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LIFE SCIENCES

NEXT-GEN CASE STUDIES TECHNOLOGY

Akadeum's next-generation microbubble technology is disrupting the status quo in how sample preparation is occurring in laboratories across the country. Get an inside look at the work that is being done using Akadeum's microbubble-based cell isolation kits and how Akadeum's technology is enabling research.

Buoyant Solutions. Better Health.

At Akadeum, we seek to improve human health by enabling better processes. Our platform technology is broadly applicable, but we are particularly focused on process improvements in the areas of cell therapy manufacturing, clinical diagnostics, and cell & molecular research.

Akadeum is revolutionizing the way separations are performed, including cell separation, nucleic acid extraction, chemical separation, and so much more. The power of our platform is that we've developed an elegant and easy-to-use technology that can enable faster, more accurate, and scalable workflows to solve the problems of tomorrow.

Inadequate sample preparation is both harmful and costly. Most biological workflows require a sample preparation step to isolate the target of interest before downstream testing or processing can occur. Current technologies have failed to meet the needs of evolving diagnostic and therapeutic industries – and that shortcoming has a negative impact on healthcare costs and results.

AKADEUM HAS RISEN TO MEET THIS NEED. WE ARE A GLOBAL LEADER IN BUOYANCY-BASED TECHNOLOGY AND ARE APPLYING THIS CAPABILITY TO IMPROVING SAMPLE PREPARATION ACROSS INDUSTRIES.

Buoyancy-Activated Cell Sorting (BACS™), Akadeum's patented approach to separation, offers a novel way to isolate the target of interest (cells, nucleic acids, proteins, chemicals, etc) using science so simple, it floats! We functionalize tiny floating particles that we call "microbubbles" and develop the protocols and devices to put our microbubbles to work.

Our technology combines the specificity of affinity molecules such as antibodies with the power of gravity in a workflow that's fast, easy, and effective while being exceptionally gentle on delicate targets, like rare immune cells of low abundance.

Contents:

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Researcher Spotlight On:

Using Akadeum's Mouse B Cell Isolation Kit to study targeted delivery of anti-tumor DNA vaccines to B cells as a novel alternative to chemotherapy

92.8%

Purity with Microbubbles

Sample preparation using Akadeum's Mouse B Cell Isolation Kit delivered 92.8% purity

85%

Purity with Magnetics

Sample preparation using a magnetic bead-based isolation kit delivered 85% purity

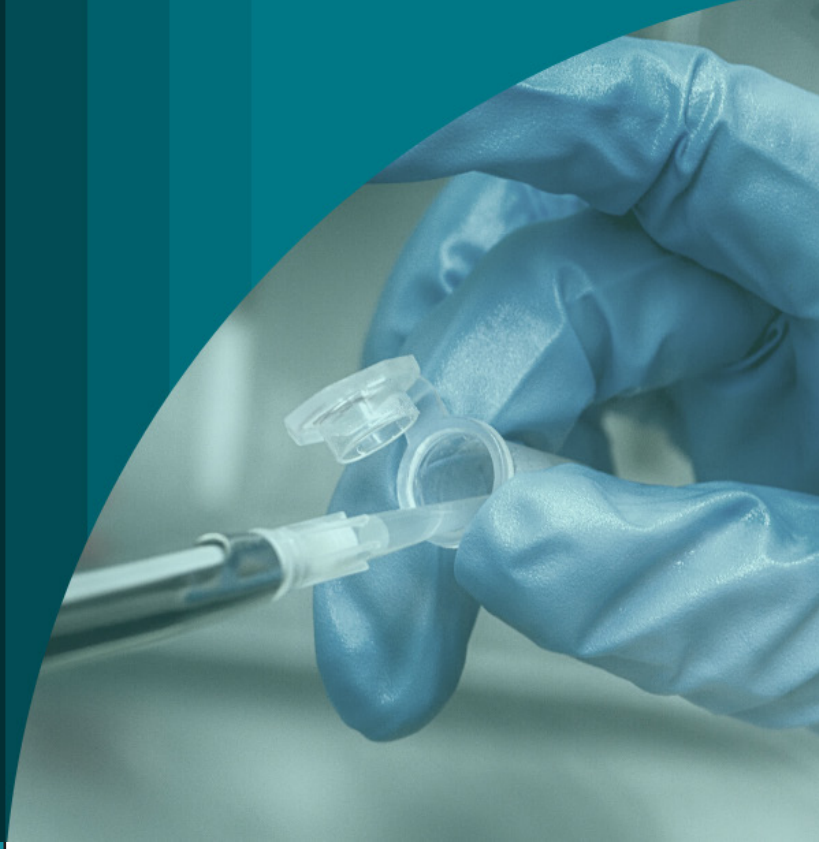
7.8%

Improvement in Purity Overall

In this head-to-head comparison, the microbubble isolation kit delivered 7.8% higher purity

RESEARCHER SPOTLIGHT:

MOUSE B CELL ISOLATION KIT



"Akadeum's kit provided reproducible results. It was super quick - just 2 or 3 steps ... quicker than any other kit I have used before."

Objective:
Successfully obtain a highly-purified population of viable B cells from mouse splenocytes

Kit Used:
Mouse B Cell Isolation Kit from Akadeum Life Sciences

Key Takeaway:
In this head-to-head comparison with a magnetic bead-based protocol, the Akadeum protocol delivered 92.8% purity as compared to 85.0% with magnetics. The B cells retained their antigen presenting potential.

Outcome:
The sample preparation using Akadeum's Mouse B Cell Isolation Kit delivered a 7.8% higher purity of B cells as compared to magnetics in a faster, easier-to-use process than the EasySep™ kit. The final enriched sample of healthy cells retained their antigen-presenting capabilities, providing the research team with the tools needed for further analysis.

Using Akadeum's Mouse B Cell Isolation Kit to study targeted delivery of anti-tumor DNA vaccines to B cells as a novel alternative to chemotherapy

Ichwaku Rastogi from the Doug McNeel Lab at the University of Wisconsin recently used Akadeum's Mouse B Cell Isolation Kit to obtain a high purity isolation of viable, healthy B cells. The research is looking into targeted delivery of anti-tumor DNA vaccines to B cells as a novel alternative to chemotherapy. To accomplish this, cell isolation that yields high quality cells without sacrificing purity is needed. It is critical that the isolated B cells remain healthy and retain their antigen-presenting capabilities.

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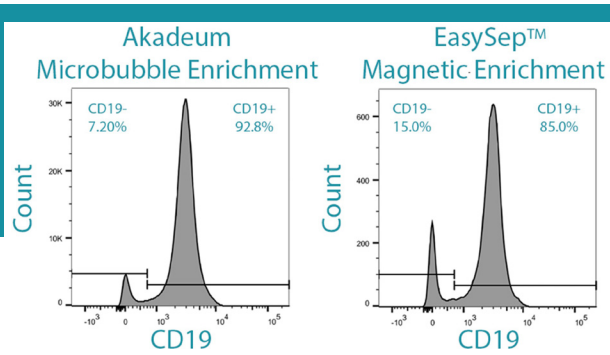

Figure 1. Akadeum's Kit provides high purity B cells
Mouse spleens were dissociated and the Akadeum Mouse B Cell Isolation kit or the corresponding EasySep™ kit were used to enrich B cells. FACS plots for CD19+ B cells show 92.8% purity with Akadeum microbubble enrichment (left) and 85.0% purity following EasySep™ magnetic bead-based enrichment (right).

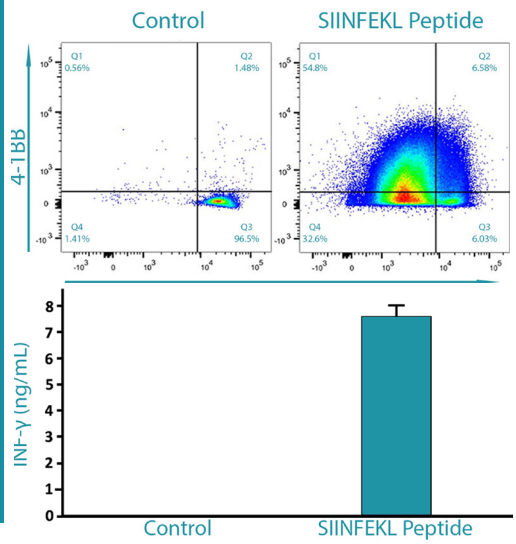

Figure 2. Microbubble enriched B cells remain functional and retain their antigen presenting capacity
B cells isolated with the Akadeum B Cell Isolation Kit were cultured with either vehicle or SIINFEKL peptide. The following day CFSE labeled CD8+ T cells from OT-1 mice (SIINFEKL restricted MHC-1, CD8 T cells) were added to the culture. After 3 additional days in culture antigen presenting capacity was assessed by investigating proliferation and activation of the spiked in CD8+ T cells.

A) FACS plots showing the proliferation indicator dye, CSFE, and a marker of activation, 4-1BB.

B) Bar graph showing ELISA determined interferon gamma (INF-γ) levels. Loss of CSFE intensity in the SIINFEKL exposed cells shows these cells are proliferating. Similarly, production of INF-γand increased expression of 4-1BB indicate activation of these T cells. Taken together these results demonstrate that microbubble enriched B cells maintain their antigen presenting capabilities.

The team was looking to obtain a highly-enriched population of viable B cells from splenocyte samples; using Akadeum's Mouse B Cell Isolation Kit delivered an overall B cell purity of >92%, whereas they were only able to obtain 85% with a magnetic bead-based isolation kit. Not only did the microbubble enrichment protocol deliver significantly higher purity, it also maintained cell health and viability. These results have given the lab confidence that the microbubble isolation platform will allow them to investigate the efficacy of their vaccine candidates. Using Akadeum's B Cell Isolation Kit empowers investigation of both the targeted delivery of the vaccine to B cells and also the ability of the delivered vaccine to trigger a cancer destructive immune response in T cells.

The Akadeum microbubble enrichment protocol can be performed directly in the sample container for quick and easy sample preparation that does not require additional equipment or expensive consumables like magnets or columns. The microbubble approach is exceptionally gentle on delicate cells and eliminates the need to expose cells to harsh chemicals or external forces like magnetic gradients from rare earth magnets.

About Akadeum Life Sciences

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Researcher Spotlight On:

Using Akadeum's Mouse B Cell Isolation Kit to study autoreactive B cell activation and differentiation at the University of California

36%

B Cell Purity Pre-Enrichment

The starting material began with a baseline B cell purity of 36%

81%

Purity with Microbubbles

Akadeum's microbubble kit resulted in a highly-enriched B cell population

BCR%

Maintained in Sample

Isolation did not disturb B cell receptors or skew the population

RESEARCHER SPOTLIGHT:

MOUSE B CELL ISOLATION KIT

"The resulting sample looked perfect after using microbubbles – very happy with the product!"

Objective:
To understand how autoreactive B cells, despite chronic antigen engagement of the B cell receptor, are restrained from inappropriate activation and differentiation. Of particular interest is how this process is disrupted in autoimmune disease, and how tolerance mechanisms can be harnessed to re-establish tolerance.

Kit Used:
Mouse B Cell Isolation Kit from Akadeum Life Sciences

Key Takeaway:
With a faster, simpler and less expensive process, the Akadeum kit achieved B Cell Purity on par with the market leading magnetic-based kit.

Outcome:
A highly purified population of B cells was obtained, while BCR percentages remained similar to starting material. The isolation protocol did not disturb these receptors or skew the isolated population.

Using Akadeum's Mouse B Cell Isolation Kit to study autoreactive B cell activation and differentiation

Get an inside look at how our products perform in real-world research that is happening in laboratories across the country. A research group at the University of California San Francisco recently used the Mouse B Cell Isolation Kit from Akadeum Life Sciences in the course of their research into understanding how autoreactive B cells, despite chronic antigen engagement of the B cell receptor (BCR), are restrained from inappropriate activation and differentiation. This research puts special focus on how this process is disrupted in autoimmune disease and how tolerance mechanisms can be harnessed to re-establish tolerance.

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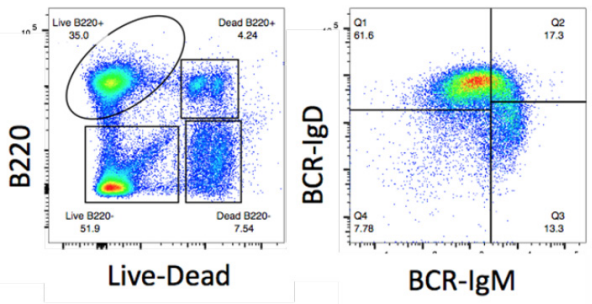

Figure 1. Starting Material
Analysis of the starting material shows the sample contains 35% Live B220+ cells

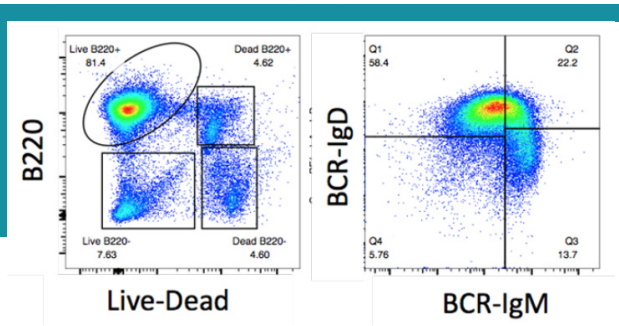

Figure 2. Microbubble Enriched Material
Analysis of the material following microbubble separation using Akadeum's Mouse B Cell Isolation Kit shows 81.4% Live B220+ cells with similar BCR population

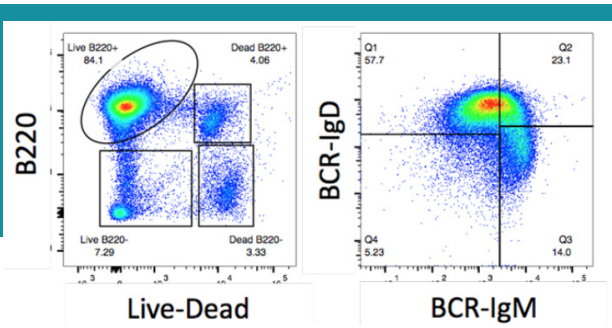

Figure 3. Magnetics Comparison
Analysis of the material following magnetic bead-based separation using a commercially-available kit shows similar results to the Microbubble enrichment protocol

Using the Akadeum Mouse B Cell Isolation Kit improved B cell purity from 36% (in the non-enriched sample) to 81% (following Akadeum's fast and easy microbubble protocol). Critically, the BCR percentages were similar in the enriched sample to the starting material, confirming that the isolation protocol didn't disturb these receptors or skew the isolated population. In a direct comparison against traditional magnetic bead separation, the results were similar with less than 3% variance in final purity. The Akadeum microbubble workflow can be performed faster and without additional equipment and consumables like magnets and columns, as the microbubbles can be used directly in the sample container for quick and easy enrichment.

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Researcher Spotlight On:

Using Akadeum's Mouse B Cell Isolation Kit to study B cell differentiation into plasma cells at the University of Pennsylvania

65.7%

Purity Pre-Enrichment

The starting sample showed a 65.7% purity of B cells prior to enrichment.

>97%

Purity with Microbubbles

Akadeum's protocol delivered a highly-enriched final sample

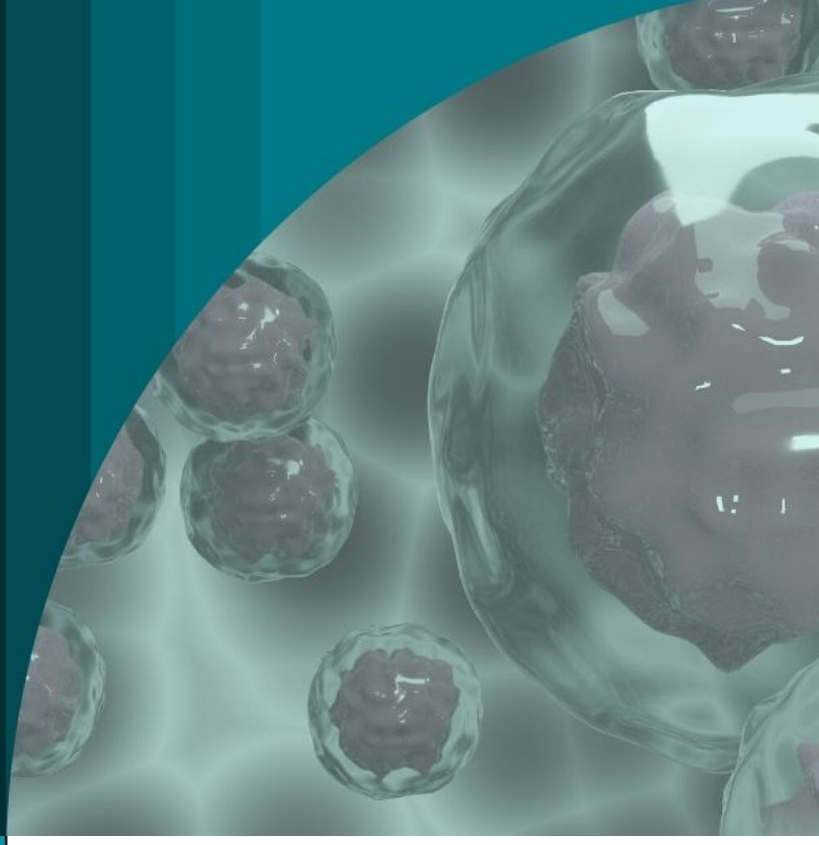
0%

Activation due to Isolation

Cells were not activated, retaining their differentiation abilities

RESEARCHER SPOTLIGHT:

MOUSE B CELL ISOLATION KIT



"Generally very easy to use... it was streamlined compared to magnetic bead separation. The ability to get 4 times the number of cells over competitor is absurd."

Objective:
Identify transcriptional programs and other mechanisms that regulate plasma cell differentiation.

Kit Used:
Mouse B Cell Isolation Kit from Akadeum Life Sciences

Procedure:
A single cell suspension of splenocytes was obtained by mechanically dissociating spleens of 8-week-old C57BL/6 mice and passing the dissociated material through a filter. The resulting sample was enriched for B cells using Akadeum's Mouse B Cell Isolation Kit. Post-enrichment, B cells were cultured in the presence or absence of CpG and IL-5 for 3-days and plasma cell differentiation was assessed based on induction of CD138.

Key Takeaway:
B cell purity of >97% was obtained while physiology and plasma cell differentiation potential were conserved post-enrichment.

Using Akadeum's Mouse B Cell Isolation Kit to study B cell differentiation into plasma cells

A research group at the University of Pennsylvania used the Mouse B Cell Isolation Kit from Akadeum Life Sciences in their research into the mechanisms that underlie the differentiation of activated B cells into antibody-producing plasma cells.

Using the Akadeum Mouse B Cell Isolation Kit allowed the research group to obtain a B cell purity of greater than 97%. More importantly, the group observed that the isolated cells were healthy, were not activated by the isolation process, and had maintained their ability to be differentiated into plasma cells.

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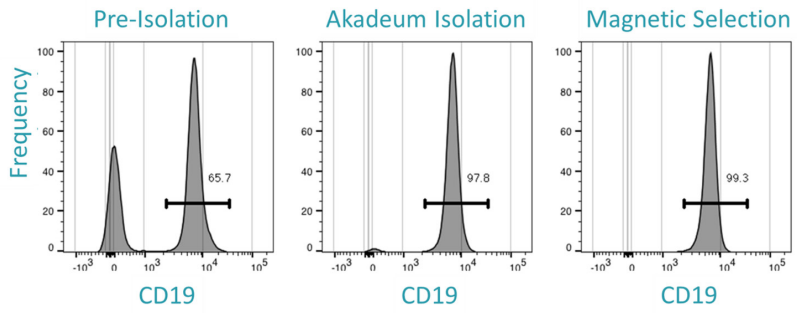

Figure 1. Akadeum's microbubble kit delivered a highly-enriched sample for downstream analysis.

Flow plots for CD19+ B cells before enrichment (left), following enrichment with Akadeum's Mouse B Cell Isolation Kit (middle), and following positive selection with magnetics competitor (right).

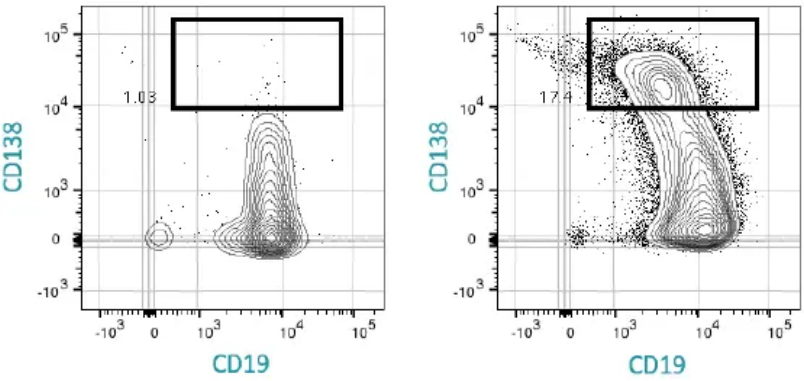

Figure 2. B cells were not artificially activated by Akadeum isolation and maintained their capacity for plasma cell differentiation as shown by CD138 induction.

Flow plots from enriched CD19+ B cells that were cultured for 3 days in the absence (left) or presence (right) of IL-5 and bacterial CpG.

The sample preparation using Akadeum's Mouse B Cell Isolation Kit delivered a highly-enriched sample with B cell purity of greater than 97%. Following plasma cell induction, upregulation of CD138 was confirmed in the enriched B cell population, validating post-enrichment function. The Akadeum microbubble workflow can be performed directly in the sample container for quick and easy enrichment – no need for additional equipment and consumables like magnets or columns.

If you are involved in cell isolation research, we'd love to hear from you! We are actively seeking new applications for our microbubble technology and would welcome the opportunity to learn more about your research and to discover if our microbubbles could help you in your work. Let's schedule a time to talk!

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Researcher Spotlight On:

Using Akadeum's Mouse T Cell Isolation Kit to study the affect of dietary alterations on immune cells

T Cell

Isolation from splenocytes

The researchers require a highly-enriched, viable T cell population

>97%

Purity with Microbubbles

Akadeum's microbubble kit resulted in a 97% pure population of T cells

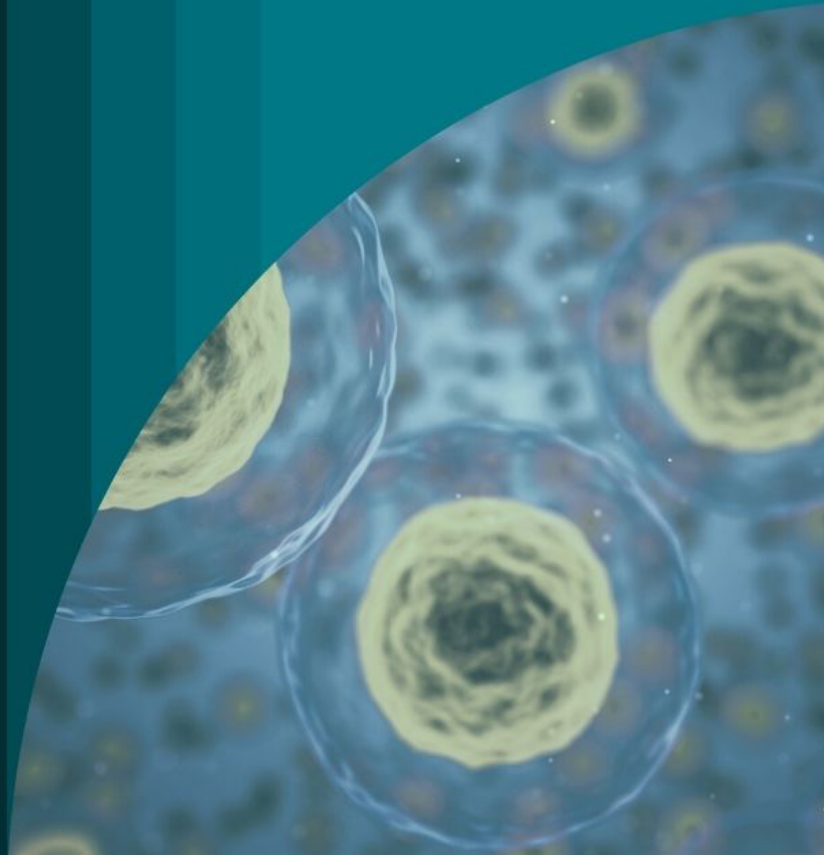
87.4%

Viability with Microbubbles

T cell enrichment with Akadeum's protocol maintained cell viability

RESEARCHER SPOTLIGHT:

MOUSE T CELL ISOLATION KIT



"Akadeum cell isolation kits isolate high purity samples in a matter of minutes, no magnets needed!"

Objective:
To understand the link between nutrition and health by investigating the affect of dietary alterations on cells of the immune system.

Kit Used:
Mouse T Cell Isolation Kit from Akadeum Life Sciences

Key Takeaway:
T Cell Purity of > 97%

Procedure:
Cells were obtained from a wild type mouse spleen. RBC lysis was performed, and following lysis, the T cell enrichment was performed according to Akadeum's protocol.

Outcome:
A highly purified population of T cells was obtained, which will allow this research group to move forward with downstream analysis of the cells with confidence.

Using Akadeum's Mouse T Cell Isolation Kit to study the affect of dietary alterations on immune cells

Get an inside look at how our products perform in real-world research that is happening in laboratories across the country. A research group at a prestigious east coast laboratory recently used the Mouse T Cell Isolation Kit from Akadeum Life Sciences in the course of their research into understanding the link between nutrition and health by investigating the affect of dietary alterations on immune cells.

Using the Akadeum Mouse T Cell Isolation Kit resulted in a highly purified population of T cells, which will allow the research group to move forward with downstream analysis with full confidence.

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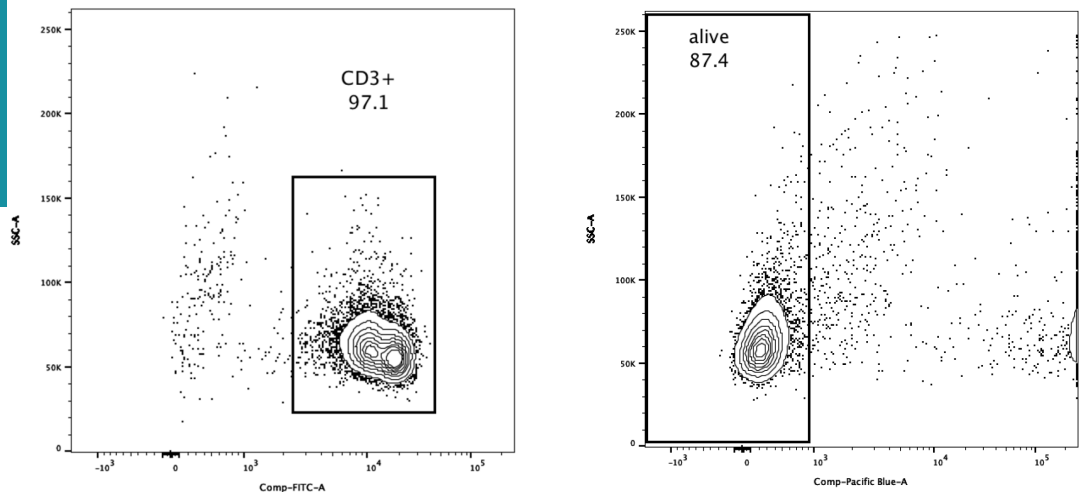

Figure 1. Results by the Numbers.
Splenocytes were obtained from a wild type mouse spleen and red blood cell lysis was performed. Following lysis, the resulting sample was enriched for T cells using Akadeum's Mouse T Cell Isolation Kit, following kit instructions. After enrichment, the sample demonstrated 97.1% purity and 87.4% viability, resulting in a highly-enriched and viable sample.

Akadeum's Mouse T Cell Isolation Kit delivers a highly enriched population of viable T cells using a protocol that is fast, easy, and gentle on cells. Ideal for processing delicate cells, Akadeum's novel Buoyancy Activated Cell Separation (BACS™) occurs directly in the sample container without exposing cells to harsh chemicals or harmful external forces like magnetic gradients from rare earth magnets.

If you are involved in cell isolation research, we'd love to hear from you! We are actively seeking new applications for our microbubble technology and would welcome the opportunity to learn more about your research and to discover if our microbubbles could help you in your work. Let's schedule a time to talk!

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Researcher Spotlight On:

Using Akadeum's Mouse T Cell Isolation Kit to study immunological processes of vaccine mediated immunity

>98%

Purity with Microbubbles

Akadeum's microbubble kit resulted in a highly-enriched population of cells

87%

Viability with Microbubbles

The microbubble protocol resulted in a large population of viable T cells

79%

Viability with Magnetics

The magnetics protocol resulted in a reduced number of viable cells

RESEARCHER SPOTLIGHT:

MOUSE T CELL ISOLATION KIT

"Use of Akadeum's gentle Mouse T Cell Isolation kit results in a high purity T cell population while retaining cellular viability."

Objective:
Successfully obtain a highly-purified population of viable T cells from C57BL/6-Tg(H2-Kb-Tcra,-Tcrb)P25ktk/J Rag+/- mice

Kit Used:
Mouse T Cell Isolation Kit from Akadeum Life Sciences

Procedure:
Splenocytes were obtained by mechanically dissociating spleens of C57BL/6-Tg(H2-Kb-Tcra,-Tcrb)P25ktk/J Rag+/- mice and filtering through a 70um nylon cell strainer. The resulting sample was enriched for T cells using Akadeum's Mouse T Cell Isolation Kit or the equivalent magnetic bead kit following kit instructions.

Key Takeaway:
In this head-to-head comparison with a magnetic bead-based protocol, the Akadeum protocol produced a more viable cell population (87% vs. 79% viability), with >98% T cell purity in the enriched sample.

Using Akadeum's Mouse T Cell Isolation Kit to study immunological processes of vaccine mediated immunity

A research group, led by Evan Scott at Northwestern University, used the Mouse T Cell Isolation Kit from Akadeum Life Sciences to obtain a high purity isolation of viable, healthy T cells from transgenic mice.

The Scott group investigates basic immunological processes to improve our understanding of the mechanisms involved in vaccine mediated immunity. With the knowledge gained, they intend to use engineering and material-based strategies to rationally design delivery systems targeting key inflammatory cell populations to either elicit or suppress immune responses in a controlled manner.

The sample preparation using Akadeum's Mouse T Cell Isolation Kit delivered an 8.66% higher population of viable cells as compared to magnetics. The final enriched sample demonstrated >98% T cell purity, providing the research team with a highly-purified sample of viable cells.

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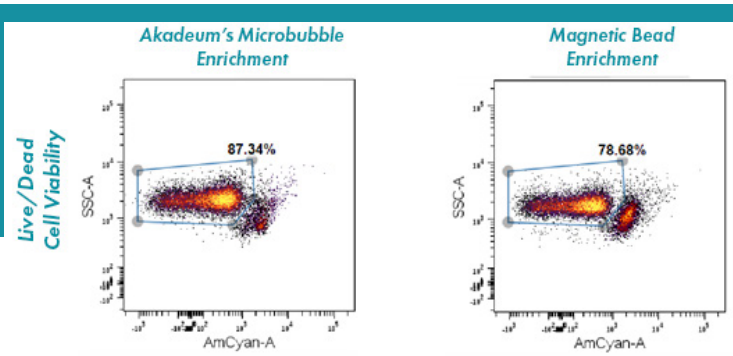

Figure 1. Head-to-Head Viability Comparison

Dot plots from flow cytometric analysis of isolated T cells. Doublets and debris were excluded prior to analysis. Akadeum microbubble enrichment resulted in 87.34% cell viability, compared to magnetic bead enrichment, which resulted in 78.68% viability. The microbubble protocol demonstrated an overall improvement of 8.66% in live cell population post-enrichment.

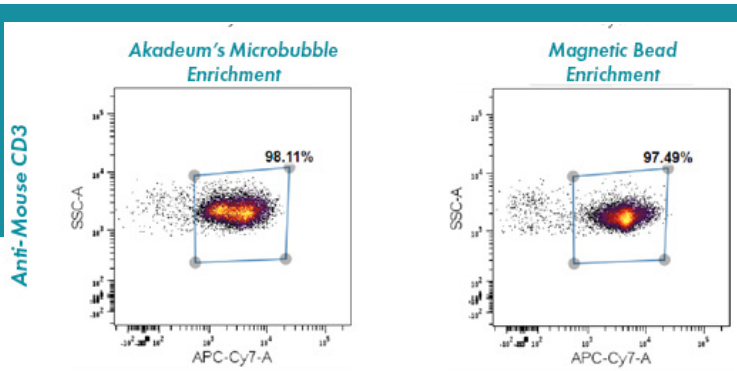

Figure 2. Head-to-Head Purity Comparison

Dot plots from flow cytometric analysis of isolated T cells. Doublets and debris were excluded prior to analysis. Of the live cells obtained post-enrichment, Akadeum's microbubble protocol delivered 98.11% T cell purity as compared to 97.49% T cell purity obtained with magnetic bead enrichment.

To accomplish their groundbreaking work, the team required cell isolation methods that yield high quality cells without sacrificing purity. The researchers were looking to obtain a highly-enriched population of viable T cells from splenocyte samples, and using Akadeum's Mouse T Cell Isolation Kit delivered! The enriched sample demonstrated an overall T cell purity of >98% while maintaining cell health and viability, with an 8.66% higher population of viable cells (87.34% viability with microbubbles as compared to 78.68% viability with magnetics).

Akadeum's Mouse T Cell Isolation Kit delivers a highly enriched population of viable T cells using a protocol that is fast, easy, and gentle on cells. Ideal for processing delicate cells, Akadeum's novel Buoyancy Activated Cell Separation (BACS™) occurs directly in the sample container without exposing cells to harsh chemicals or harmful shear forces. If you are involved in cell isolation research, we'd love to hear from you! We are actively seeking new applications for our microbubble technology and would welcome the opportunity to learn more about your research and to discover if our microbubbles could help you in your work.

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