Synthace

Uncommon ushering in a new era of sustainable food production through lab-grown meat.

Using DOE to accelerate media optimization

CASE STUDY | uncommon

About Uncommon.

Uncommon is on a mission to reduce traditional meat consumption by having a 5% share of the global pork market by 2030 and from there, to reduce meat consumption further by bringing other cultured meat products to market.

In 2050 global meat consumption will be double what it was in 2000 due to increased global population and wealth. There are many negative impacts of animal agriculture particularly the devastating environmental impact.

Challenge.

Using state-of-the-art cell culture techniques, Uncommon take a small sample of cells from an animal. They then reprogram these cells into stem cells and are able to expand these cells by feeding them a rich and animal-free growth media. When the cells have grown, they guide them to become muscle, fat, and other types of tissue to take the form of the desired meat product.

To accomplish their ambitious mission, they were looking for a solution that would enable their scientists to explore very large design spaces without the need to write code.

The team had some obstacles to overcome on their path to their goal:

1 Astronomical costs associated with commercial media.

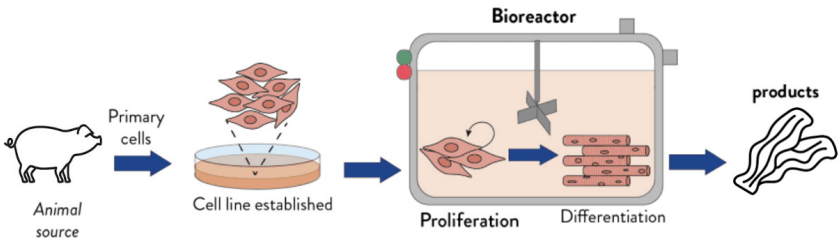
Represent at least a 100x magnitude higher cost for production and common components in these media are not appropriate for human consumption.

2 Feasibility of necessary factor screening.

Running a factor screen and associated interactions using a one-factor-at-a-time (OFAT) approach would have been impossible in the circumstances.

3 Reproducibility of experimental successes for iterative development.

Being able to repeat the results provided was a prerequisite for continued optimization of media required to direct cell growth toward a particular tissue type for future products.



While being a relatively small team, these challenges represented a fundamental obstacle Uncommon needed to overcome in pursuit of its goals.

So, the team went searching for a solution to help solve these challenges directly.

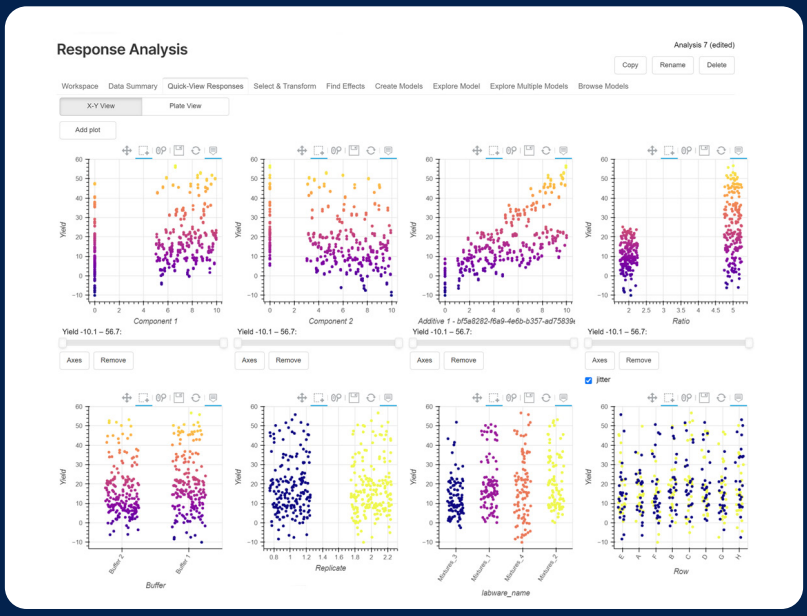
Solution.

Uncommon ultimately selected Synthace as their core experimental solution as it aligned with their vision of being able to explore large design spaces, create repeatable workflows, and automate the execution of their experiments.

Viewing the entire optimization landscape.

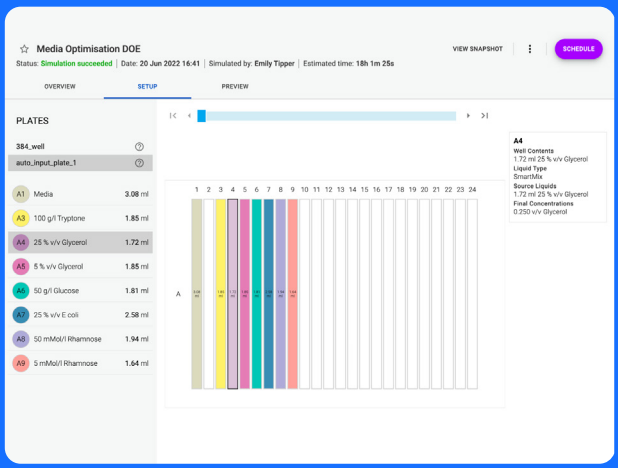
Tracking liquids can be time-consuming and difficult, even at the best of times. Synthace lets the Uncommon team define liquids, and tag components and subcomponents with rich metadata. Even during the most complex DOE workflow, they know exactly what's in each well and where it came from.

With Synthace, using fractional factorials allowed them to screen 22 factors, as well as interaction profiling, in only 320 experimental runs.

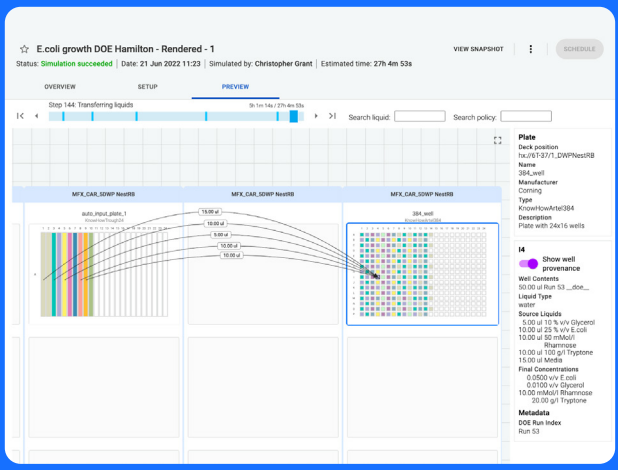


Simulating and executing complex, high-throughput experiments.

Synthace accepts and translates imported DOE design files into the complex liquid handling steps for you. There's no need for the Uncommon team to do any complex manual coding—if they've got a design file, they're able to automate their workflow through the Synthace platform.



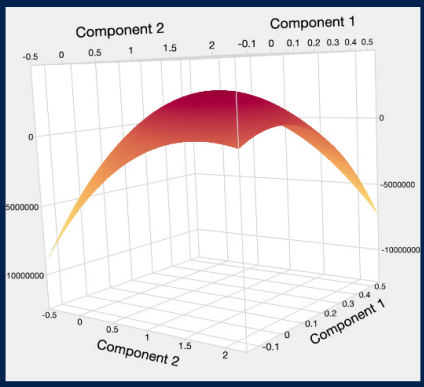
Even with trial runs, it can be difficult to know if your manual or automated protocols will result in the final well concentrations you're looking for in your DOE run. Synthace lets you preview all of this in silico beforehand, so the Uncommon team can be confident in their desired outcome before they get started in the lab.



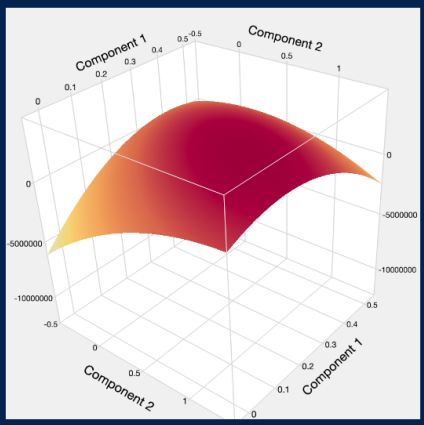
Results.

Significant time savings in the development of optimized media.

Uncommon were able to optimize cell growth and differentiation by understanding the full range of factors at play with far fewer experimental runs. This saved time and money, and helped the team move with confidence towards better results.



The broader exploration of this space using DOE on Synthace allowed them to immediately identify the true maxima within the examined factors and their interactions with one another.



Using a one-factor-at-a-time approach to this exploratory study would have been “impossible” according to Alex Rimmer.

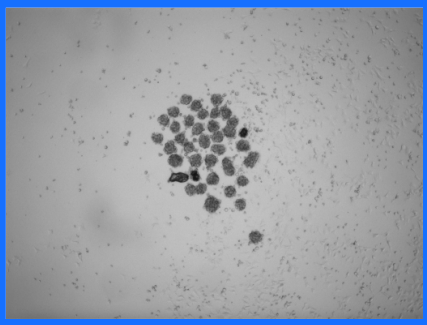
Alex estimates that without Synthace, a result they achieved in weeks would have taken 6-9 months longer–accelerating their progress towards their goal of rapid and sustainable cultured meat production.

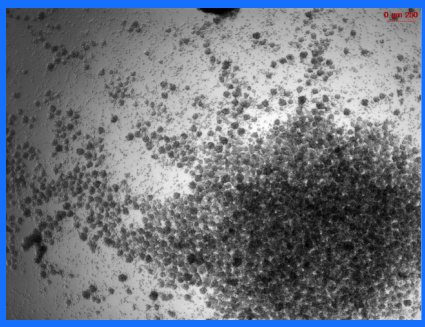
Greatly increased quality of media at a fraction of the cost.

The Uncommon team obtained a significantly increased cellular yield, and at the same time, greatly reduced their costs “by an order of magnitude.”

Initially, they were able to learn which components work for porcine cells and also learnt which suppliers worked best for them in the context of a specific cell line.

From there, applying their findings from the first approach, they were able to formulate a medium for a new cell line in a much shorter timescale–shortening their discovery phase and getting products into pipeline faster.



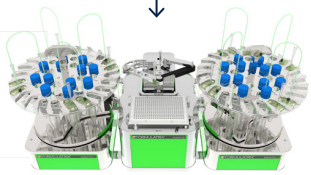


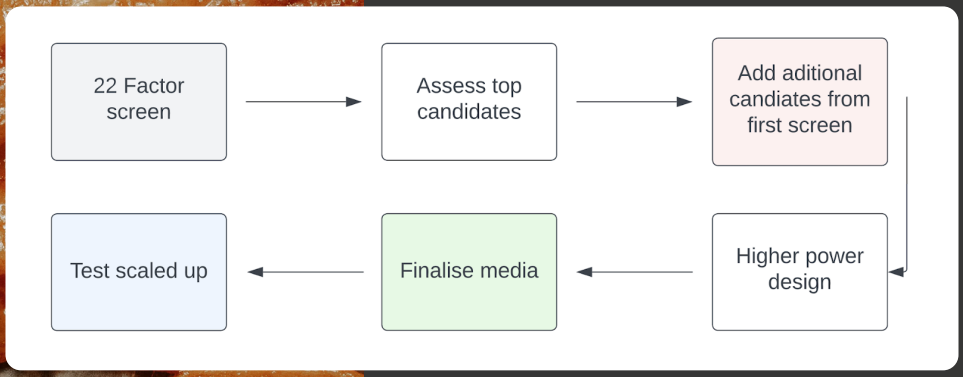
Enabled scientists to rapidly scale their planning & execution capacity.

Synthace calculates what Uncommon will be putting on their liquid handler deck for them. Plus, since it's based on an imported DOE design file, they can preview everything in advance to make planning quicker and easier–which is even more important with a constrained stock concentration.

Synthace

jmp STATISTICAL DISCOVERY





In just a few months Synthace saved me from performing 20,000 manual calculations—it's all done for me.

Alex Rimmer,
Stem Cell Scientist III,
Uncommon

Conclusion.

In 2020, Uncommon successfully cultivated pork belly and bacon–a feat never achieved before and was the first to develop a prototype containing over 70% cultivated pork muscle.

The production of the first-ever cultivated bacon and pork belly is proof that new techniques can help meet the overwhelming demand for pork products globally.

While this is a major milestone for Uncommon, who have made substantial advancements in a relatively short amount of time whilst managing cashflow, Synthace continues to assist in their mission of accelerating the development of cultured pork products.

The company is now focused on the next steps to bring a wider variety of cultured pork products to everyone's homes, and in turn reduce greenhouse gas emissions and improve animal welfare worldwide.

About Synthace.

Synthace is a cloud-based experiment platform that enables life science R&D teams to do experiments that would otherwise be impossible. It helps scientists innovate faster by executing high throughput experiments, structuring complex datasets, and allowing them to use powerful methodologies—like Design of Experiments—all within their browser.

To find out more about our platform or to book a demo please visit synthace.com.