BofA SECURITIES

US Biopharmaceuticals

SMid Biotech 4Q23 Updates Week 2

Price Objective Change

Thoughts on 4Q23 SMid updates

We are adjusting our models for SMid biotechs following 4Q earnings across our coverage. Notably, we highlight changes to Sana (SANA) below, where we reiterate our Buy rating and raise our PO to $14 from $10. Separately, we've raised our PO on 89Bio (ETNB) to $30 from $25 and Neumora (NMRA) to $24 from $20, and lowered our PO on CVAC to $3 from $6.40. Our ratings remain the same, though we detail estimate changes on p. 2-3.

SANA: Maintain Buy, PO to $14 (from $10)

SANA shares have been robust (YTD: +132%; +2% NBI) since revealing promising preclinical data from the company's UP421 islet program for treating type 1 diabetes (T1D). Given the preclinical proof-of-concept, we think investors are growing more confident in the broader potential of the company's platform technology, propelled by increasing interest in developing cell therapies for autoimmune disorders. In conjunction with the data, Sana raised >$189M in gross proceeds, nearly doubling their cash balance and extending cash runway through 2025, which partially de-risks continued pipeline development. Furthermore, we expect 2024 to be a pivotal year for the company with multiple initial clinical proof-of-concept readouts across heme/onc, autoimmune, and T1D after clearing regulatory applications to initiate clinical trials. Taken together, we are raising the probability of success to 15% (from 12%) across the platform. We maintain Buy on SANA, and are raising our PO to $14 (from $10; +$1/sh for T1D and +$2/sh for heme/onc and the rest in cash on base year 2025 valuation).

Benefit of pipeline re-prioritization evident in 4Q results

Recently, along with reporting 4Q results, Sana highlighted the reduction in cash burn to <$200M following pipeline re-prioritization that included a 29% reduction in headcount and decreased expenses related to the development of assets utilizing the fusogen platform (SG299). Indeed, we think the company's pivot to focusing on the hypoimmune platform has been strategic and has afforded Sana greater financial flexibility to meet its goal of treating 40-60 patients in 2024 across four clinical trials, including updates from the SC291 (heme/onc, autoimmune), SC262 (heme/onc), and UP421 (T1D) programs. That said, we acknowledge SANA shares have been pressured since the 4Q press release last week, which we'd attribute to more muted initial UP421 data expectations (focused on safety and feasibility) in humans.

Expectations for first-in-human (FIH) UP421 data

Sana has stated that the goal for the investigator-sponsored clinical trial of UP421 is to "understand islet cell survival and immune evasion without immunosuppression in patients with autoimmunity." We'd note that while transplant tolerance studies using non-human primate models have translated successfully in humans, there are still limitations (see our note on the preclinical non-human primate data published in *Nature Cell*). Furthermore, manufacturing stable islet cells for commercial clinical development is complex and yet to be proven. That said, the potential for curing T1D through engraftment with modified hypoimmune islets is promising and FIH data, while not intended to demonstrate efficacy, would be a major de-risking step.

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Exhibit 1: BofA PO changes
Find changes to our PO below

Ticker	New PO	Old PO
ETNB	$30	$25
CVAC	$3	$6.40
NMRA	$24	$20
SANA	$14	$10

Source: BofA Global Research

BofA GLOBAL RESEARCH

See abbreviations beginning page 3.

89Bio (ETNB): Maintain Buy, PO to $30 (from $25)

89Bio had a busy 4Q centered around 1) favorable phase 2b results for pegozafermin at 48-weeks in metabolic dysfunction-associated steatohepatitis (MASH) (see our thoughts on the ENLIVEN results here) and 2) alignment with FDA + EMA on pivotal trial design for pegozafermin in MASH and MASH cirrhosis. The latter is of particular importance, in our view, as there are still no approved therapeutics for MASH or MASH cirrhosis, though we do think it's quite likely that Madrigal's resmetirom receives approval imminently (PDUFA March 14th). Looking more broadly at the MASH space, we received phase 2 results for Lilly's tirzepatide (see our thoughts on the SYNERGY-NASH results here) which highlighted impressive MASH resolution (61% placebo adjusted at 52 weeks) and a clinically meaningful decrease in fibrosis by at least one stage with no worsening of MASH on liver histology (we expect full results at EASL, June 5-8th), underscoring investors' concerns on the impact of GLP-1's on the space. That said, based on our KOL discussions, we'd say 89Bio's pegozafermin and Akero's efruxifermin (EFX) FGF21 mechanism of action (MoA) is differentiated versus GLP-1's and could be broadly utilized in F3/F4 patients. Indeed, 89Bio reiterated its plan to initiate pivotal trials, ENLIGHTEN-Fibrosis (F2-F3 MASH patients), and ENLIGHTEN-Cirrhosis (F4 cirrhotic patients), in 1Q and 2Q, respectively, which should support regulatory submissions. Moreover, following the positive phase 2b results for EFX this past week, our confidence is bolstered in the FGF21 MoA, so we've increased our forecasts for pegozafermin in MASH + MASH cirrhosis. This, together with 89Bio's follow-on offering, elevate our PO to $30 (from $25). Maintain Buy.

Neumora (NMRA): Maintain Buy, PO to $24 (from $20)

Neumora had a quiet 4Q as expected given the company just become a publicly traded company recently (September 2023) and the near-term focus is on competitive readout from J&J's aticaprant in adjunctive major depressive disorder (MDD; VENTURA-1) in mid '24 and Neumora's own navacaprant first phase 3 MDD readout in 2H24 (KOSTAL-1). That said, we're encouraged by the announcement that the FDA does not see a need for Neumora to conduct further studies to assess physical dependence with navacaprant, a typical concern for a drug that targets the opioid pathway. Beyond MDD, the company plans to initiate a phase 2 trial in bipolar depression in 1H24. Other key assets are also progressing as planned, including NMRA-266, which we expect to see phase 1 single ascending dose/ multiple ascending healthy volunteer data in mid-24 and initiation of phase 1b study in schizophrenia in 2H24, with data anticipated in 2025, as well as NMRA-511, which is expected to launch phase 1b study in Alzheimer's disease agitation in 1H24, with data anticipated in 2025. Of note, AbbVie/ Cerevel's emraclidine, which shares the same mechanism as NMRA-266, is expected to have pivotal data in 2H24 and could be a value inflection driver for NMRA-511. Overall, 2024 is a catalyst rich year for Neumora with multiple value inflection points starting mid-year. Thus, we maintain a Buy rating and raise PO to $24 (from $20) by raising our peak sales estimates to $3.3B (vs. $3.0B prior) given our increasing confidence on navacaprant as a differentiated drug.

CureVac (CVAC): Maintain Underperform, PO to $3 (from $6.40)

Commercial and development risks remain

CureVac is facing declining interest in its COVID-19 and flu vaccines and major challenges in cancer vaccine development. Further, CureVac had a setback late last year related to its '122 patent (guanine-cytosine enrichment) claim against BioNTech (covered by Tazeen Ahmad), which diminished the outlook of a potential payout from a portion of COVID revenue generated by Pfizer/BioNtech. While CureVac has made some progress with the current generation of vaccines, we remain skeptical about the commercial opportunity since competitors (Pfizer/ Moderna) are well-established and it's unclear how CureVac's technology/ platform differs. To that end, we believe more work and validation are needed to drive value inflection. Thus, we lower our PO to $3 (from $6.4) as we now expect the launch of influenza and cancer vaccines to be delayed to 2027/28, respectively. We maintain our Underperform rating.

Fundamental outlooks is far from clear

Given the early stage of CureVac's clinical pipeline, we continue to take a cautious stance. The company has initiated a phase 2 vaccine studies for COVID-19 and influenza (data expected later this year) and is in discussions with regulators on phase 3. That said, given the lack of appetite from the public and investors on COVID vaccination and mRNA technology, we suspect the sentiment on CureVac is unlikely to change in the near-term. Importantly, Pfizer/Moderna are ahead in development for these indications and well-entrenched in the market. Turning to oncology, while we expect phase 1 glioblastoma cancer vaccine data in 2H24, it's unlikely the company will move ahead with this program. Instead, it will focus on second generation cancer vaccines via Frame Cancer's antigen discovery platform, which is still in pre-clinical stage. As such, the outlook for CureVac is muddy and it's not clear when that will change.

Patent litigation provides optionality

Despite early patent litigation setback vs. BioNTech last year on '122 patent, CureVac still has several other patents in litigation, which we expect to have updates later this year. While expectations are low, we note that even a small fraction of the monetary award based on existing >$90B COVID sales would still be substantial for the company.

Commercial launch not until 2027+

Given the uncertainty of influenza and cancer vaccine development, we have pushed back our model assumption for commercial launch by a year and adjusted expense assumptions accordingly. Importantly, given that the company's cash runway is only until mid-2025, we suspect CureVac swill need to raise capital later this year.

Exhibit 2: BofA EPS Estimate Changes
We summarize our updated EPS numbers with this report

Company	Ticker	Rating	Updated earnings		Previous earnings		Changes to our model
			2024e	2025e	2024e	2025e	
89Bio	ETNB	Buy	-$2.80	-$3.40	-3.30	-3.50	Updated OpEx to reflect pivotal trial initiations + increased share count given follow on offering
CureVac	CVAC	Underperform	-$0.67	-$0.61	-0.36	-0.36	Updated revenue and OpEx forecast
Neumora	NMRA	Buy	-$1.41	-1.42	-1.13	-1.08	Updated revenue and OpEx forecast
SANA	SANA	Buy	-$1.00	-$1.00	-$1.01	-$1.02	Updated OpEx forecasts

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 3: Stocks mentioned
Prices and ratings for stocks mentioned in this report

BofA Ticker	Bloomberg ticker	Company name	Price	Rating
ETNB	ETNB US	89Bio Inc	US$ 13.11	C-1-9
CVAC	CVAC US	CureVac N.V.	US$ 3.48	C-3-9
NMRA	NMRA US	Neumora Therapeutics	US$ 19.42	C-1-9
SANA	SANA US	Sana Biotechnology	US $9.56	C-1-9

Source: BofA Global Research

BofA GLOBAL RESEARCH

Abbreviations:

FDA: Food and Drug Administration

T1D: Type 1 Diabetes

IND: Investigational New Drug

FIH: First in human

HIP: hypoimmune

EMA: European Medicines Agency

PDUFA: Prescription Drug User Fee Act

EASL: European Association for the Study of the Liver

GLP-1: glucagon like peptide 1

KOL: key opinion leader

FGF21: Fibroblast growth factor 21

F2-F4: fibrotic stage

Investment Rationale

89bio, Inc
We rate ETNB shares with a Buy rating. Its target indications (MASH and SHTG) have high unmet need given current available treatments are not effective. Lead asset pegozafermin is a FGF21 analog that can potentially show differentiated clinical profile compared to other mechanisms (FXR, THR-beta, FGF19). We look for additional color to validate its dosing superiority and efficacy.

Price objective basis & risk

89bio, Inc (ETNB)
Our $30 PO is based on a probability-adjusted NPV, including a $12/share for pegozafermin in MASH, a $11/share for pegozafermin in MASH cirrhosis and $0/share for pegozafermin in SHTG. The remaining value in our PO comes from cash. We use a 14% WACC in MASH and SHTG and and terminal growth of -40% (we project revenues out through 2035), in-line with other biotech companies of similar size and stage of clinical development.

Upside risks to our price objective are 1) additional positive clinical results in MASH showing potential dosing superiority, 2) positive clinical data in SHTG showing differentiation against standard of care, and 3) higher than expected prevalence/diagnosis rate in MASH/SHTG leading to high market penetration.

Downside risks are 1) failure of pivotal studies in MASH/ MASH cirrhosis, 2) subpar efficacy/lack of dosing advantage of pegozafermin in MASH compared to other FGF21 analogs, 3) low penetration/poor uptake in the MASH/SHTG market for pegozafermin and 4) failure to show clinical benefits in SHTG in the pivotal trial.

CureVac (CVAC)
Our $3/ share PO is based on a probability-adjusted net present value (NPV) of CureVac's pipeline, including its oncology program and its other prophylactic vaccines. We apply a 10% weighted-average cost of capital (WACC) and a terminal value of -15% depending on the program (we project revenues out through 2035), in line with other biotech companies of similar size and stage of clinical development. We also include approximately $2/share from CureVac's current cash position.

Upside risks are 1) faster-than-expected clinical development, 2) competitor failures, 3) better than expected clinical data.

Downside risks are 1) clinical risk to early stage programs, 2) regulatory risk from newer mechanisms, 3) competition to key assets.

Neumora Therapeutics (NMRA)
Our 12-month price objective of $24 is based on our NPV analysis on key products, including navacaprant for MDD, bipolar depression, and NMRA-266 for schizophrenia. We assign a valuation of $17/sh to navacaprant in MDD, $2/sh to navacaprant in bipolar depression, and $2/sh to NMRA-266 in schizophrenia, with the remaining $3/sh coming from net cash. We model sales through patent exclusivity with zero terminal value and apply a 14% WACC.

Upside risks to our PO:
1) Positive navacaprant MDD readouts in 2H24/1H25, 2) readthrough from competitor J&J's aticaprant's positive phase 3 adjunctive MDD data in mid-'24, 3) readthrough from competitor Cerevel's emraclidine phase 2 EMPOWER data in 2H24.

Downside risks to our PO:
1) Failure of MDD trial readout, 2) failure of competitors' data in MDD, 3) weak market uptake for Karuna's schizophrenia drug and Axsome's MDD drug could dampen investor enthusiasm for the neuropsychiatric markets.

Sana Biotechnology (SANA)
Our $14 PO is based on a probability-adjusted NPV of Sana's pipeline (15% likelihood of success), including its in vivo and ex vivo platform programs. We apply a 15% WACC and a terminal growth of -30% (we project revenues out through 2035), in-line with other biotech companies of similar size and stage of clinical development. We also include

approximately $2/share from Sana's current cash position.

Downside risks to our PO are: 1) clinical trial failures, 2) better than expected data from competitors, 3) dilution from cash raises.

Analyst Certification

I, Geoff Meacham, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

US - Biopharmaceuticals Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	89bio, Inc	ETNB	ETNB US	Geoff Meacham
	Acumen Pharma	ABOS	ABOS US	Geoff Meacham
	Agios Pharmaceuticals	AGIO	AGIO US	Greg Harrison, CFA
	BioMarin	BMRN	BMRN US	Geoff Meacham
	BioXcel Therapeutics	BTAI	BTAI US	Greg Harrison, CFA
	BridgeBio Pharma	BBIO	BBIO US	Greg Harrison, CFA
	Caribou	CRBU	CRBU US	Geoff Meacham
	CRISPR Therapeutics	CRSP	CRSP US	Geoff Meacham
	Eli Lilly and Company	LLY	LLY US	Geoff Meacham
	Gilead Sciences Inc.	GILD	GILD US	Geoff Meacham
	HUTCHMED	HCM	HCM US	Alec W. Stranahan
	Immatics	IMTX	IMTX US	Alec W. Stranahan
	Insmed Incorporated	INSM	INSM US	Jason Zemansky
	Intellia Therapeutics	NTLA	NTLA US	Greg Harrison, CFA
	Janux Therapeutics	JANX	JANX US	Alec W. Stranahan
	Keros	KROS	KROS US	Greg Harrison, CFA
	Kiniksa Pharmaceuticals, Ltd.	KNSA	KNSA US	Geoff Meacham
	Krystal Biotech	KRYS	KRYS US	Alec W. Stranahan
	Kura Oncology	KURA	KURA US	Jason Zemansky
	Liquidia Corporation	LQDA	LQDA US	Greg Harrison, CFA
	Lyell Immunopharma	LYEL	LYEL US	Geoff Meacham
	MeiraGTx	MGTX	MGTX US	Alec W. Stranahan
	Merck & Co.	MRK	MRK US	Geoff Meacham
	Mineralys Therapeutics	MLYS	MLYS US	Greg Harrison, CFA
	Neumora Therapeutics	NMRA	NMRA US	Geoff Meacham
	Rani Therapeutics	RANI	RANI US	Geoff Meacham
	Regenxbio, Inc.	RGNX	RGNX US	Alec W. Stranahan
	Revolution Medicines	RVMD	RVMD US	Alec W. Stranahan
	Rocket Pharmaceuticals, Inc.	RCKT	RCKT US	Greg Harrison, CFA
	Royalty Pharma	RPRX	RPRX US	Geoff Meacham
	Sana Biotechnology	SANA	SANA US	Geoff Meacham
	SpringWorks	SWTX	SWTX US	Alec W. Stranahan
	Syndax Pharmaceuticals	SNDX	SNDX US	Jason Zemansky
	Travere Therapeutics Inc	TVTX	TVTX US	Greg Harrison, CFA
	Turnstone Biologics	TSBX	TSBX US	Geoff Meacham
	Vertex Pharmaceuticals Inc.	VRTX	VRTX US	Geoff Meacham
	Werewolf Therapeutics	HOWL	HOWL US	Jason Zemansky
	Xencor	XNCR	XNCR US	Alec W. Stranahan
NEUTRAL				
	AbbVie	ABBV	ABBV US	Geoff Meacham
	Alector, Inc	ALEC	ALEC US	Greg Harrison, CFA
	Amgen Inc.	AMGN	AMGN US	Geoff Meacham
	Amylyx Pharmaceuticals	AMLX	AMLX US	Geoff Meacham
	Arcus Biosciences	RCUS	RCUS US	Jason Zemansky
	Beam Therapeutics	BEAM	BEAM US	Greg Harrison, CFA
	Biogen Inc.	BIIB	BIIB US	Geoff Meacham
	Bristol-Myers Squibb	BMY	BMY US	Geoff Meacham
	Cytokinetics, Incorporated	CYTK	CYTK US	Jason Zemansky
	Editas Medicine	EDIT	EDIT US	Greg Harrison, CFA
	Erasca	ERAS	ERAS US	Alec W. Stranahan
	Esperion	ESPR	ESPR US	Jason Zemansky
	Exscientia	EXAI	EXAI US	Alec W. Stranahan
	IGM Biosciences	IGMS	IGMS US	Greg Harrison, CFA
	Johnson & Johnson	JNJ	JNJ US	Geoff Meacham
	Kymera Therapeutics	KYMR	KYMR US	Geoff Meacham
	Moderna	MRNA	MRNA US	Geoff Meacham
	Pfizer	PFE	PFE US	Geoff Meacham
	Recursion Pharmaceuticals, Inc.	RXRX	RXRX US	Alec W. Stranahan
	Tyra Biosciences	TYRA	TYRA US	Greg Harrison, CFA
	Vir	VIR	VIR US	Alec W. Stranahan
	Y-mAbs Therapeutics, Inc	YMAB	YMAB US	Alec W. Stranahan
UNDERPERFORM				
	AlloVir, Inc.	ALVR	ALVR US	Jason Zemansky

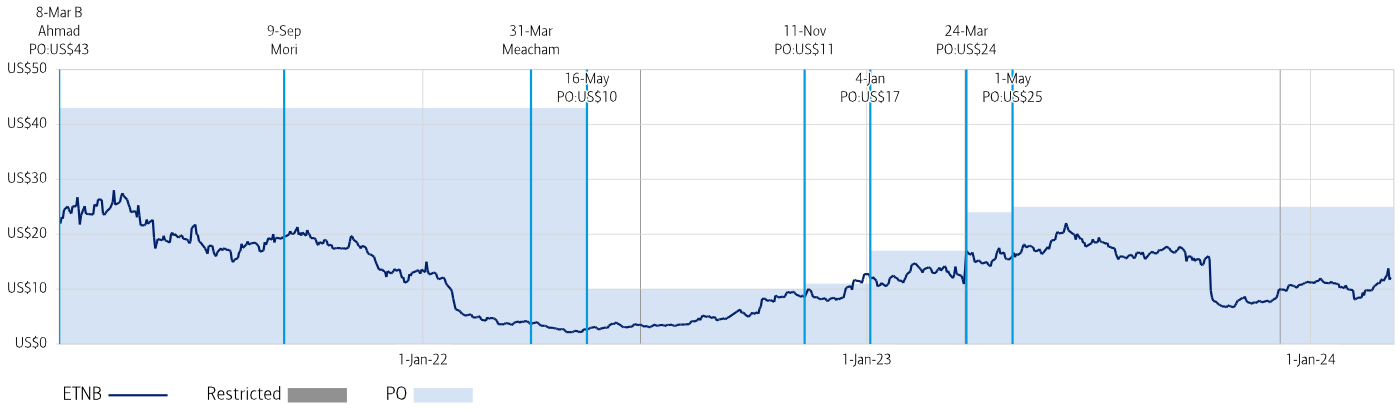
US - Biopharmaceuticals Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
	CureVac	CVAC	CVAC US	Geoff Meacham
	Day One Biopharmaceuticals	DAWN	DAWN US	Alec W. Stranahan
	Novavax	NVAX	NVAX US	Alec W. Stranahan
	Regeneron Pharmaceuticals Inc.	REGN	REGN US	Geoff Meacham
	Reneo Pharmaceuticals	RPHM	RPHM US	Jason Zemansky
	TG Therapeutics	TGTX	TGTX US	Alec W. Stranahan
	United Therapeutics Corporation	UTHR	UTHR US	Greg Harrison, CFA

Disclosures

Important Disclosures

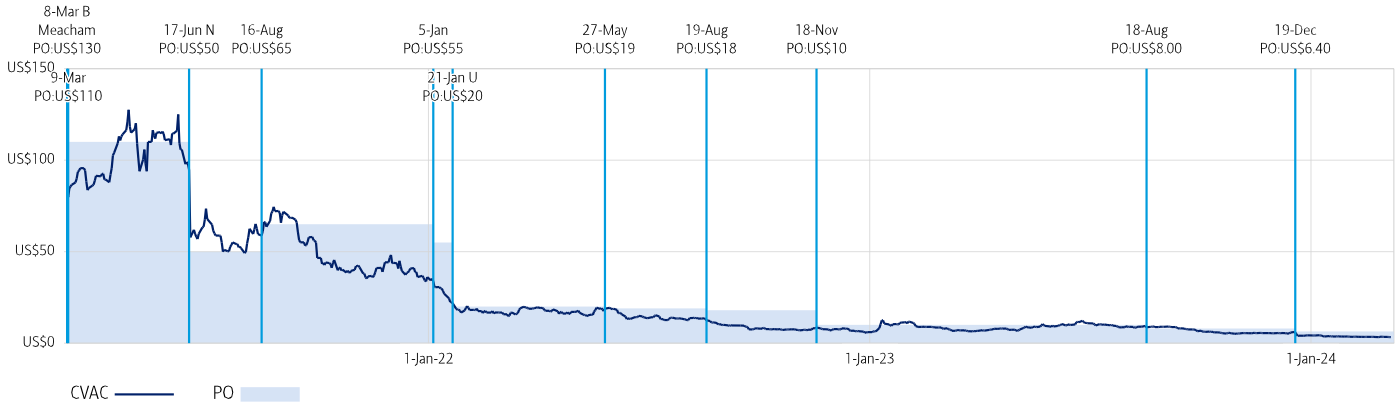
89bio, Inc (ETNB) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

CureVac (CVAC) Price Chart



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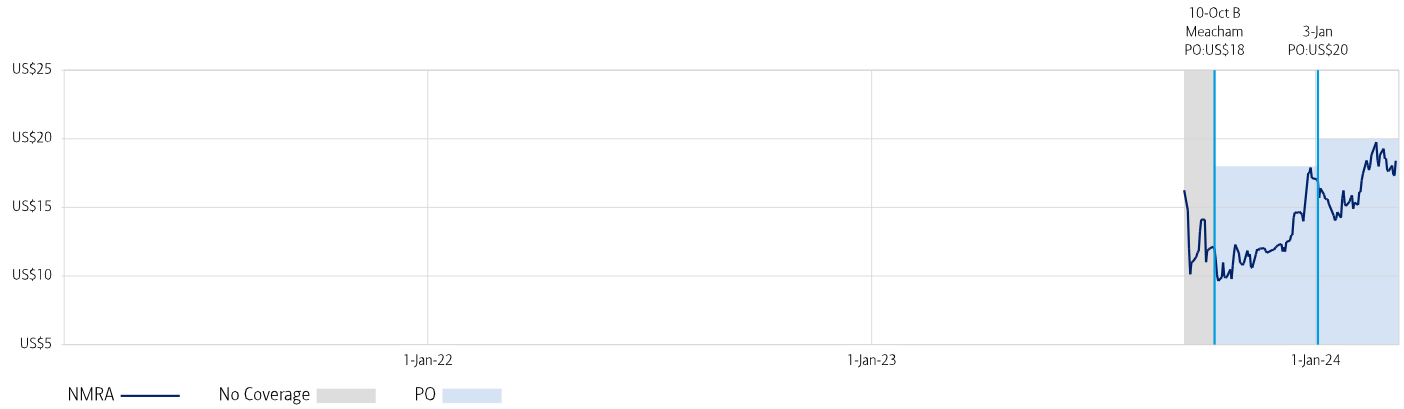
Neumora (NMRA) Price Chart



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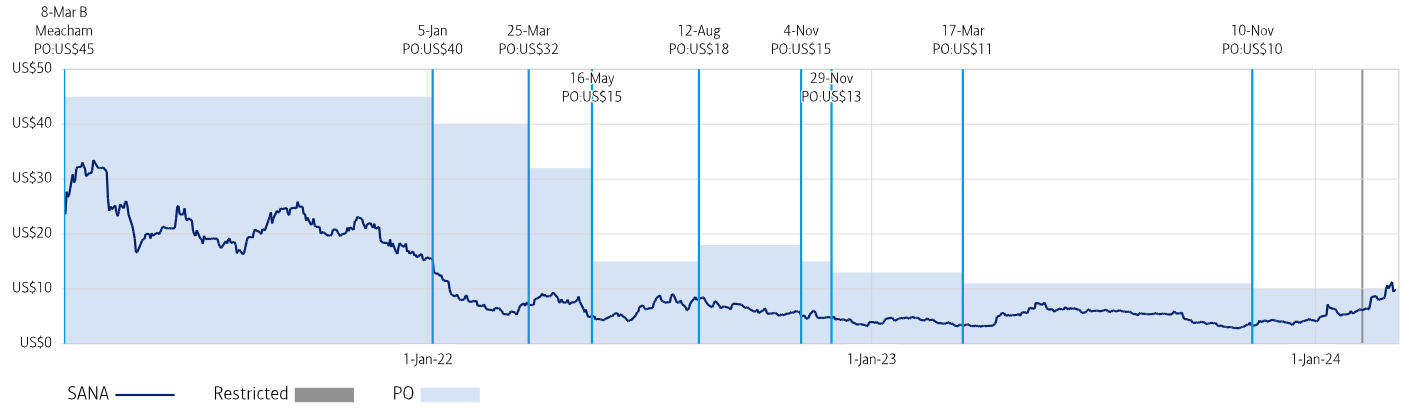
Sana Biotechnology (SANA) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

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Equity Investment Rating Distribution: Health Care Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	234	60.94%	Buy	115	49.15%
Hold	80	20.83%	Hold	36	45.00%
Sell	70	18.23%	Sell	29	41.43%

Equity Investment Rating Distribution: Global Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	1895	53.62%	Buy	1083	57.15%
Hold	832	23.54%	Hold	454	54.57%
Sell	807	22.84%	Sell	383	47.46%

[R1] Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.

FUNDAMENTAL EQUITY OPINION KEY: Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. VOLATILITY RISK RATINGS, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. INVESTMENT RATINGS reflect the analyst's assessment of both a stock's absolute total return potential as well as its attractiveness for investment relative to other stocks within its Coverage Cluster (defined below). Our investment ratings are: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. An investment rating of 6 (No Rating) indicates that a stock is no longer trading on the basis of fundamentals. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster[R2]
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

[R2]Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

INCOME RATINGS, indicators of potential cash dividends, are: 7 - same/higher (dividend considered to be secure), 8 - same/lower (dividend not considered to be secure) and 9 - pays no cash dividend. *Coverage Cluster* is comprised of stocks covered by a single analyst or two or more analysts sharing a common industry, sector, region or other classification(s). A stock's coverage cluster is included in the most recent BofA Global Research report referencing the stock.

Price Charts for the securities referenced in this research report are available on the Price Charts website, or call 1-800-MERRILL to have them mailed.
BofAS or one of its affiliates acts as a market maker for the equity securities recommended in the report: 89bio, Inc, CureVac, Neumora, Sana Biotechnology.
BofAS or an affiliate was a manager of a public offering of securities of this issuer within the last 12 months: 89bio, Inc, Neumora Therapeutics, Sana Biotechnology.
The issuer is or was, within the last 12 months, an investment banking client of BofAS and/or one or more of its affiliates: 89bio, Inc, Neumora Therapeutics, Sana Biotechnology.
BofAS or an affiliate has received compensation from the issuer for non-investment banking services or products within the past 12 months: 89bio, Inc.
The issuer is or was, within the last 12 months, a non-securities business client of BofAS and/or one or more of its affiliates: 89bio, Inc.
BofAS or an affiliate has received compensation for investment banking services from this issuer within the past 12 months: 89bio, Inc, Neumora Therapeutics, Sana Biotechnology.
BofAS or one of its affiliates is willing to sell to, or buy from, clients the common equity of the issuer on a principal basis: 89bio, Inc, CureVac, Neumora, Sana Biotechnology.
The issuer is or was, within the last 12 months, a securities business client (non-investment banking) of BofAS and/or one or more of its affiliates: 89bio, Inc.
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