



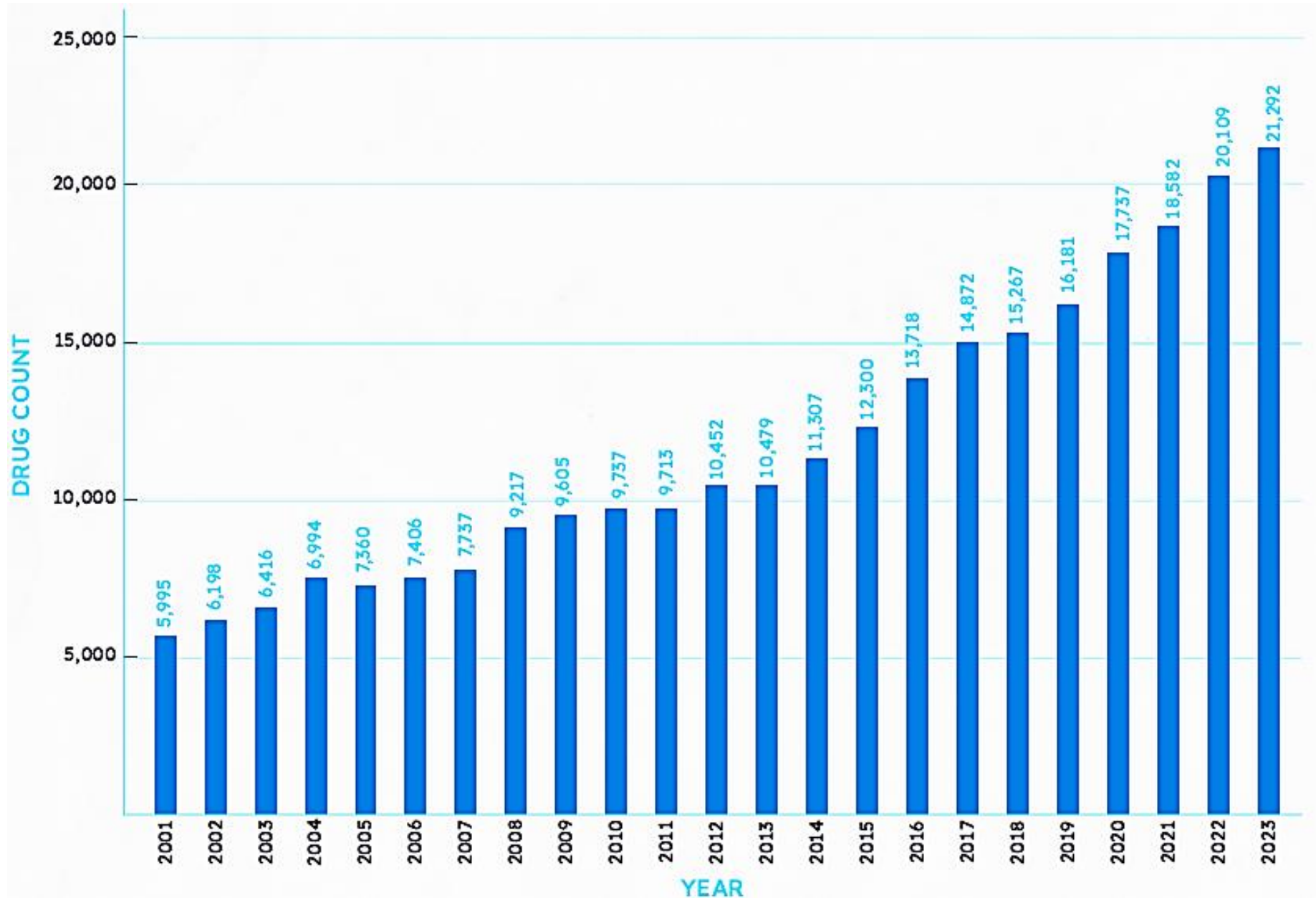
سرمایه‌گذاری در مسیر توسعه؛ فرصت‌ها، چالش‌ها و عدم توفیق‌ها

## Pharma R&D Review

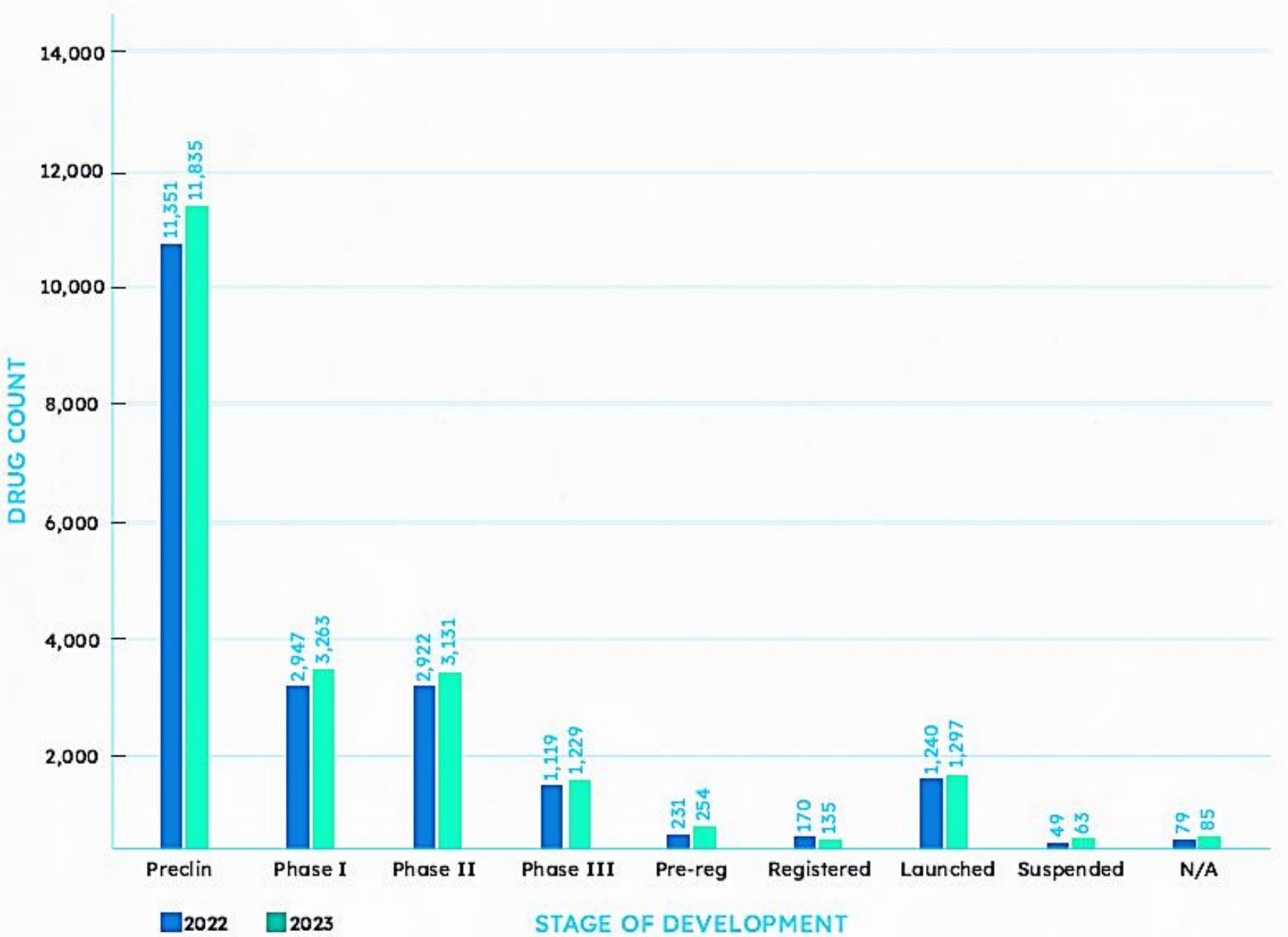
Dr. Fereidoun Mahboudi

Sep 2023

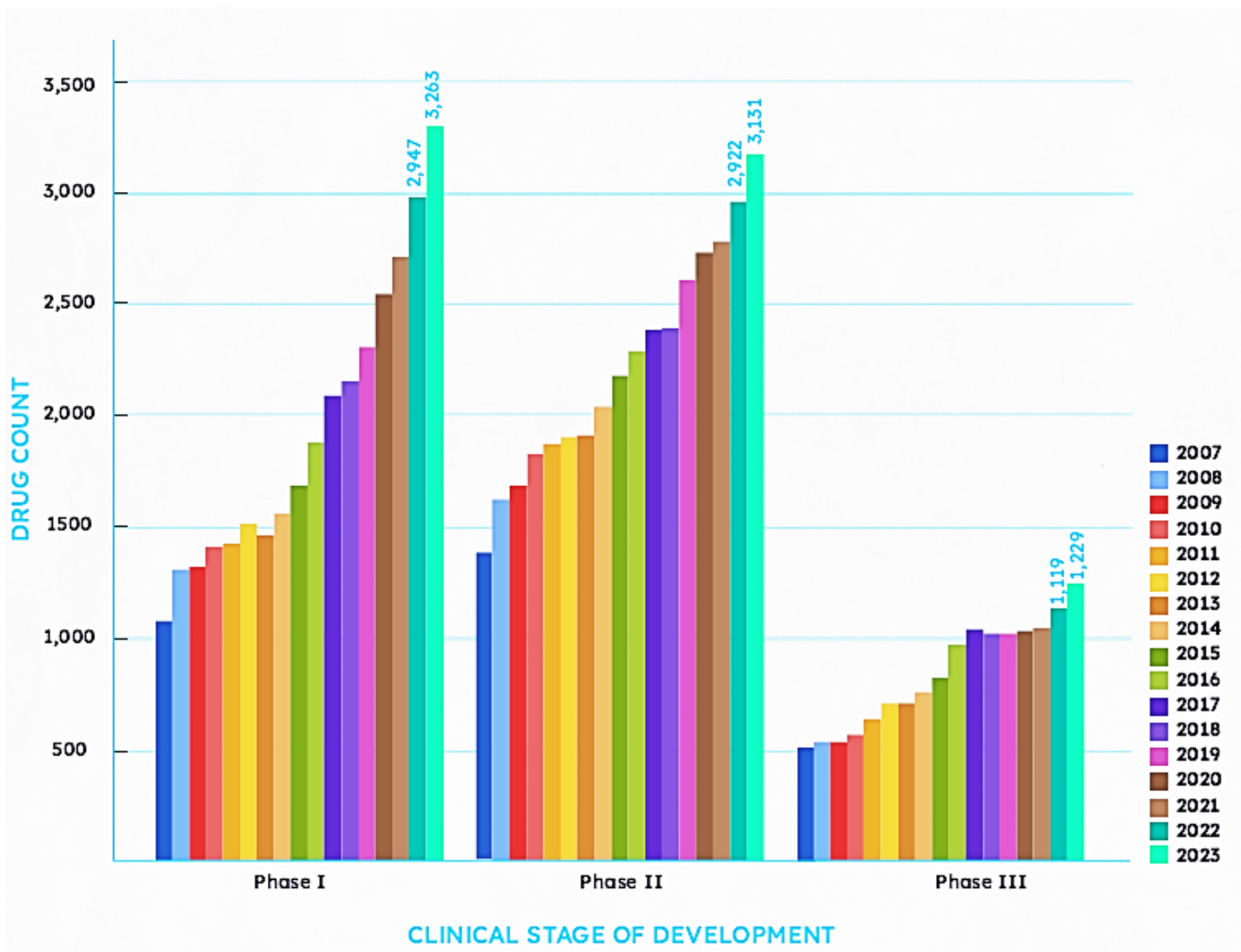
# Total R&D pipeline size, by year, 2001-23



# Pipeline by development phase, 2023 vs. 2022



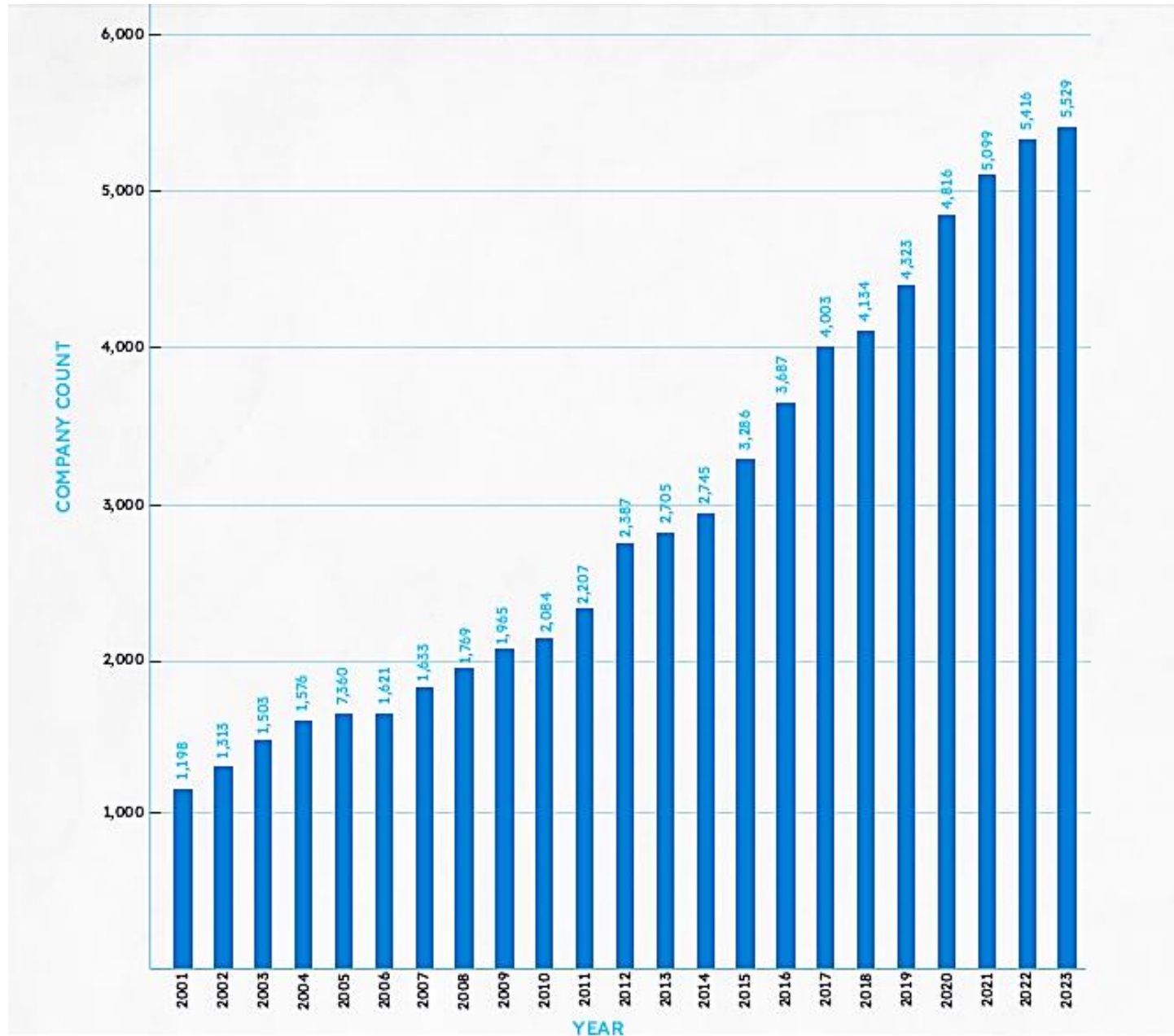
# Clinical phase trends, 2007-23



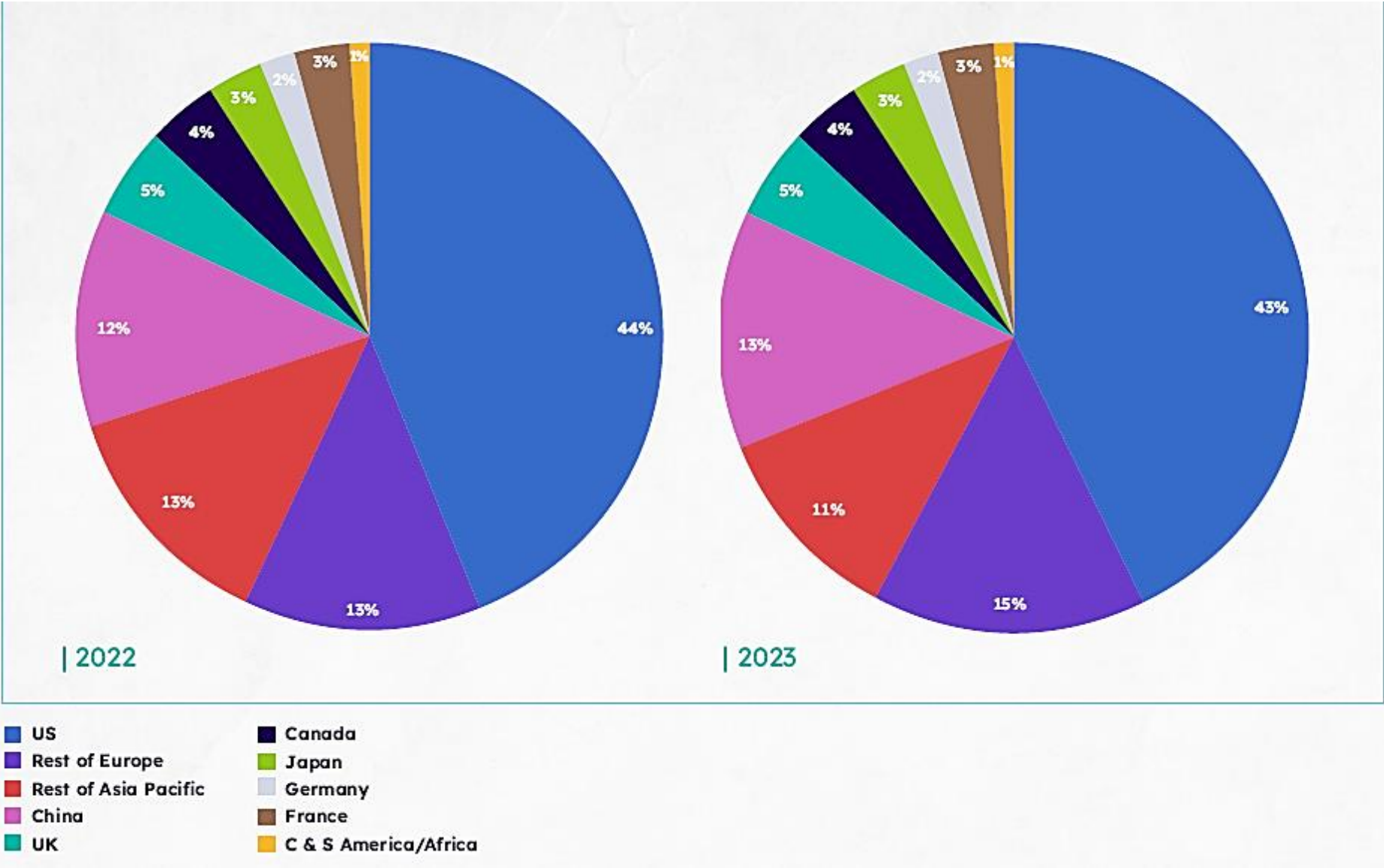
## Top 25 pharma companies by size of pipeline

POSITION 2023 (2022)	COMPANY	NO. OF DRUGS IN PIPELINE 2023 (2022)	NO. OF ORIGINATED DRUGS 2022	TREND
1 (2)	Roche	194 (200)	110	↔
2 (1)	Novartis	191 (213)	112	↓
3 (3)	Takeda	178 (184)	61	↔
4 (4)	Bristol Myers Squibb	175 (168)	96	↔
5 (5)	Pfizer	171 (168)	105	↔
6 (8)	Johnson & Johnson	156 (157)	84	↔
7 (6)	AstraZeneca	155 (161)	85	↔
8 (7)	Merck & Co	151 (158)	72	↔
9 (9)	Sanofi	145 (151)	82	↔
10 (10)	Eli Lilly	135 (142)	64	↔
11 (11)	GSK	123 (131)	60	↔
12 (12)	AbbVie	122 (121)	45	↔
13 (16)	Jiangsu Hengrui Pharmaceuticals	106 (89)	96	↑
14 (13)	Boehringer Ingelheim	99 (108)	75	↔
15 (14)	Bayer	93 (105)	63	↓
16 (21)	Gilead Sciences	86 (72)	59	↑
17 (15)	Otsuka Holdings	85 (93)	42	↔
18 (17)	Amgen	79 (83)	58	↔
19 (36)	Novo Nordisk	77 (51)	52	↑↑
20 (18)	Eisai	74 (80)	39	↔
21 (22)	Regeneron	73 (68)	41	↔
22 (20)	Daiichi Sankyo	70 (75)	37	↔
23 (27)	CSPC Pharmaceutical	68 (62)	53	↔
24 (23)	Shanghai Fosun Pharmaceutical	64 (68)	43	↔
25 (24)	Biogen	63 (66)	18	↔



























# Total number of companies with active pipeline, 2001-23



# Distribution of R&D companies by HQ country/region, 2022 and 2023



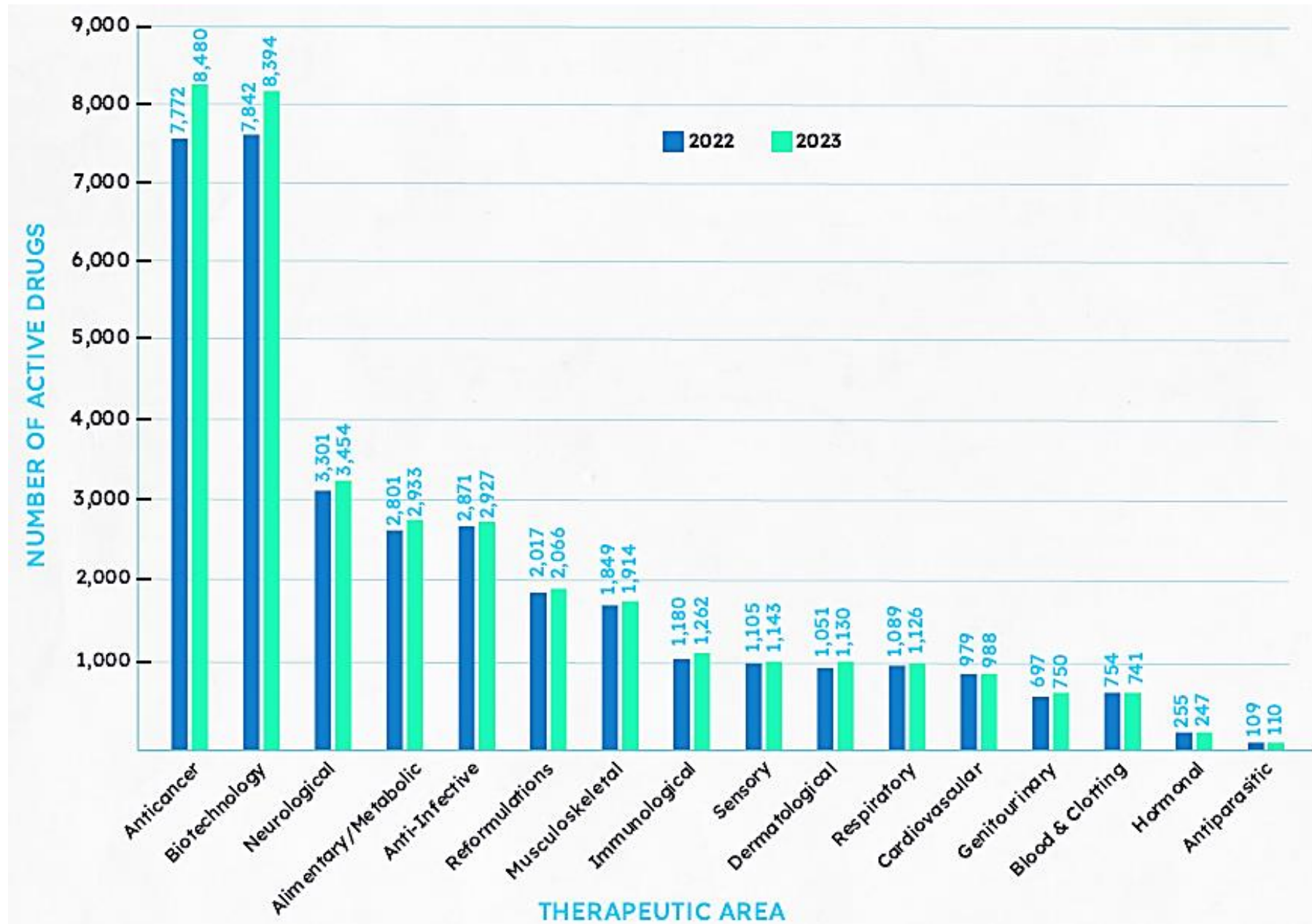
## Where is R&D actually occurring?

COUNTRY	NO. OF DRUGS	% OF PIPELINE
 US	10,876	51.1
 China	5,033	23.6
 UK	3,048	14.3
 South Korea	2,917	13.7
 Germany	2,349	11.0
 Canada	2,231	10.5
 Australia	2,172	10.2
 France	2,161	10.1
 Spain	2,033	9.5
 Japan	1,964	9.2
 Netherlands	1,704	8.0
 Italy	1,670	7.8
 Belgium	1,651	7.8
 Poland	1,575	7.4
 Sweden	1,437	6.7
 Denmark	1,415	6.6
 Switzerland	1,403	6.6
 Hungary	1,298	6.1
 Czech Republic	1,283	6.0
 Austria	1,258	5.9
 Taiwan, China	1,240	5.8
 Bulgaria	1,150	5.4
 Finland	1,105	5.2
 Ireland	1,085	5.1
 Israel	1,062	5.0
 Greece	1,055	5.0

 North America  
 Asia  
 Europe  
 Oceania



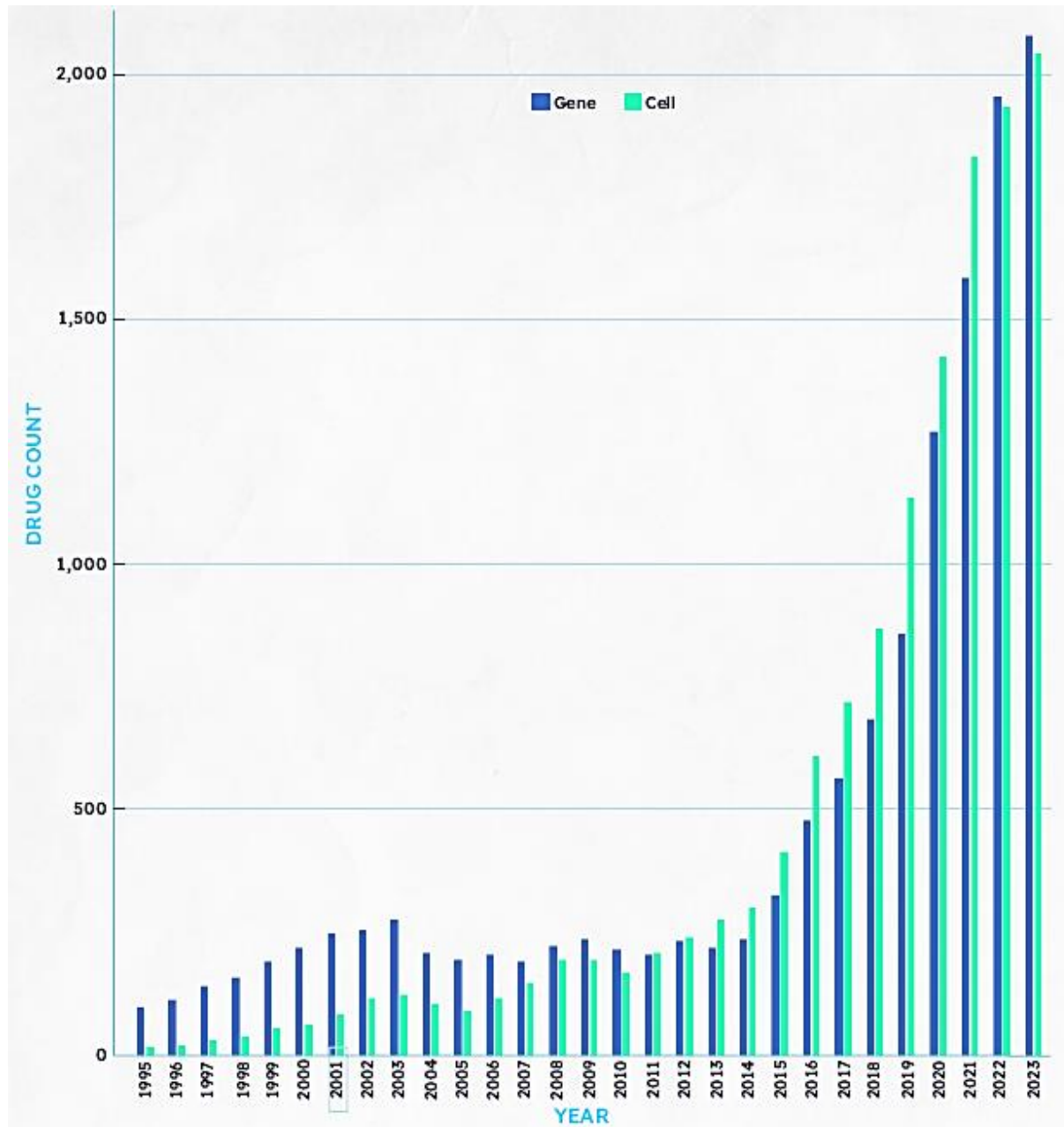
## The R&D pipeline by therapeutic area, 2022 and 2023



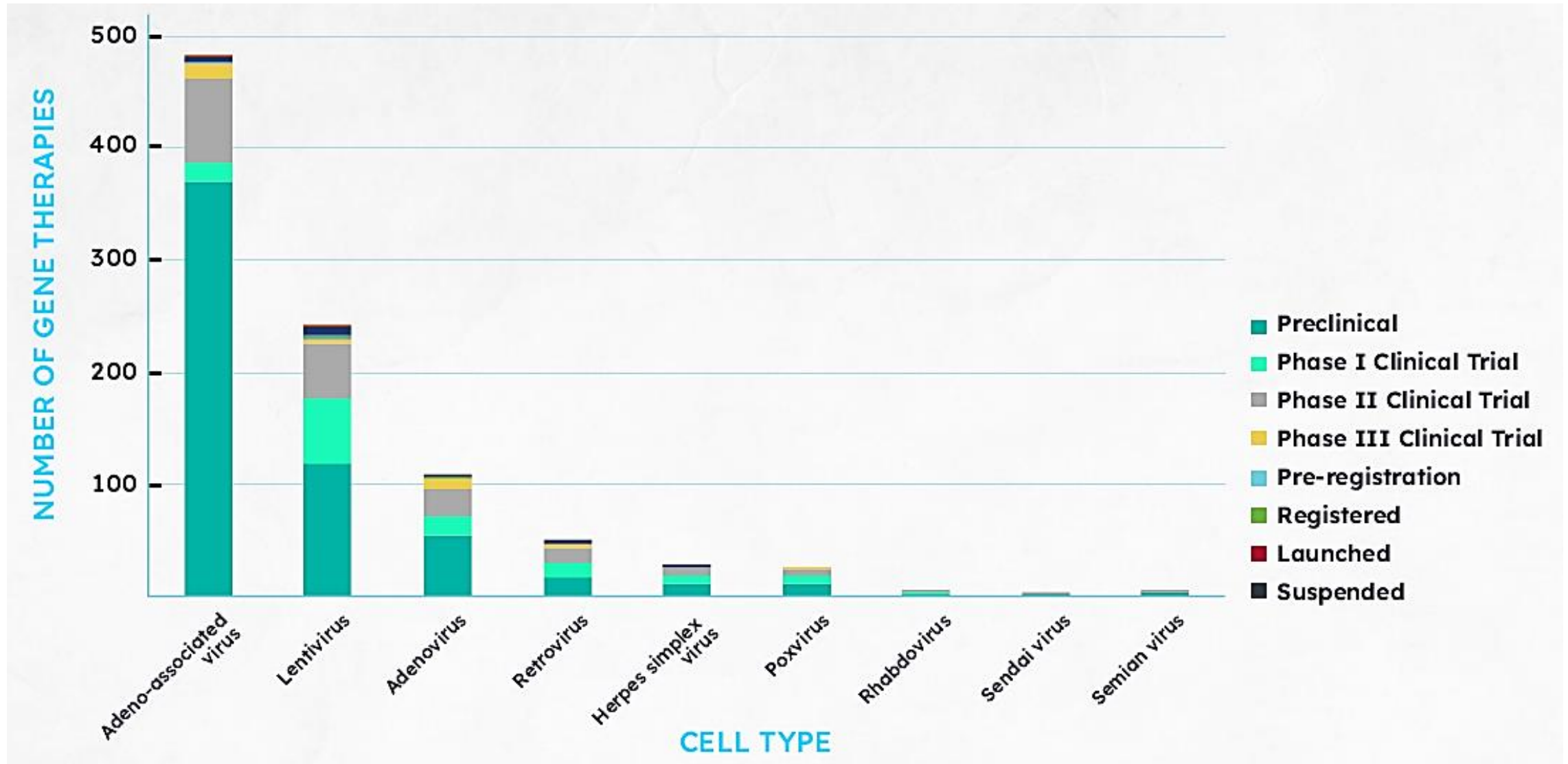
## Top 25 therapeutic categories

POSITION 2023 (2022)	THERAPY	NO. OF ACTIVE COMPOUNDS 2023 (2022)	TREND
1 (1)	Anticancer, immunological	4,492 (4,275)	↑
2 (2)	Anticancer, other	3,622 (3,154)	↑↑
3 (3)	Gene therapy	2,083 (1,960)	↔
4 (4)	Monoclonal antibody, other	1,395 (1,277)	↔
5 (7)	Prophylactic vaccine, anti-infective	1,064 (983)	↔
6 (6)	Neurological	1,045 (993)	↔
7 (8)	Ophthalmological, other	984 (953)	↔
8 (5)	Antiviral, other	983 (998)	↔
9 (12)	Immunosuppressant	797 (713)	↑
10 (10)	Cellular therapy, chimaeric antigen receptor	792 (720)	↑
11 (11)	Antidiabetic	747 (717)	↔
12 (9)	Anti-inflammatory	722 (726)	↔
13 (14)	GI inflammatory/bowel disorders	705 (645)	↔
14 (13)	Musculoskeletal	677 (656)	↔
15 (16)	Cognition enhancer	641 (600)	↔
16 (17)	Respiratory	632 (596)	↔
17 (15)	Monoclonal antibody, humanized	624 (602)	↔
18 (18)	Cardiovascular	599 (595)	↔
19 (20)	Neuroprotective	595 (569)	↔
20 (19)	Hepatoprotective	594 (573)	↔
21 (21)	Dermatological	559 (504)	↑
22 (24)	Urological	519 (485)	↔
23 (25)	Analgesic, other	517 (484)	↔
24 (22)	Antiparkinsonian	516 (489)	↔
25 (23)	Monoclonal antibody, human	498 (488)	↔

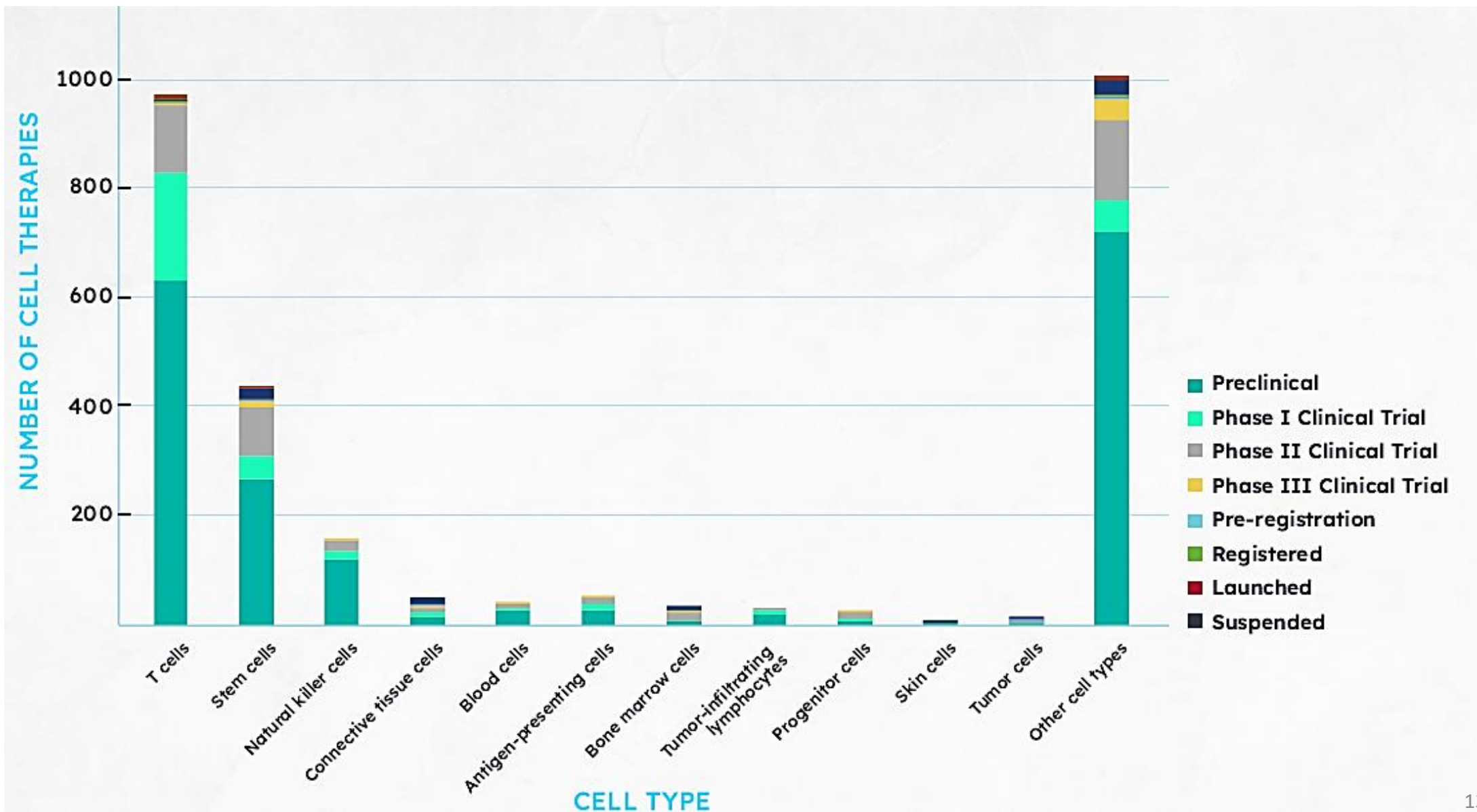
# The ongoing rise of gene and cell therapy, 1995-2023



# Viral vectors used in gene therapy



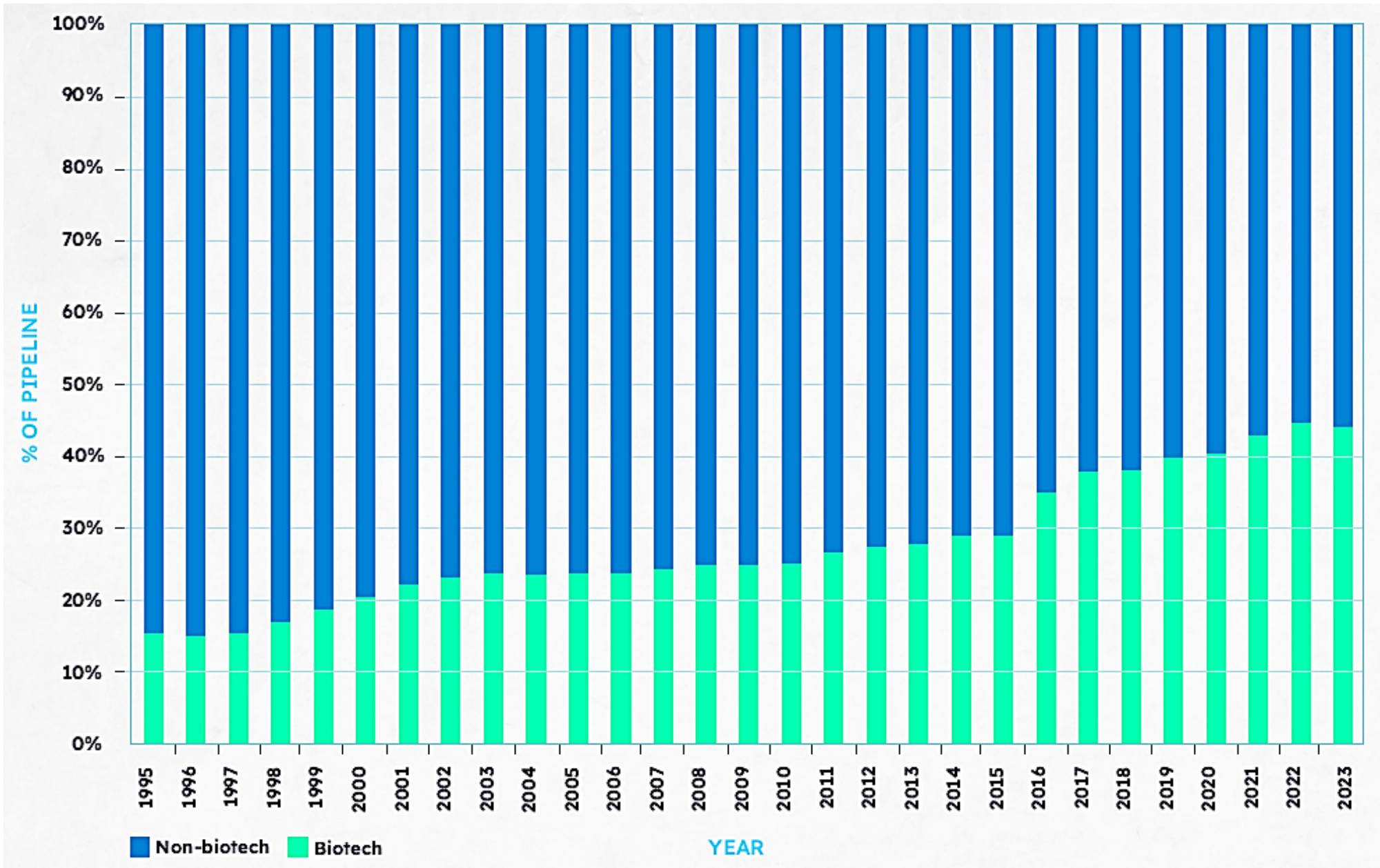
# Cell types used in cell therapies



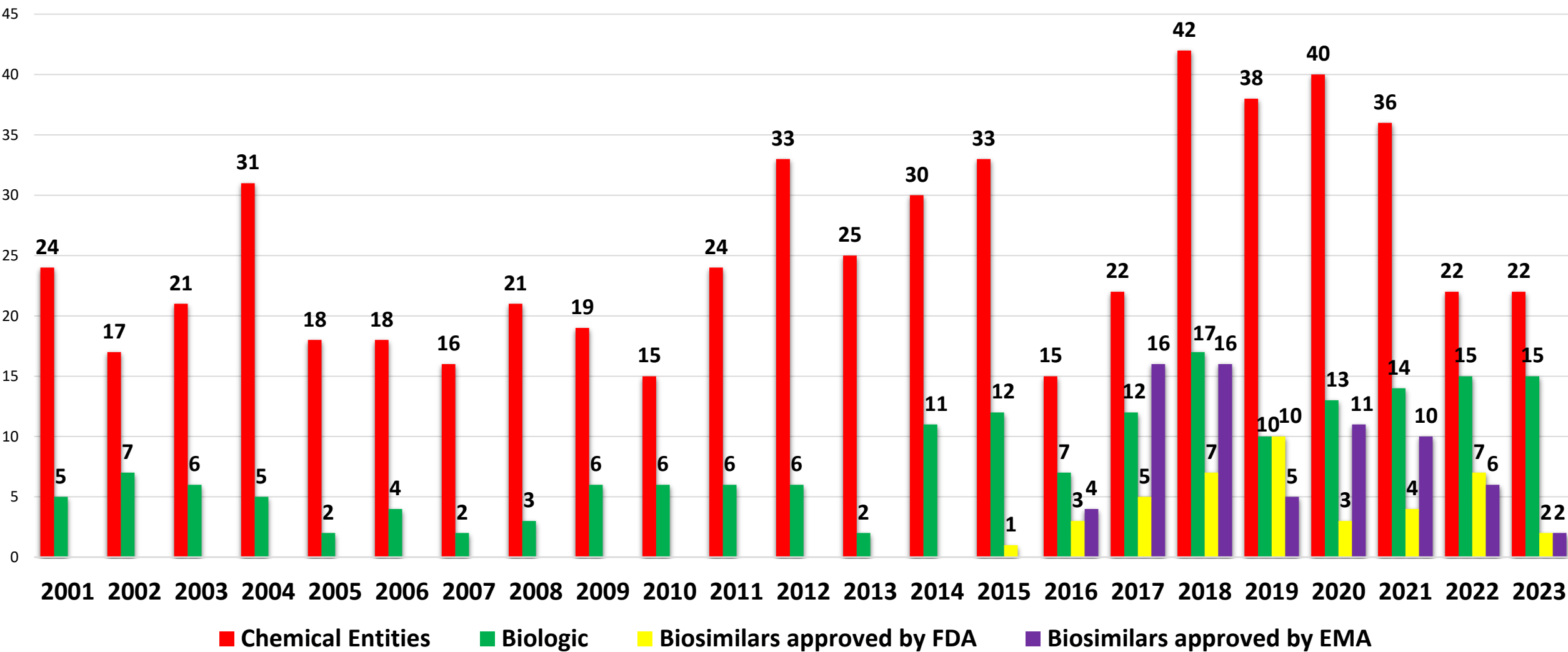
## Top 25 disease/indications

POSITION 2023 (2022)	Drug disease	Number of drugs 2023 (2022)	TREND
1 (1)	Cancer, breast	965 (888)	↑
2 (2)	Cancer, lung, non-small cell	925 (832)	↑↑
3 (4)	Cancer, colorectal	741 (663)	↑
4 (5)	Cancer, pancreatic	675 (591)	↑↑
5 (3)	Infection, coronavirus, novel coronavirus	653 (677)	↔
6 (6)	Cancer, ovarian	587 (530)	↑
7 (9)	Cancer, brain	539 (485)	↑
8 (8)	Alzheimer's disease	529 (496)	↔
9 (7)	Cancer, prostate	523 (509)	↔
10 (10)	Cancer, leukemia, acute myelogenous	484 (462)	↔
11 (12)	Cancer, melanoma	476 (437)	↑
12 (11)	Diabetes, Type 2	475 (445)	↔
13 (19)	Cancer, gastrointestinal, stomach	449 (373)	↑↑
14 (14)	Cancer, myeloma	445 (431)	↔
15 (16)	Cancer, liver	444 (407)	↔
16 (13)	Infection, coronavirus, novel coronavirus prophylaxis	444 (436)	↔
17 (15)	Arthritis, rheumatoid	431 (427)	↔
18 (17)	Cancer, head and neck	408 (377)	↑
19 (18)	Parkinson's disease	407 (377)	↑
20 (20)	Cancer, lymphoma, non-Hodgkin's	399 (373)	↔
21 (21)	Non-alcoholic steatohepatitis	369 (360)	↔
22 (23)	Psoriasis	337 (328)	↔
23 (22)	COVID-19 complications	322 (332)	↔
24 (24)	Cancer, renal	281 (254)	↑
25 (25)	Asthma	258 (252)	↔

# Biological vs. non-biological drugs as a percentage of the pipeline, 1995-2023

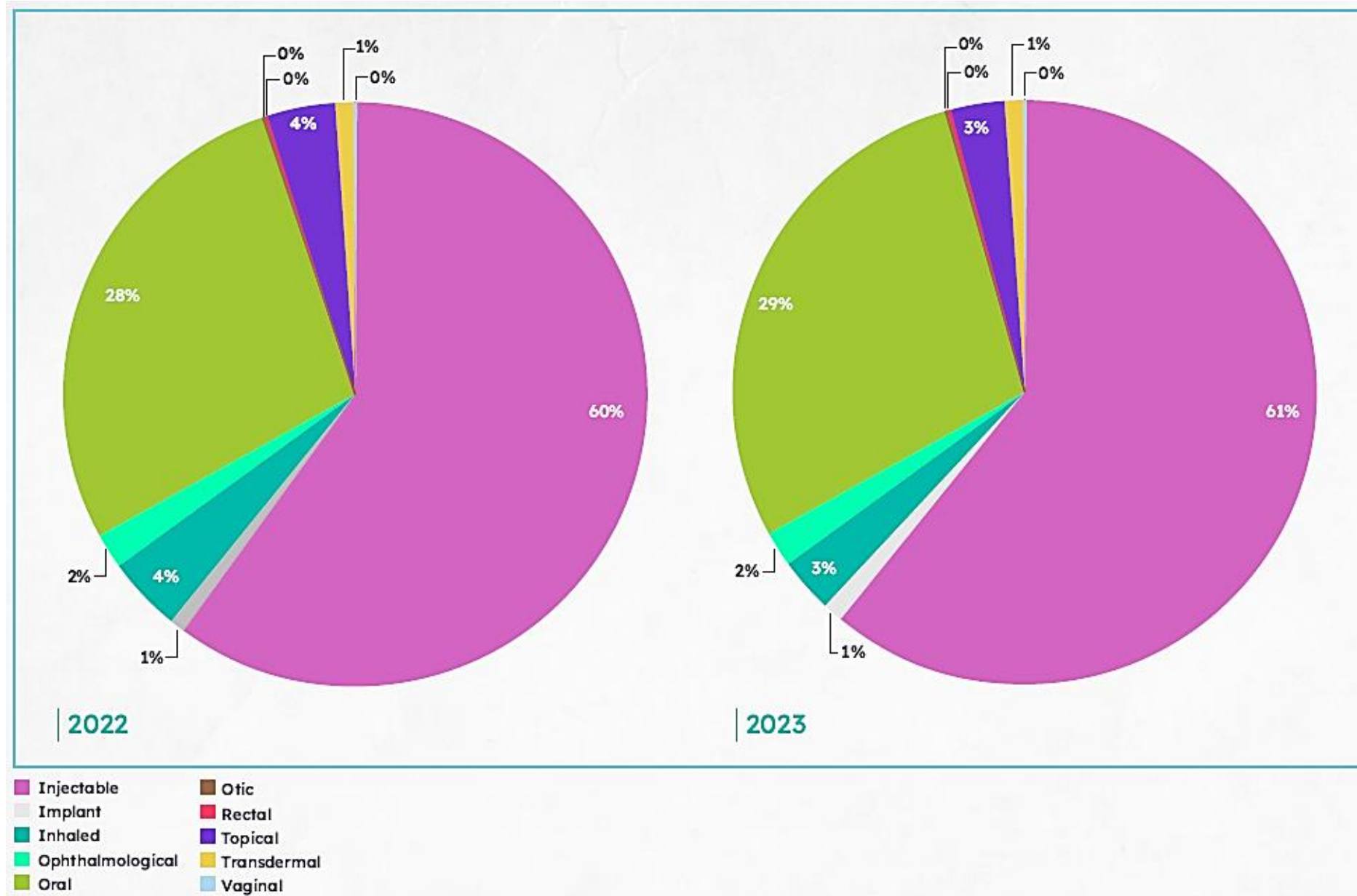


# Approval trends of Biologics & Biosimilars (2001-2022)





## Pipeline by delivery route, 2022 and 2023



# Merging And Acquisition (M&A) By Big Pharma



## Top 5 M&A deals by value in the pharmaceutical industry since 2022

Target	Acquirer	Deal value	Date announced	Main therapeutic area
Seagen	Pfizer	\$43000m	Mar, 2023	Antibody-drug conjugate technology
Horizon Therapeutics	Amgen	\$28300m	Dec, 2022	Enzyme And Monoclonal Antibodies
Biohaven Pharmaceutical Holding	Pfizer	\$12210m	May, 2022	Calcitonin gene-related peptide
Prometheus Biosciences	Merck	\$10800m	Apr, 2023	Immunology R&D
Oak Street Health	CVS Health	\$10600m	Feb, 2023	Antibody-drug conjugate drugs

# Thank You

