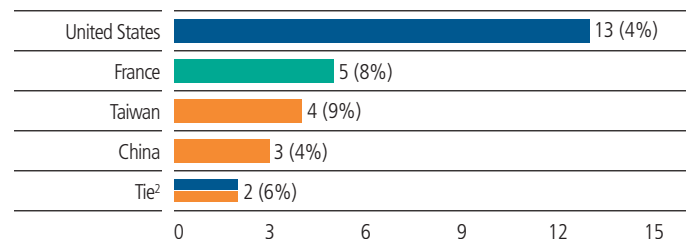
Top Countries for Preclinical Research

Number of sites



Top Countries with Preclinical Research Growth

Sites added, cumulative 2017 to 2022



Preclinical research in 2022 remained steady, with no significant changes from 2021 both in terms of overall numbers of sites and global distribution. The United States remains the dominant country for preclinical focused ultrasound research.

Preclinical research additional content

For more information about specific preclinical research sites and indications, please visit:

www.fusfoundation.org/the-technology/research-sites

Use the “search by disease research” and/or “search by research stage” dropdown menu.

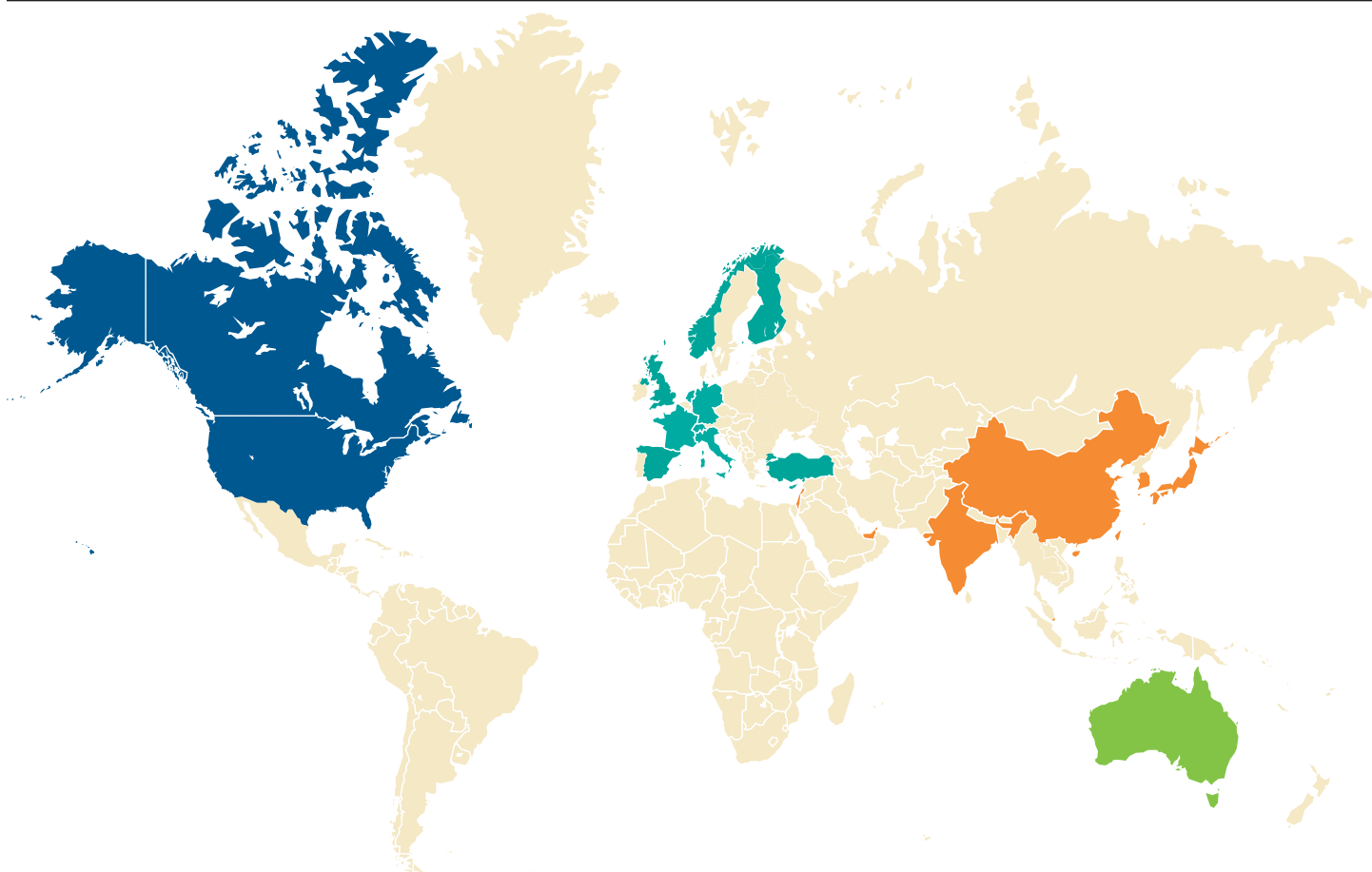
* Preclinical research sites conduct nonhuman FUS research to collect data in support of the safety or feasibility of clinical applications.

¹ Three-way tie: Canada, Germany, and South Korea

² Two-way tie: Canada and South Korea



Preclinical Research Sites by Country



North America

- 7 Canada
- 62 United States

Europe

- 1 Cyprus
- 1 Finland
- 13 France
- 7 Germany
- 2 Italy
- 1 The Netherlands
- 2 Norway
- 4 Spain
- 3 Switzerland
- 1 Turkey
- 6 United Kingdom

Asia

- 14 China
- 1 India
- 2 Israel
- 3 Japan
- 1 Singapore
- 7 South Korea
- 10 Taiwan
- 1 United Arab Emirates

Oceania

- 3 Australia



Preclinical Research Sites by Indication and Body System*

102 indications are being researched at preclinical sites worldwide.

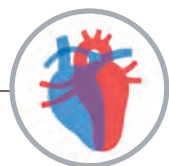
26 Cardiovascular sites 15 indications	4 Endocrine disorders sites 3 indications	43 Gastrointestinal sites 8 indications	24 Miscellaneous sites 9 indications
31 Musculoskeletal sites 12 indications	81 Neurological sites 32 indications	7 Ophthalmological sites 4 indications	6 Pulmonary sites 2 indications
31 Urological sites 9 indications	39 Women's health sites 8 indications		


* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary above.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.
Use the "search by disease research" and/or "search by research stage" dropdown menu.



Preclinical Research Sites by Indication and Region*





Indications	Regions				Totals
	N. America	Europe	Asia	Oceania	
Cardiovascular					
Cardiac					
Atrial fibrillation	1	1	1	—	3
Cardiac hypertrophy	—	—	1	—	1
Cardiac pacing	—	1	—	—	1
Fetal heart anomalies	1	—	—	—	1
Heart valve calcifications	—	1	—	—	1
Mitral regurgitation	—	1	—	—	1
Ventricular tachycardia	1	1	—	—	2
Peripheral					
Arteriovenous malformations	1	—	—	—	1
Atherosclerosis	4	1	1	—	6
Deep vein thrombosis	6	—	—	—	6
Hematoma	2	—	—	—	2
Hemophilia	1	—	—	—	1
Hypertension	1	—	—	—	1
Peripheral artery disease	2	—	—	—	2
Twin-twin transfusion syndrome	1	3	1	—	5

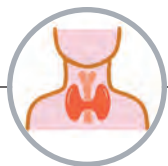
* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Preclinical Research Sites by Indication and Region* continued



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Endocrine disorders

Diabetes	2	—	—	—	2
Thyroid cancer	2	—	—	—	2
Thyroid nodules	1	—	—	—	1



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Gastrointestinal

Colorectal tumors	1	1	—	—	2
Gastric tumors	—	1	—	—	1
Inflammatory bowel disease	—	1	—	—	1
Liver metastases	2	3	—	—	5
Liver tumors	10	11	5	—	26
Pancreatic tumors	—	—	4	—	4
Pancreatic tumors, malignant	9	11	—	—	20
Periodontal disease	—	—	—	1	1

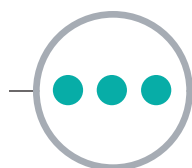
* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the "search by disease research" and/or "search by research stage" dropdown menu.



Preclinical Research Sites by Indication and Region* continued



Indications

Regions

Totals

■ N. America ■ Europe ■ Asia ■ Oceania

Miscellaneous

Head & neck tumors	2	1	1	–	4
Heterotopic ossification	1	–	–	–	1
Infection	2	–	1	–	3
Melanoma	5	–	–	–	5
Multiple tumors ¹	4	2	–	–	6
Niemann-Pick disease	1	–	–	–	1
Obesity	1	–	–	–	1
Sinonasal disease	–	–	1	–	1
Wound healing	3	–	–	1	4

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

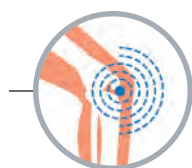
For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.

¹ Protocols inclusive of more than one indication



Preclinical Research Sites by Indication and Region* continued




Indications	Regions				Totals
	N. America	Europe	Asia	Oceania	
Musculoskeletal					
Arthritis, facetogenic	2	1	1	–	4
Arthritis, knee	–	–	1	–	1
Bone cancer	1	–	–	–	1
Bone metastases	3	1	3	1	8
Bone tumors, benign	1	1	–	–	2
Muscle atrophy	3	–	–	–	3
Osteoid osteoma	1	1	2	–	4
Osteopenia	1	–	–	–	1
Rotator cuff injury	1	–	–	–	1
Soft tissue cancer	9	2	–	–	11
Soft tissue tumors, benign	2	1	2	–	5
Tendon contracture	1	–	–	–	1

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.
Use the “search by disease research” and/or “search by research stage” dropdown menu.



Preclinical Research Sites by Indication and Region* continued



Indications	Regions				Totals
	N. America	Europe	Asia	Oceania	
Neurological					
Movement disorder					
Epilepsy	11	4	3	—	18
Essential tremor	—	—	1	—	1
Parkinson’s disease, dyskinesia	—	—	1	—	1
Parkinson’s disease, tremor	2	—	—	—	2
Neurodegenerative					
Alzheimer’s disease	8	6	4	1	19
Amyotrophic lateral sclerosis	1	1	—	—	2
Dementia	—	—	1	—	1
Huntington’s disease	1	—	—	—	1
Parkinson’s disease, underlying cause	6	3	4	—	13
Rett syndrome	—	1	—	—	1
Other					
Hydrocephalus	1	—	—	—	1
Neuromyelitis optica	1	—	—	—	1
Pain					
Cancer pain	1	2	—	—	3
Headache	—	—	1	—	1
Neuropathic pain	5	—	1	—	6
Neuropathy	—	—	1	—	1
Psychiatric					
Anxiety	2	1	—	—	3
Autism	—	1	—	—	1
Depression	4	2	—	—	6
Opioid and other addictions	2	1	—	—	3
Trauma					
Spinal cord injury	3	—	1	—	4
Traumatic brain injury	1	—	—	—	1

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the "search by disease research" and/or "search by research stage" dropdown menu.



Preclinical Research Sites by Indication and Region* continued



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Neurological continued

Tumor					
Astrocytoma	3	2	3	—	8
Brain metastases, breast cancer	3	1	—	—	4
Brain metastases, melanoma	1	—	—	—	1
Brain tumors, general	10	3	3	—	16
Glioblastoma	18	8	9	—	35
Neurofibromatosis	1	—	—	—	1
Pontine glioma	2	2	—	—	4
Vascular					
Cavernomas	1	—	—	—	1
Stroke, intracerebral hemorrhage	6	2	1	—	9
Stroke, thromboembolic	4	2	—	—	6

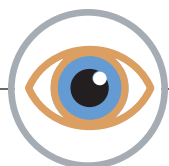
* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Preclinical Research Sites by Indication and Region* continued



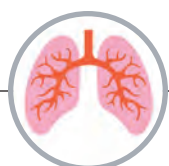
Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Ophthalmological

Glaucoma	–	3	–	–	3
Macular degeneration	1	–	–	–	1
Presbyopia	–	1	1	–	2
Retinal injury	1	–	–	–	1



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Pulmonary

Lung cancer	3	1	1	–	5
Tuberculosis	–	–	1	–	1

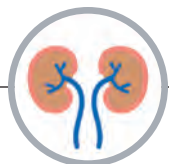
* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the “search by disease research” and/or “search by research stage” dropdown menu.



Preclinical Research Sites by Indication and Region* continued



Indications

Regions **Totals**

■ N. America ■ Europe ■ Asia ■ Oceania

Urological

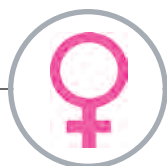
Acute tubular necrosis	1	–	–	–	1
Benign prostatic hyperplasia	1	–	1	–	2
Bladder tumors	2	–	–	–	2
Fetal bladder obstruction	–	–	1	–	1
Kidney disease, acute	1	–	–	–	1
Kidney stones	2	–	–	–	2
Kidney tumors	4	1	2	–	7
Prostate cancer	13	7	3	–	23
Urinary tract infection	–	1	–	–	1

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.
Use the “search by disease research” and/or “search by research stage” dropdown menu.



Preclinical Research Sites by Indication and Region* continued

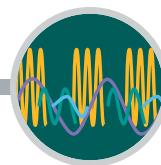


Indications	<div><div></div> N. America</div>	<div><div></div> Europe</div>	<div><div></div> Asia</div>	<div><div></div> Oceania</div>	
Women's health					
Breast tumors, benign	1	–	1	–	2
Breast tumors, malignant	15	4	6	–	25
Cervical tumors	–	–	1	–	1
Endometrial tumors	1	–	1	–	2
Endometriosis	–	1	–	–	1
Ovarian tumors	1	–	1	1	3
Uterine adenomyosis	–	–	2	1	3
Uterine fibroids	4	2	8	1	15

* A site may perform treatments on more than one indication within the same body system. Because of this, the total number of sites within a body system in the table may not equal the values provided in the summary.

For more information about specific clinical research sites and indications, please visit: www.fusfoundation.org/the-technology/research-sites.

Use the "search by disease research" and/or "search by research stage" dropdown menu.



Mechanisms of Action Research Sites

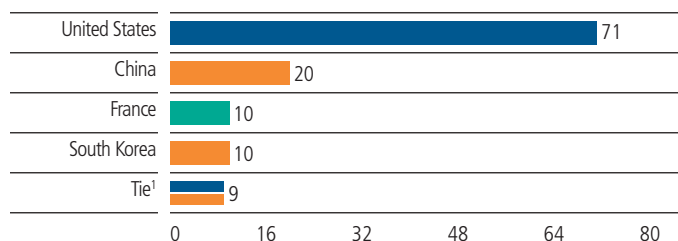
180

MOA research sites worldwide*



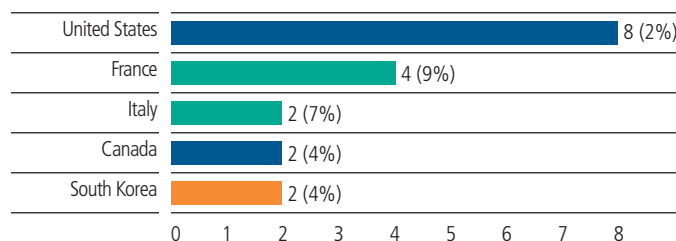
Top Countries for MOA Research

Number of sites



Top Countries with MOA Research Growth

Sites added, cumulative 2017 to 2022



Mechanism of action research also remained steady in 2022. No significant changes from 2021 both in terms of overall numbers of sites and global distribution. The United States remains the dominant country for mechanism of action focused ultrasound research.

MOA research additional content

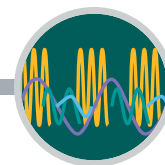
For more information about specific Mechanism of Action research sites and indications, please visit:

www.fusfoundation.org/the-technology/research-sites

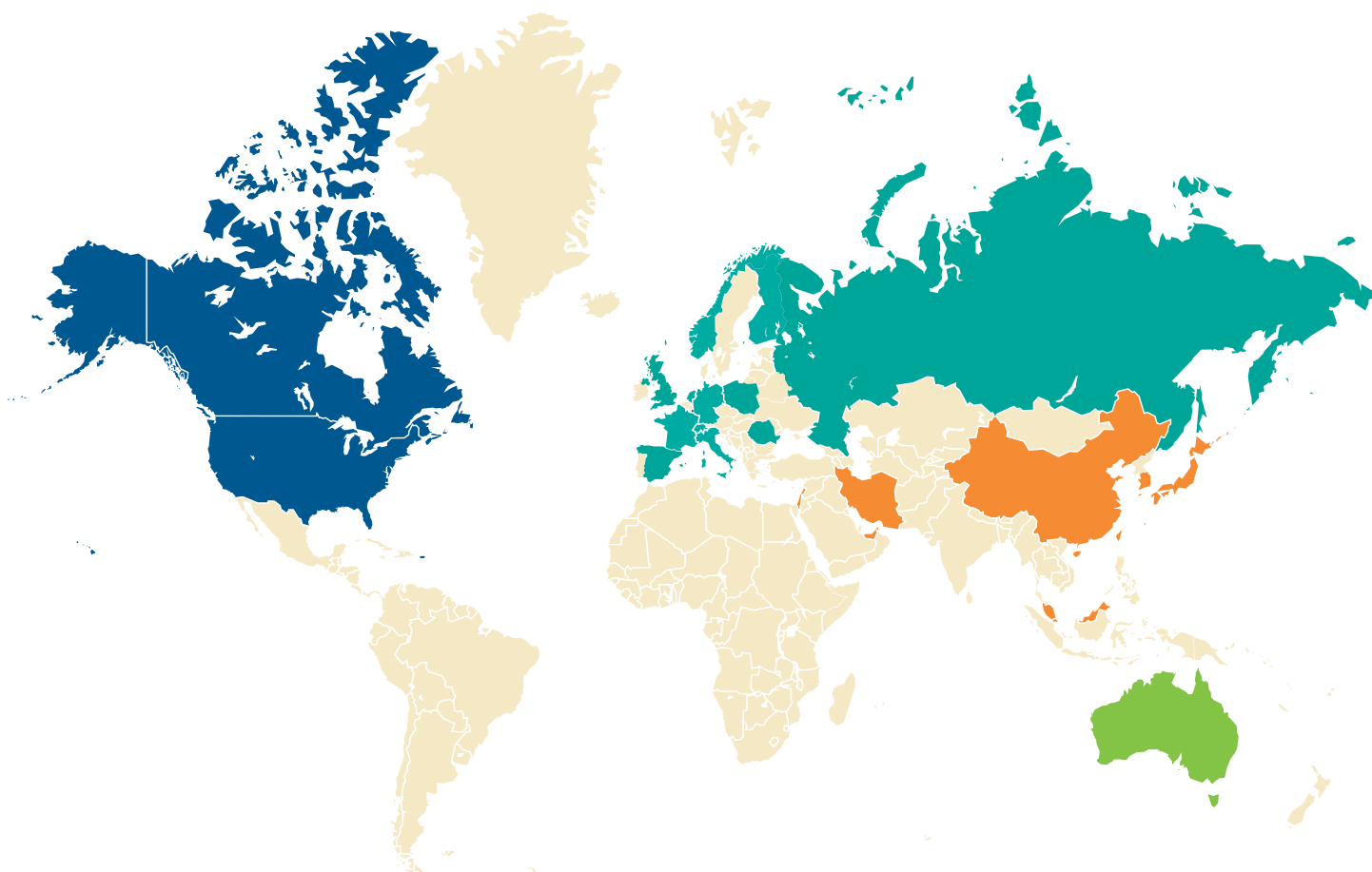
Use the “search by disease research” and/or “search by research stage” dropdown menu and choose “Bioeffect.”

* Mechanisms of action research sites conduct basic science research to understand how focused ultrasound affects the body.

¹ Two-way tie: Canada and Japan



Mechanisms of Action Research Sites by Country



North America

9 Canada
71 United States

Europe

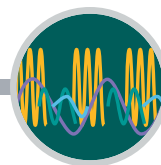
1 Bulgaria
1 Cyprus
10 France
6 Germany
6 Italy
2 The Netherlands
2 Norway
1 Russian Federation
2 Spain
4 Switzerland
7 United Kingdom

Asia

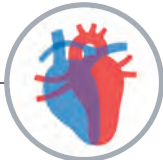
20 China
2 Iran
4 Israel
9 Japan
1 Malaysia
1 Singapore
10 South Korea
7 Taiwan
1 United Arab Emirates

Oceania

3 Australia



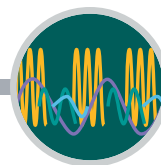
Number of Research Sites and MOAs under Investigation




Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Cardiovascular					
Cardiac					
Atrial fibrillation	2	3	—	—	3
Cardiac hypertrophy	1	1	—	—	1
Cardiac pacing	1	1	—	—	1
Fetal heart anomalies	1	1	—	—	1
Heart valve calcifications	1	1	9	—	10
Mitral regurgitation	1	1	—	—	1
Ventricular tachycardia	1	2	—	—	2
Peripheral					
Arteriovenous malformations	3	1	1	2	4
Atherosclerosis	5	7	—	—	6
Deep vein thrombosis	6	9	—	—	6
Hematoma	2	2	—	—	2
Hemophilia	1	1	—	—	1
Hypertension	2	1	3	—	4
Peripheral artery disease	3	2	1	—	3
Twin-twin transfusion syndrome	3	5	1	—	5
Varicose veins	2	—	6	9	15

¹ Mechanisms of action

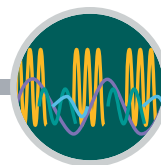
² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.




Number of Research Sites and MOAs under Investigation continued



Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Endocrine disorders					
Diabetes	1	2	—	—	2
Graves' disease	1	—	1	—	1
Thyroid cancer	2	2	—	—	2
Thyroid nodules	2	1	9	20	30



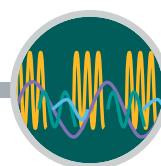
Number of Research Sites and MOAs under Investigation continued



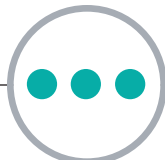
Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
		Gastrointestinal			
Biliary tract cancer	1	—	1	—	1
Colorectal tumors	3	2	5	—	7
Dental infections	1	—	1	—	1
Esophageal tumors	1	—	1	—	1
Gastric tumors	2	1	1	—	3
Inflammatory bowel disease	1	1	—	1	1
Liver metastases	5	5	3	3	11
Liver tumors	11	31	36	137	181
Pancreatic tumors	3	4	4	41	49
Pancreatic tumors, benign	1	—	1	1	2
Pancreatic tumors, malignant	16	35	19	9	40
Periodontal disease	2	2	—	—	1

¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



Number of Research Sites and MOAs under Investigation continued



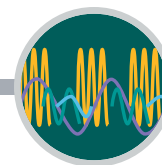
Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Miscellaneous					
Actinic keratosis	1	—	2	—	2
Basal cell carcinoma	1	—	3	—	3
Dercum's disease	1	—	1	—	1
Head & neck tumors	6	4	3	—	6
Heterotopic ossification	1	1	—	—	1
Hypersplenism	1	—	1	—	1
Infection	3	3	—	—	3
Kaposi's sarcoma	1	—	1	—	1
Lipoma	1	—	1	—	1
Melanoma	3	5	2	—	6
Multiple tumors ³	7	6	5	—	10
Niemann-Pick disease	1	1	—	—	1
Obesity	*	1	—	—	1
Sinonasal disease	1	1	—	—	1
Wound healing	4	5	—	—	4

¹ Mechanisms of action


² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.

³ Protocols inclusive of more than one indication.

* No mechanism of action was provided



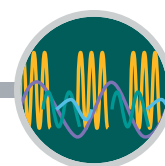
Number of Research Sites and MOAs under Investigation continued




Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Musculoskeletal					
Arthritis, facetogenic	3	5	15	4	19
Arthritis, knee	2	1	1	–	2
Arthritis, sacroiliac	1	–	3	–	3
Bone cancer	2	1	7	8	16
Bone metastases	5	8	27	27	46
Bone tumors, benign	2	2	3	1	6
Desmoid tumors	1	–	8	11	18
Muscle atrophy	3	3	–	–	3
Osteoid osteoma	1	4	23	103	107
Osteopenia	2	2	–	–	1
Plantar fasciitis	1	–	1	–	1
Rotator cuff injury	1	1	–	–	1
Sacral chordoma	1	–	1	–	1
Soft tissue cancer	8	12	6	2	15
Soft tissue tumors, benign	2	5	21	92	101
Tendon contracture	2	2	–	–	1

¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



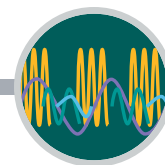
Number of Research Sites and MOAs under Investigation continued




Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Neurological					
Movement disorder					
Dystonia	2	—	4	1	5
Dystonia, hand	1	—	1	1	1
Epilepsy	10	21	10	2	26
Essential tremor	2	1	18	102	109
Parkinson’s disease, dyskinesia	2	1	14	6	19
Parkinson’s disease, tremor	3	2	14	57	69
Tremor, orthostatic	2	—	2	—	1
Neurodegenerative					
Alzheimer’s disease	9	24	20	1	28
Amyotrophic lateral sclerosis	2	2	1	—	2
Dementia	1	1	—	—	1
Huntington’s disease	1	1	—	—	1
Multiple sclerosis	1	—	1	—	1
Parkinson’s disease, underlying cause	7	16	1	—	14
Rett syndrome	1	1	—	—	1
Other					
Hydrocephalus	1	1	—	—	1
Neuromyelitis optica	1	1	—	—	1
Pain					
Cancer pain	3	3	1	—	4
Headache	1	1	—	—	1
Neuropathic pain	4	6	6	3	14
Neuropathy	3	1	2	1	4
Painful amputation neuromas	1	—	1	—	1
Trigeminal neuralgia	1	—	1	1	2

¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



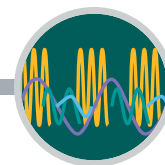
Number of Research Sites and MOAs under Investigation continued




Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Neurological continued					
Psychiatric					
ADHD	1	—	1	—	1
Anxiety	2	3	4	—	7
Autism	1	1	—	—	1
Bipolar disorder	1	—	1	—	1
Depression	2	6	11	1	13
Mood disorder	1	—	2	—	2
Obsessive-compulsive disorder	2	—	4	2	5
Opioid and other addictions	1	3	1	—	4
PTSD	1	—	1	—	1
Schizophrenia	1	—	1	—	1
Trauma					
Spinal cord injury	2	4	—	—	4
Traumatic brain injury	2	1	3	—	4
Tumor					
Astrocytoma	3	8	2	—	10
Brain metastases, breast cancer	5	6	1	—	4
Brain metastases, lung cancer	1	—	4	—	4
Brain metastases, melanoma	4	3	1	—	2
Brain tumors, general	21	31	6	—	22
Glioblastoma	21	47	37	—	57
Neuroblastoma	1	—	1	—	1
Neurofibromatosis	2	1	3	—	4
Pontine glioma	5	5	5	—	8
Vascular					
Cavernomas	1	1	—	—	1
Stroke, intracerebral hemorrhage	6	9	1	—	10
Stroke, thromboembolic	7	6	4	—	10

1 Mechanisms of action

2 For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



Number of Research Sites and MOAs under Investigation continued

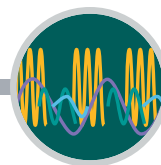


Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Ophthalmological					
Glaucoma	2	3	7	14	22
Macular degeneration	1	1	—	—	1
Presbyopia	2	2	—	—	2
Retinal injury	1	1	—	—	1


¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.

RESEARCH SITES



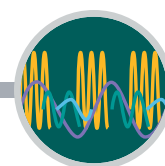
Number of Research Sites and MOAs under Investigation continued



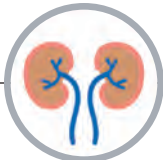
Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Pulmonary					
Lung cancer	5	6	1	—	5
Rhinitis	1	—	1	—	1
Tuberculosis	1	1	—	—	1

¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



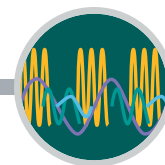
Number of Research Sites and MOAs under Investigation continued




Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Urological					
Acute tubular necrosis	1	1	—	—	1
Benign prostatic hyperplasia	3	2	2	45	49
Bladder tumors	2	2	—	—	2
Chyluria	1	—	1	—	1
Fetal bladder obstruction	1	1	—	—	1
Kidney disease, acute	2	1	1	—	2
Kidney stones	2	3	2	—	2
Kidney tumors	4	7	15	91	97
Prostate cancer	9	23	67	432	461
Urinary tract infection	1	1	—	—	1

¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



Number of Research Sites and MOAs under Investigation continued



Indications	MOAs ¹	Sites			Total ²
		■ Preclinical	■ Clinical	■ Commercial	
Women's health					
Breast tumors, benign	2	2	9	13	21
Breast tumors, malignant	16	32	27	96	125
Cervical tumors	2	1	4	—	5
Cervicitis	1	—	—	1	1
Ectopic pregnancy	1	—	1	—	1
Endometrial tumors	1	2	1	1	4
Endometriosis	2	1	2	2	4
Lichen sclerosis	1	—	1	1	2
Ovarian tumors	2	3	2	—	5
Retained placenta	1	—	1	—	1
Urinary incontinence, stress	1	—	—	1	1
Uterine adenomyosis	3	3	27	115	135
Uterine fibroids	4	16	64	319	347
Vaginal tumors	1	—	2	—	2

¹ Mechanisms of action

² For each indication, a site may examine more than one mechanism of action or may perform more than one stage of research or treatment. The total reflects unique sites, and therefore may not necessarily be the sum of the values in the preceding three columns.



Technical Research Sites by Region

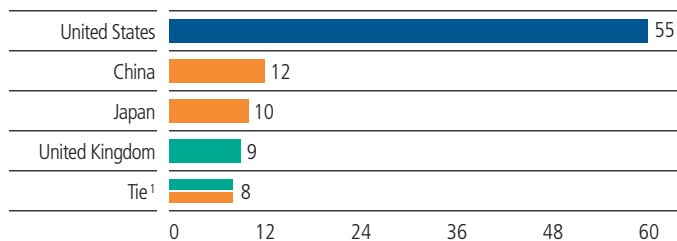
151

Technical research sites worldwide



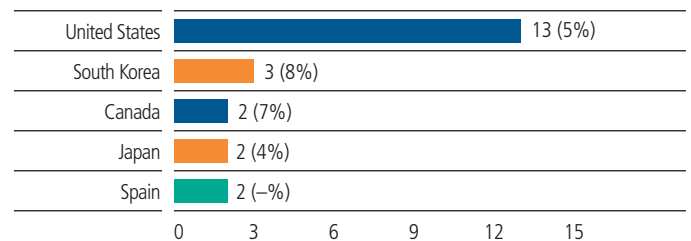
Top Countries for Technical Research

Number of sites



Top Countries with Technical Research Growth

Sites added, cumulative 2017 to 2022



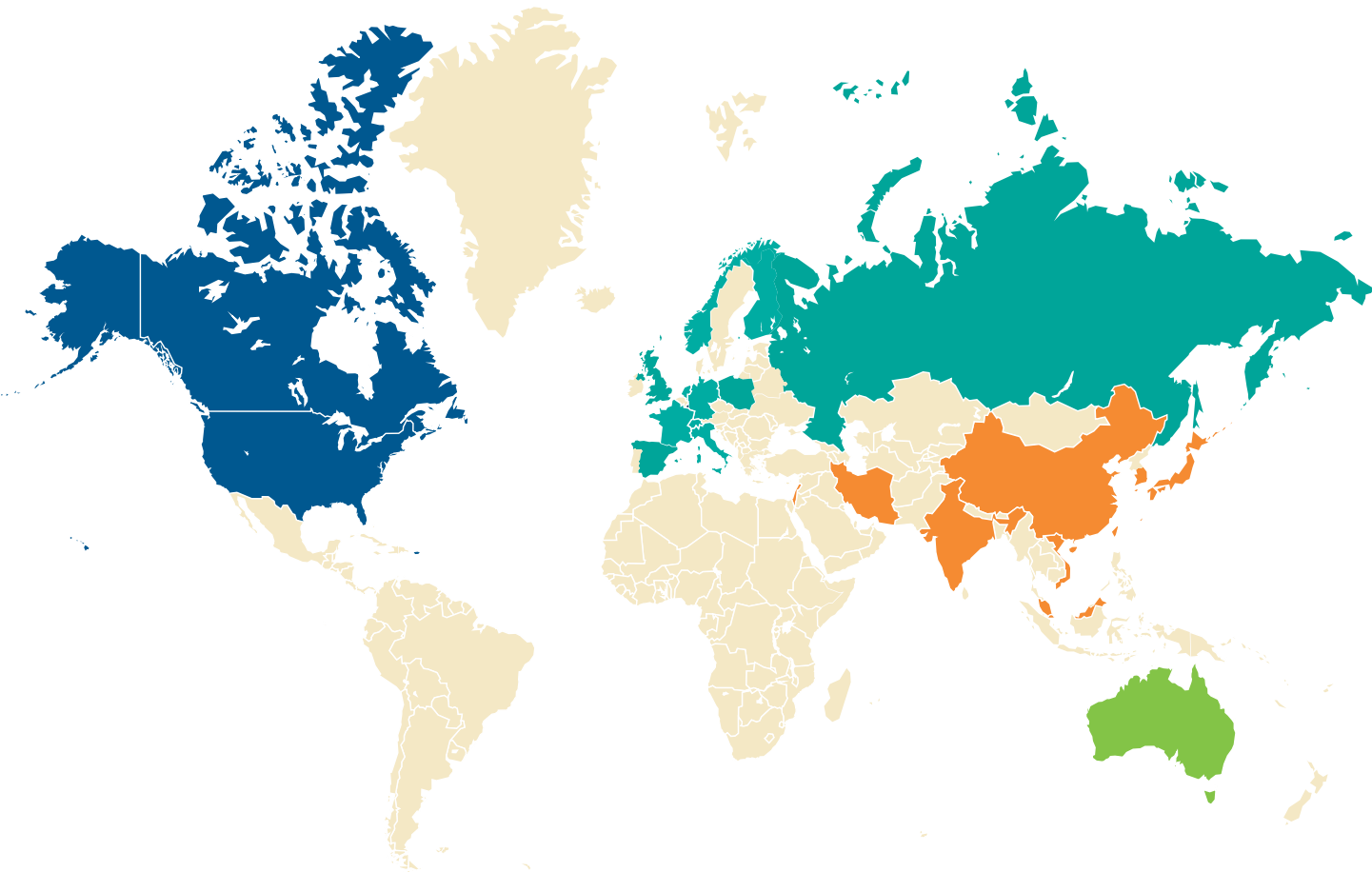
Technical research programs address high-priority scientific and engineering problems that can stand in the way of the adoption of focused ultrasound as a mainstream standard of care. Solutions developed by technical sites help make clinical treatments safer, faster, less expensive, and available to a wider patient population.

¹ Three way tie: France, Germany, and South Korea

RESEARCH SITES



Technical Research Sites by Country



North America

- 6 Canada
- 55 United States

Europe

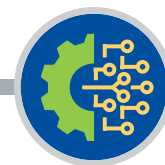
- 1 Cyprus
- 2 Finland
- 8 France
- 8 Germany
- 7 Italy
- 3 The Netherlands
- 1 Norway
- 2 Poland
- 1 Russian Federation
- 2 Spain
- 5 Switzerland
- 9 United Kingdom

Asia

- 12 China
- 1 India
- 1 Iran
- 1 Israel
- 10 Japan
- 1 Singapore
- 8 South Korea
- 4 Taiwan
- 1 Vietnam

Oceania

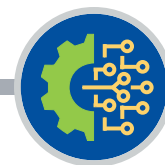
- 2 Australia



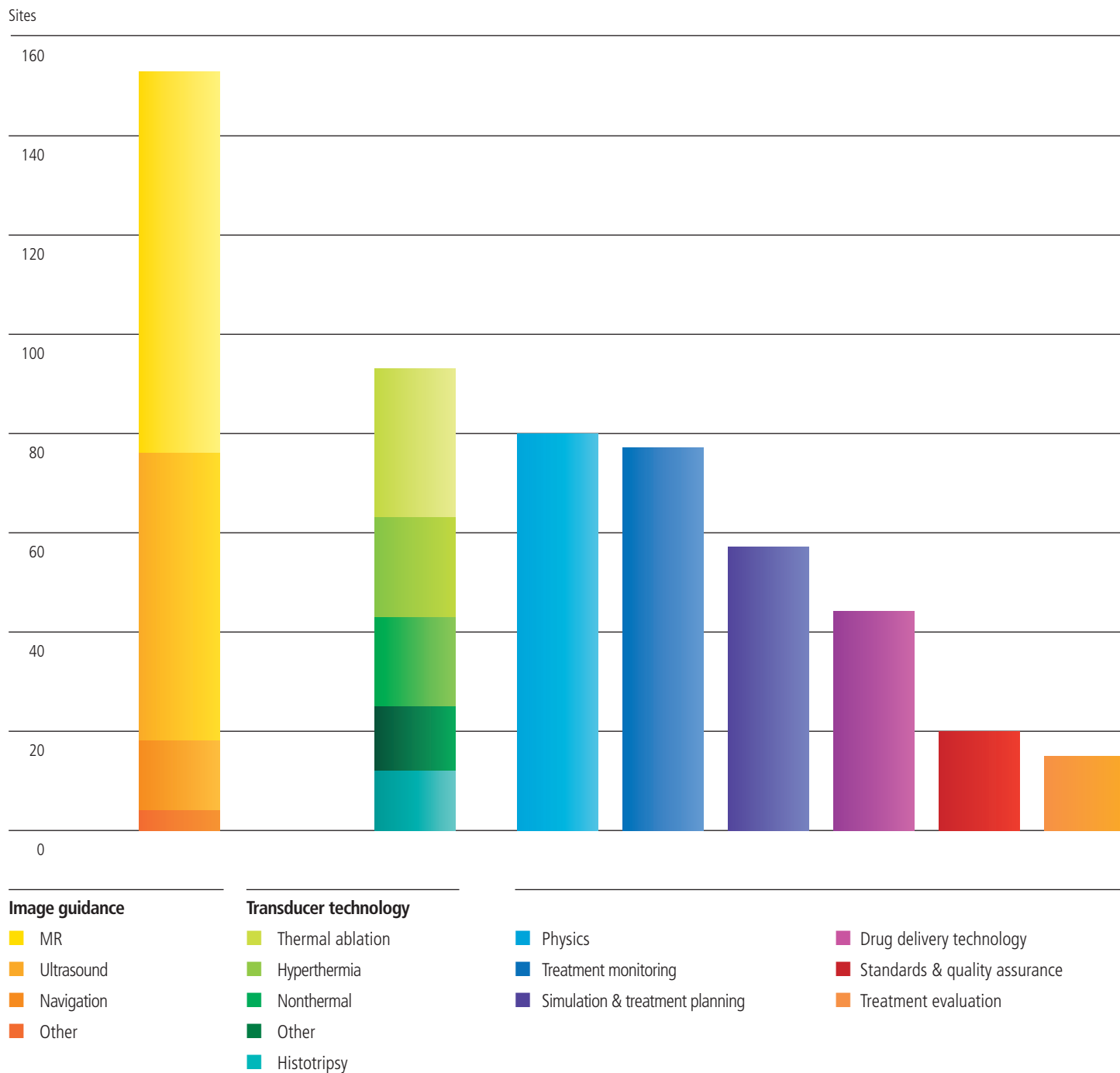
Technical Research Sites*

	Sites				Totals
	North America	Europe	Asia	Oceania	
Image guidance					153
MR	29	29	19	–	
Ultrasound	31	18	9	–	
Navigation	4	8	2	–	
Other	1	1	2	–	
Transducer technology					93
Thermal ablation	11	12	7	–	
Hyperthermia	7	10	3	–	
Nonthermal	11	3	4	–	
Other	8	4	–	1	
Histotripsy	7	3	2	–	
Physics	40	25	15	–	80
Treatment monitoring	32	29	15	1	77
Simulation & treatment planning	27	22	8	–	57
Drug delivery technology	25	13	4	2	44
Standards & quality assurance	9	8	3	–	20
Treatment evaluation	7	7	1	–	15

* Technical research sites may be working in more than one technical research area.



Technical Research Types*



*Technical research sites may be working in more than one technical research area.