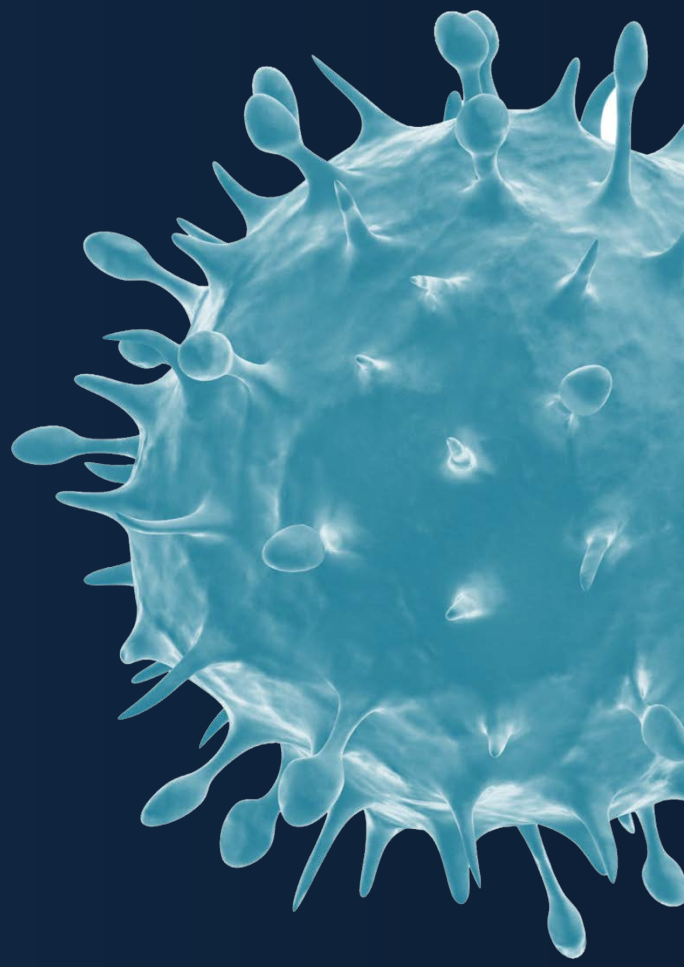
Genocea

Pioneering Neoantigen Cancer Vaccines

March 2018



genocea BIOSCIENCES

Disclaimer

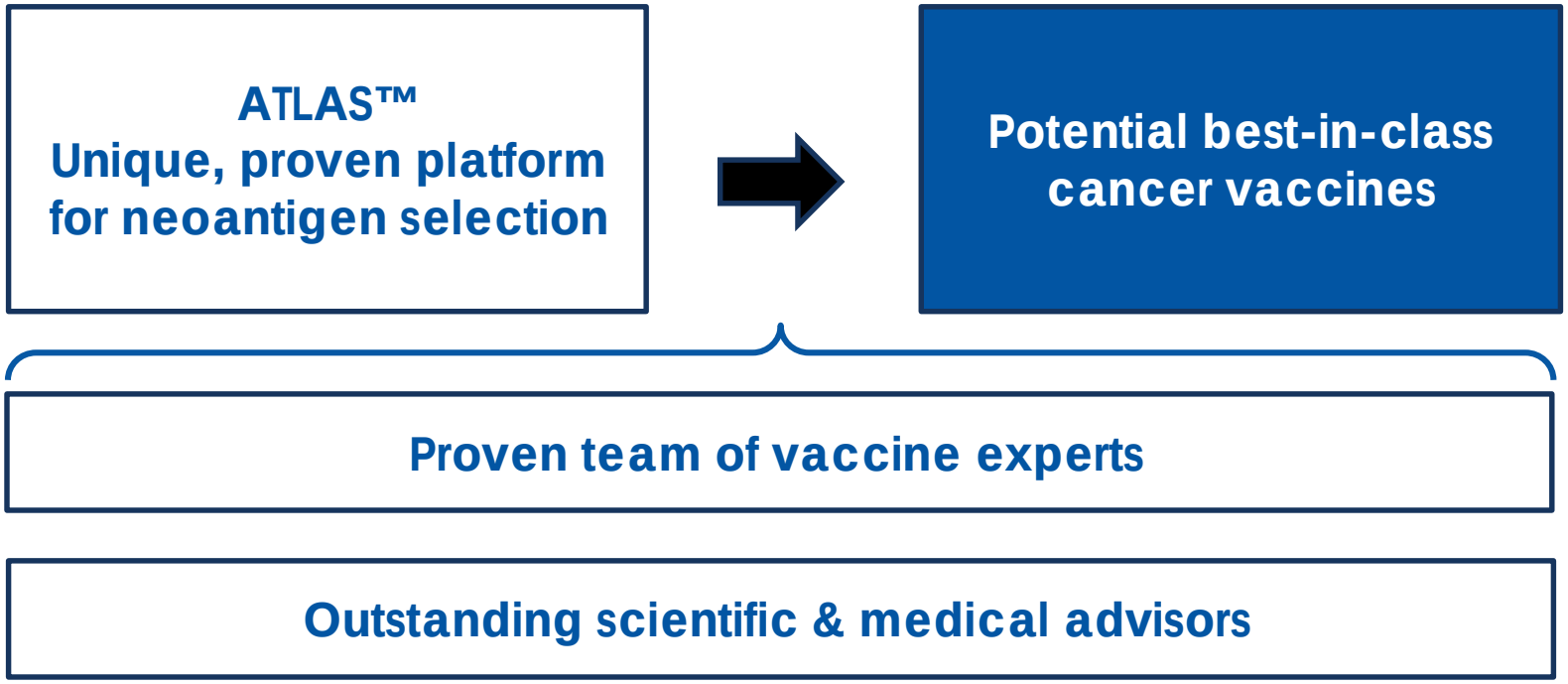
This presentation contains “forward-looking” statements that are within the meaning of federal securities laws and are based on our management’s beliefs and assumptions and on information currently available to management. Forward-looking statements include information concerning our possible or assumed future results of operations, business strategies, clinical trials and pre-clinical studies, regulatory approval of our product candidates, liquidity position and capital needs, financing plans, industry environment, potential growth opportunities, potential market opportunities and the effects of competition.

Forward-looking statements include all statements that are not historical facts and can be identified by terms such as “anticipates,” “believes,” “expects,” “could,” “seeks,” “estimates,” “intends,” “may,” “plans,” “potential,” “predicts,” “projects,” “should,” “will,” “would” or similar expressions and the negatives of those terms. Forward-looking statements represent our management’s beliefs and assumptions only as of the date of this presentation. Our operations involve risks and uncertainties, many of which are outside our control, and any one of which, or combination of which, could materially affect our results of operations and whether the forward-looking statements ultimately prove to be correct. Factors that may materially affect our results of operations include, among other things, the timing of results of our ongoing and planned our ability to progress any product candidates in clinical and clinical trials, the ability of ATLAS to identify promising oncology vaccine and immunotherapy product candidates, the scope, rate and progress of our preclinical and clinical trials and other research and development activities, anticipated timing of new clinical trails, our estimates regarding the amount of funds we require to conduct our clinical trials for GEN-009, our plans to commercialize GEN-009, the timing of, and ability to, obtain and maintain necessary regulatory approvals for our product candidates, and those listed in our Annual Report on Form 10-K for the fiscal year ended December 31, 2017 and other filings with the Securities and Exchange Commission (“SEC”). Except as required by law, we assume no obligation to update these forward-looking statements publicly, or to update the reasons actual results could differ materially from those anticipated in the forward-looking statements, even if new information becomes available in the future.

You may get copies of our Annual Report on Form 10-K, Quarterly Report on Form 10-Q and our other SEC filings for free by visiting EDGAR on the SEC website at http://www.sec.gov.

Our vision: Curing cancer with next-generation cancer vaccines

- Our mission: to create more effective cancer vaccines based on the right antigens



Compelling investment opportunity

- Emerging role of neoantigens in the IO revolution
- Proven ATLAS antigen identification technology differentiates Genocea and drives potential for vaccine success
  - ATLAS used to identify targets in Genocea Phase 3-ready infectious disease vaccine; out-licensing discussions ongoing
  - Strategic shift to focus on immuno-oncology in September 2017
- Important milestones expected over next 12-18 months
- Funded into second half of 2019 following $52m (net) January 2018 financing

Neoantigens vaccines are a potential IO cornerstone

Yadav et al., Gubin et al, 2014

- Personalized tumor mutations (neoantigens) are "foreign" to immune system

Schumacher, Schreiber, 2015

- Response to neoantigens drives checkpoint inhibitor (CPI) efficacy

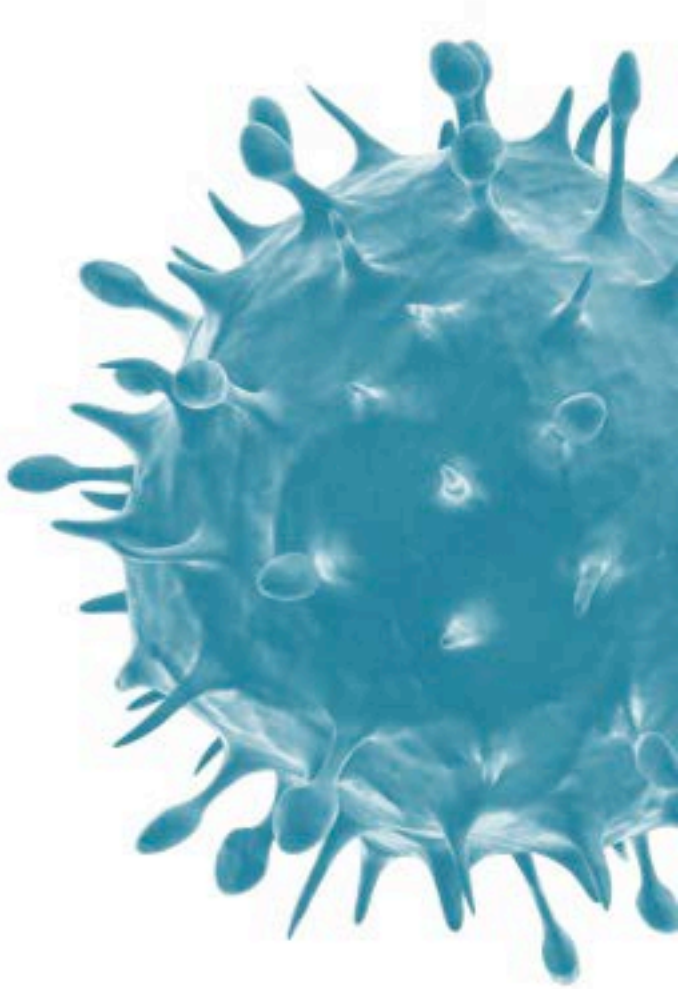
[1]Ott et al., [2]Sahin et al., 2017

- Possible to vaccinate against neoantigens

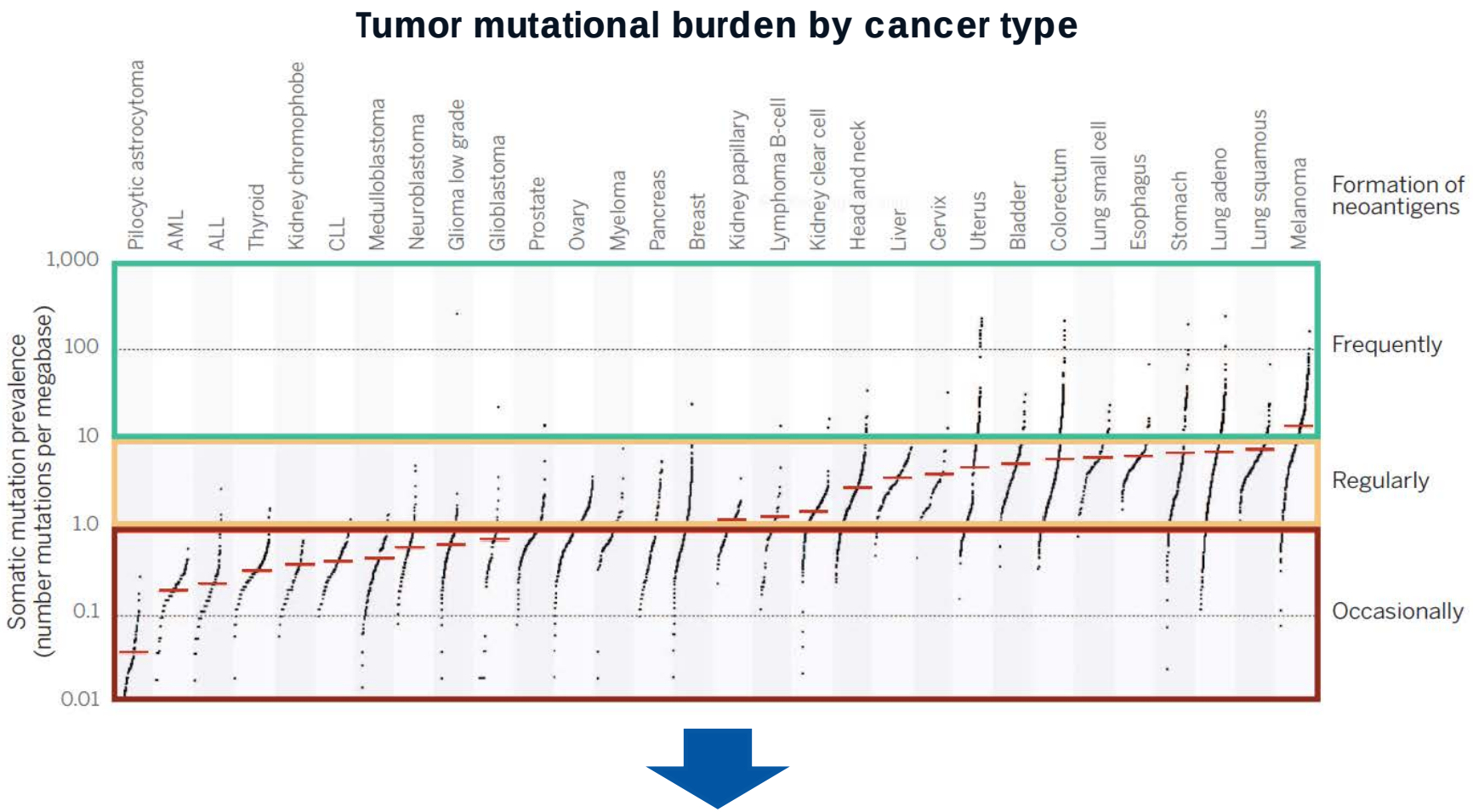
- Neoantigen vaccines: the "steering wheel" for T cells unleashed by CPI therapy
  - Complementary mechanism of action: designed to direct T cells once "brakes" are off
  - Well tolerated[1,2]
  - Potentially applicable to most cancer types

Genocea Thesis:

Neoantigen selection crucial to cancer vaccine success



Cancer biology creates significant antigen selection challenges



Up to thousands of candidate antigens per patient

Schumacher and Schreiber, Science, 2015

In silico-based antigen selection = educated guessing

The foundation: Predictive algorithms

	Positive predictive value
$CD4^+$ T cells	~5%**
$CD8^+$ T cells	~20%*

Algorithm refinement/ Down-selection

in vitro assays

Other inputs:
- Binding affinity, RNA expression, allele frequency, mutation type, etc.

Output

Predicted **$CD8^+$ neoantigens**

*Abelin *et al.*, 2017 *Immunity* 46, 315-326.
** Wang, *et al.*, PLoS Computational Biology, 2008

In silico-based selection yields limited immunogenicity

Immunogenicity from FIH Neoantigen Vaccine Trials

Vaccine modality secondary response driver	Patients	% Response to Neoantigens* via *ex vivo* ELISpot**	
		CD4+	CD8+
Ott[1] Peptide + adjuvant	Melanoma (stage IIIB/C & IVM1a/b)	20%	0%
BioNTech[2] RNA	Melanoma (stage III & IV)	21% ***	

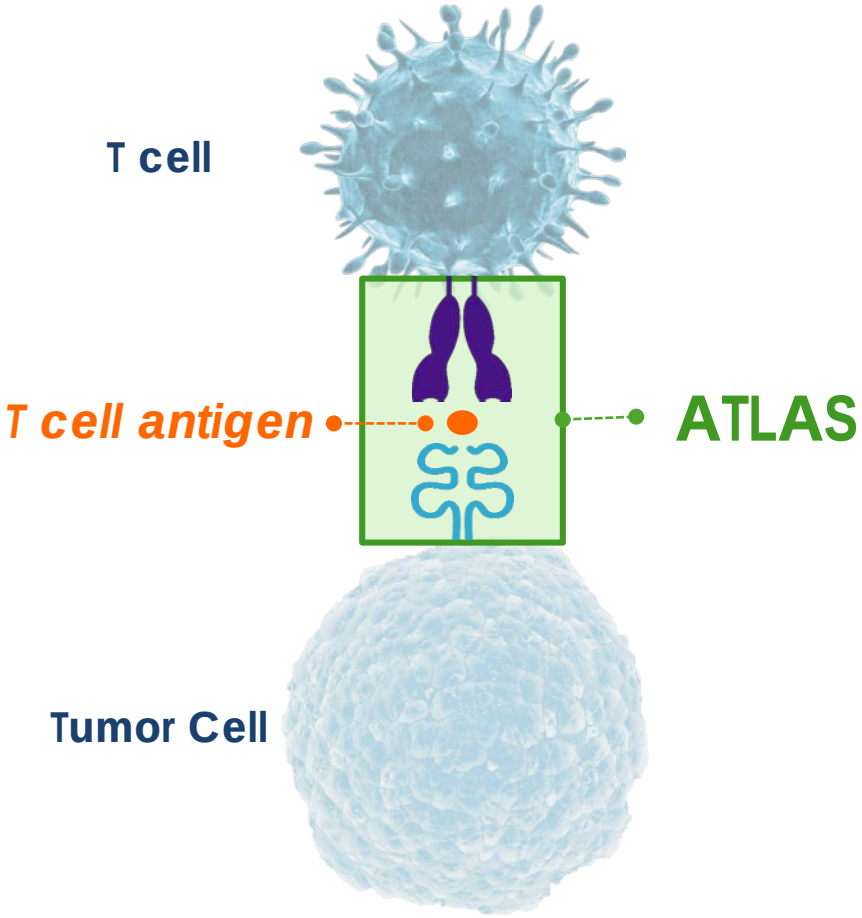
*Cohort level; number of SLP with responses in all patients/total SLP immunized across all patients

***ex vivo* ELISpot represents industry-standard approach to measuring T cell responses in blood. Papers also disclosed higher neoantigen response rate, primarily CD4+, after multiple rounds of artificial *in vitro* stimulation over 10-21d.

***Presumed CD4+ (total PBMC). Text states majority of responses were CD4+ but not disclosed in figure

[1]Ott *et al.*, 2017 *Nature*
[2]Sahin *et al.*, 2017 *Nature*

ATLAS: proprietary platform uses patients' own T cells to identify true neoantigens



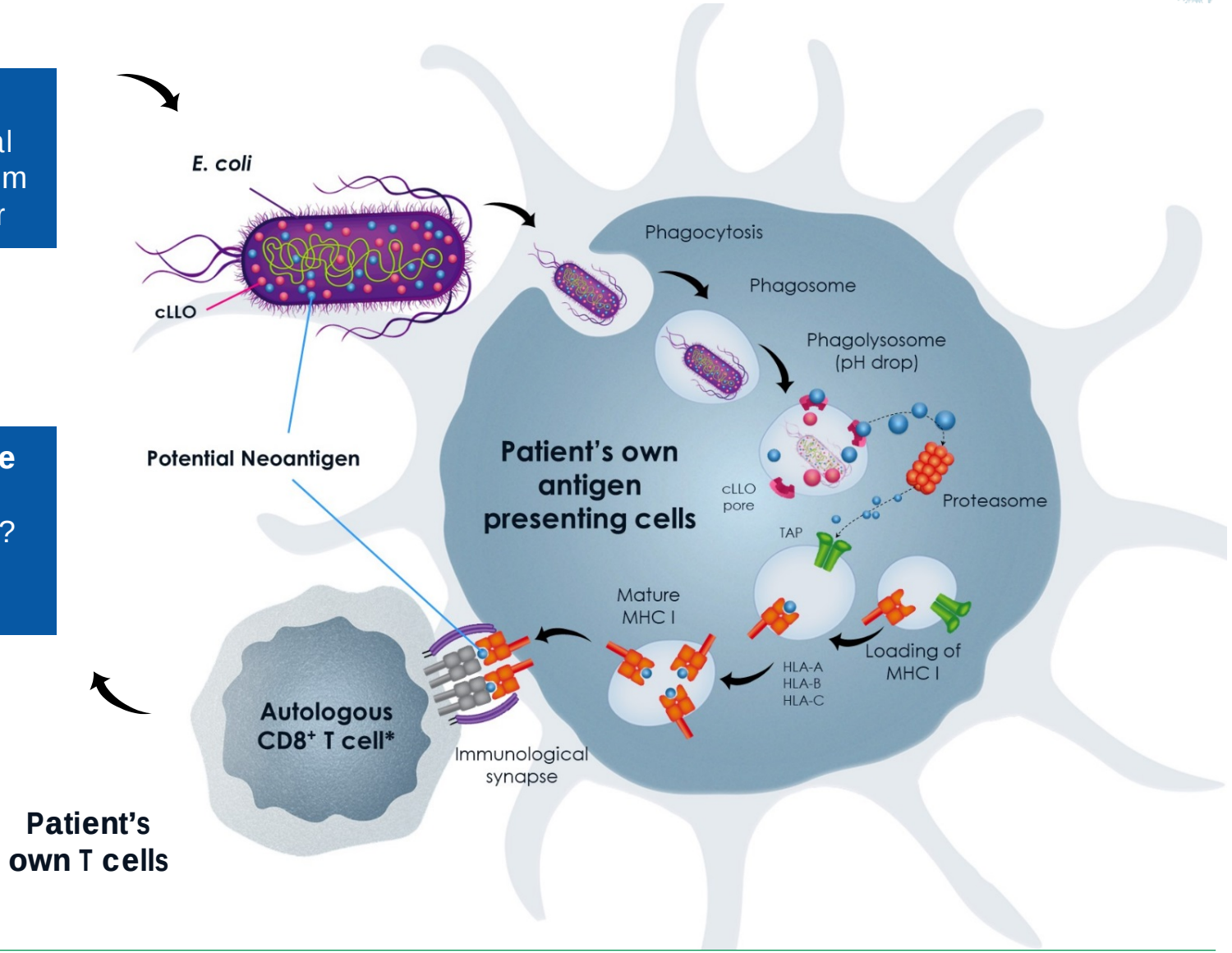
- T cells showing, not predicting, neoantigens:
  - For any patient
  - For any cancer
  - Of pre-existing responses for easier vaccination
  - For $CD8^+$ and $CD4^+$ T cells for broader immune response

- The right neoantigens for better vaccines

ATLAS: Don’t guess. Know.

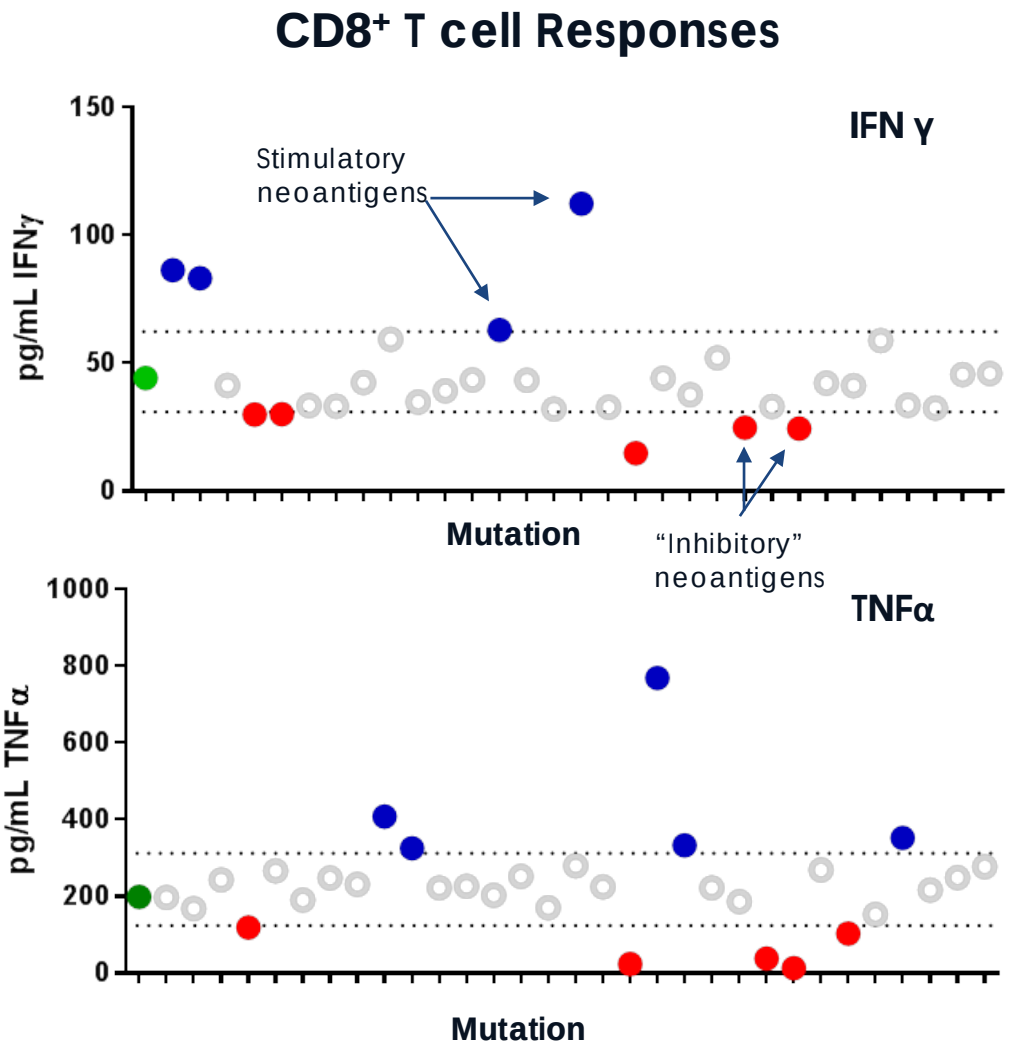
Input:
Each potential neoantigen from patient tumor

ATLAS cytokine readout:
- Antigen or not?
- Stimulatory or inhibitory?



*For CD4+ T cell screening the cLLO is not co-expressed, resulting in conventional endosomal processing and presentation by MHC cII

ATLAS identifies and categorizes all neoantigens (example from MSS colorectal patient)



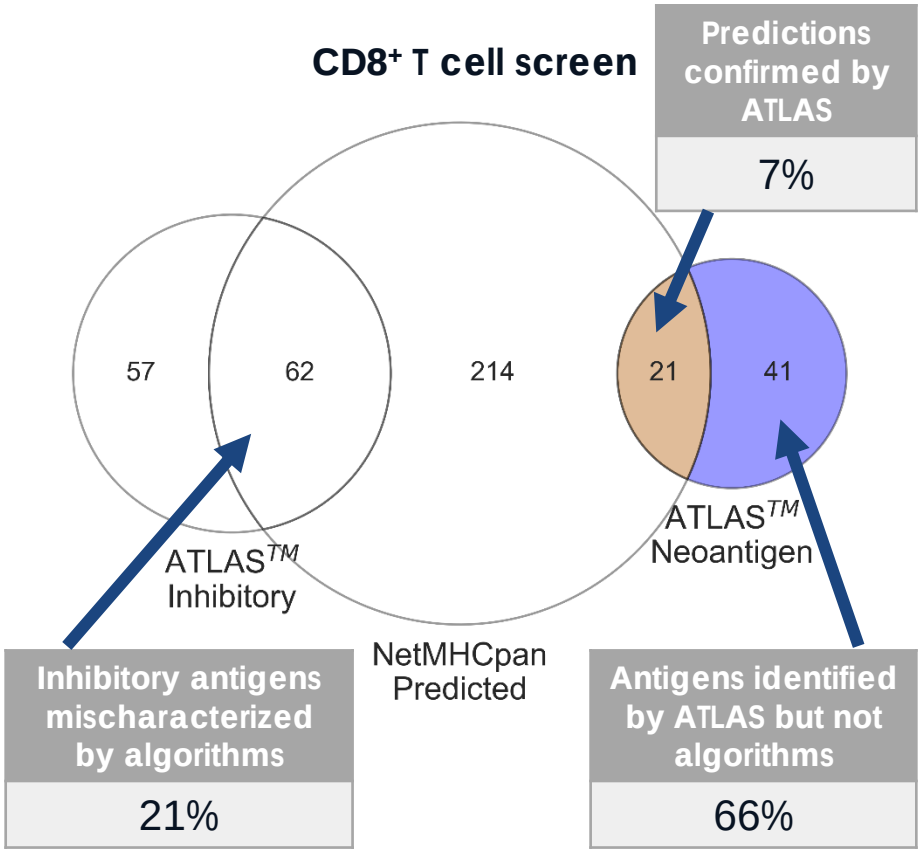
ATLAS benefits

- Finds true neoantigens (pre-existing, stimulatory responses)
- Identifies "inhibitory" antigens (for exclusion)
- Illuminates $CD8^+$ and $CD4^+$ (not shown) neoantigens
  - Limited overlap

Data are shown as the mean of duplicate measurements; 32 mutations profiled
Dotted lines represent the 2 MAD (median absolute deviations) of negative control
Red = inhibitory; Blue = stimulatory; Green = negative control

Data support ATLAS superiority in neoantigen identification and characterization

ATLAS identifies true neoantigens



From first 12 patients screened across six different tumor types; Epitope predictions cutoff ≤500nM binding affinity

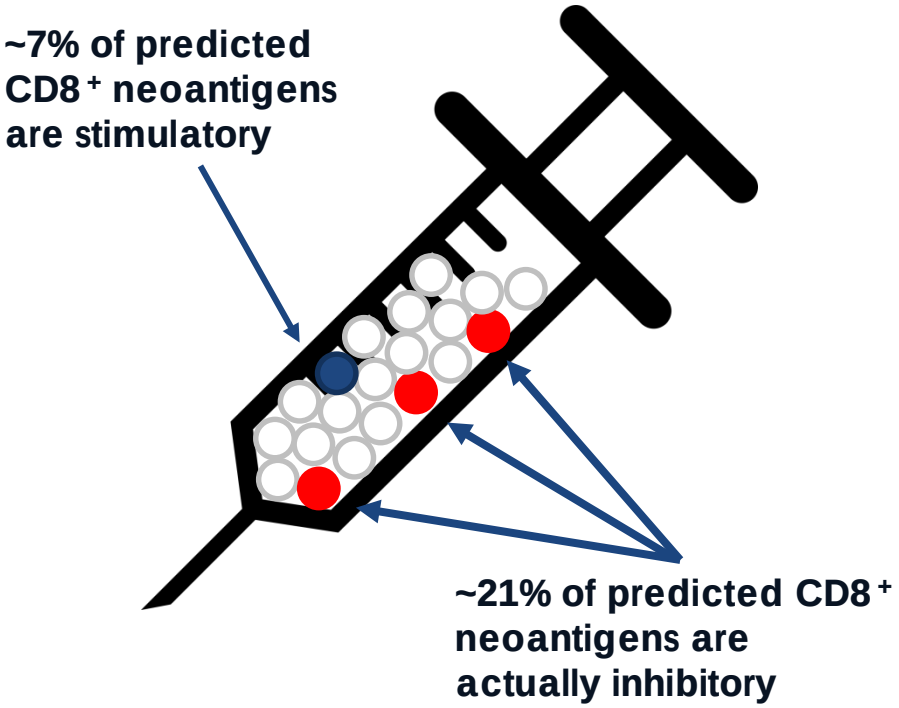
Biology too complex for *in silico*-based approaches

- **No** enrichment for key algorithm inputs
  - Binding affinity
  - RNA expression
  - Allele frequency
- Inhibitory antigens not predictable
- CD4+ antigens matter[1];
  - Under-addressed by algorithms
- **Shared** neoantigens not found to date

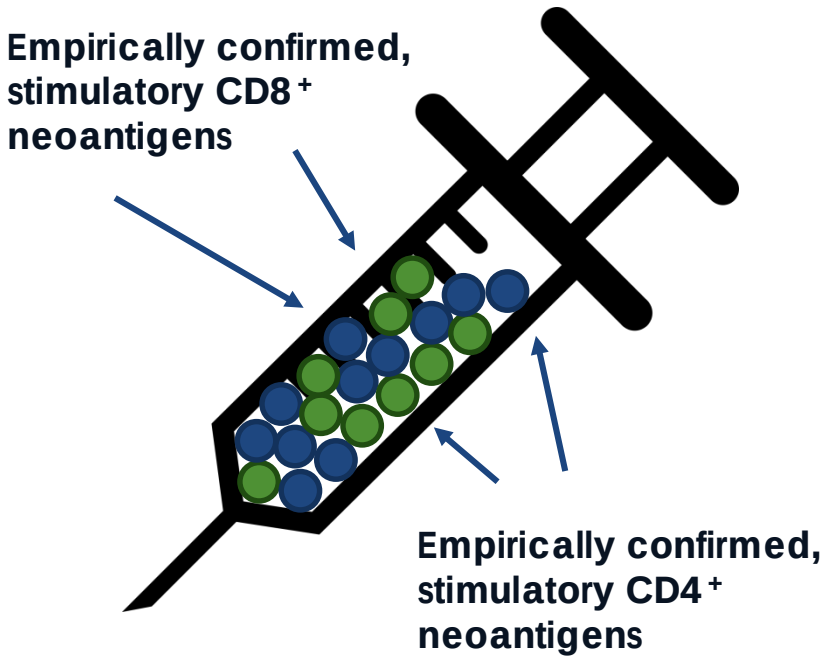
[1]Melssen and Slingluff, 2017 *Curr Opin Immunol*

ATLAS may enable better personalized vaccines

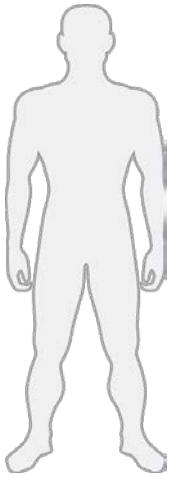
- *In silico*-based approaches:
  Majority of antigens likely ineffective or potentially harmful



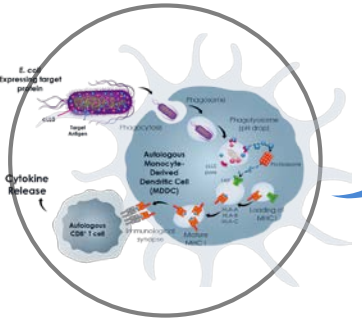
- **ATLAS:**
  All antigens likely to be protective, target both T cell subsets



GEN-009: ATLAS neoantigen selection for personalized cancer vaccines

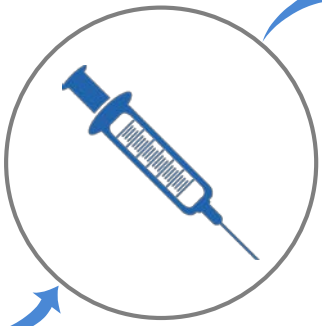


Collect tumor and blood samples, sequence exome



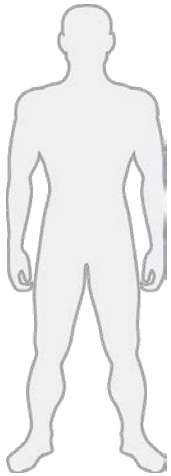
ATLAS to identify true neoantigens of CD4+ and CD8+ T cell responses

Synthesize vaccine with ATLAS-identified T cell antigens



Composition: Synthetic long peptides + Poly-ICLC

Ship personalized product to clinical site



Current needle to needle time consistent with industry standard

GEN-009 clinical program designed to demonstrate superiority of ATLAS antigen selection in patients

- **Part A: Phase 1/2a study overview:**
  - Patient cohort: No evidence of disease, high risk of relapse
  - Multiple tumor types with CPI approval
  - **Objectives: safety & immunogenicity**
  - Flexibility to test dose levels, regimens

- **Part B: Phase 1/2a study overview:**
  - *Multiple cohorts: CPI combo with SD, PRs*
  - *Objectives: safety & immunogenicity, efficacy*

- **Part C: Phase 1/2a study overview:**
  - *Metastatic disease monotherapy*
  - *Objectives: safety & immunogenicity, efficacy*

Planned near-term milestones

- IND ready (filing imminent)
- Immunogenicity data: 1H 2019

ATLAS drives Genocea neoantigen cancer vaccine pipeline and partnership opportunities

		DISCOVERY	PRE-CLINICAL	PHASE 1	PHASE 2	STATUS & EXPECTED MILESTONES
IN-HOUSE PIPELINE	**GEN-009** 1st Generation Neoantigen Cancer Vaccine					• Peptide + adjuvant vaccine • IND in early 2018 • Immunogenicity data in 1H 2019
IN-HOUSE PIPELINE	**GEN-010** 2nd Generation Neoantigen Cancer Vaccine					• Proprietary vaccine modality
PARTNERING	**Shared Antigen Cancer Vaccines***					• Exploring ATLAS partnering opportunities
PARTNERING	**Vaccines for cancers of viral origin****					• Exploring ATLAS partnering opportunities

* ATLAS proof of concept developed (CRC, NSCLC)

** ATLAS proof of concept developed (Epstein-Barr Virus)

Strong scientific leadership

- Scientific Advisory Board
  - **Elizabeth Jaffee, MD**, Johns Hopkins, Deputy Director Sidney Kimmel Comprehensive Cancer Center
    - President, AACR; Chair, NCI Moonshot
  - **Chuck Drake, MD, PhD,** Columbia, Director of Genitourinary Oncology and Associate Director for Clinical Research
  - **Kwok Wong, MD**, NYU, Chef of Hematology and Medical Oncology
  - **George Siber, MD, PhD**, Former CSO Wyeth Vaccines

- Scientific founders:
  - **Darren Higgins, PhD**, Harvard
  - **David Sinclair, PhD**, Harvard

Genocea: pioneering neoantigen cancer vaccines

- Emerging role of neoantigens in the IO revolution
- Proven ATLAS antigen identification technology differentiates Genocea
- Important milestones expected over next 12-18 months
  - First neoantigen vaccine, GEN-009, entering clinic this year
  - Pipeline expansion
  - ATLAS partnership discussions ongoing
  - GEN-009 immunogenicity data in 1H 2019
- Funded into second half of 2019

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