



# Nomad Bioscience

inspired by nature & tribal wisdom

Food Antibacterials



# The Threat of contaminated food



In USA, foodborne diseases affect 50 million people yearly, with 56.000 hospitalizations, 3.000 deaths a year

The most costly and deadly pathogen accounting for 35% of hospitalizations and 28% deaths is *Salmonella*

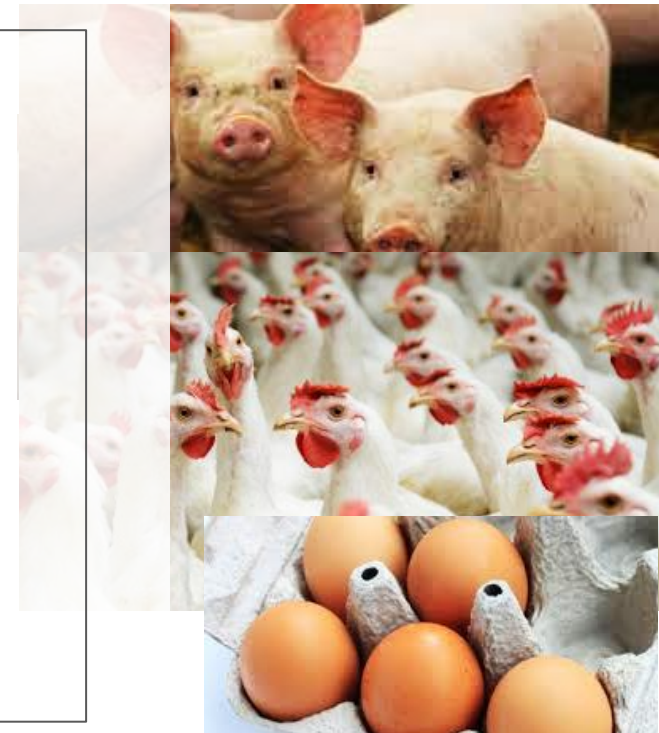
In EU - second most common pathogen and the main cause of food poisoning outbreaks

Main sources of pathogen: contaminated eggs, poultry and pig meat  
25-40% of meat sold in supermarkets contains *Salmonella*

Not declared as a food adulterant (because lack of effective control);  
antibiotics are banned in animal husbandry & processing)

<https://www.cdc.gov/foodborneburden/2011-foodborne-estimates.html>

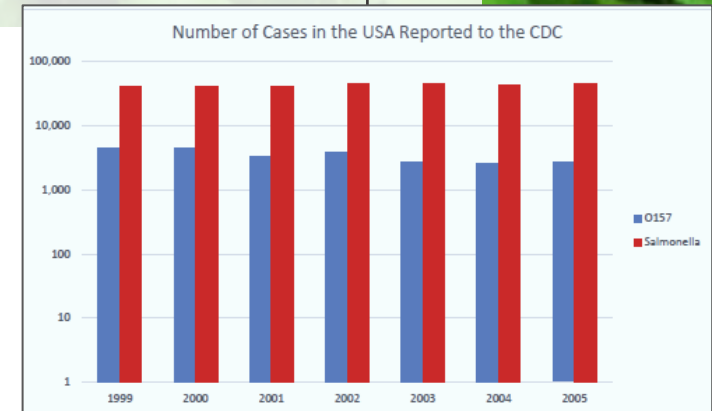
<https://www.ecdc.europa.eu/en/all-topics-z/salmonellosis-non-typhi-non-paratyphi.html>



# Imagine

if we could employ a natural non-antibiotic antibacterial protein to kill germs in our food

- removing all pathogenic bacteria in our food specifically without harming our beneficial gut microflora or changing taste, and without antibiotics
- eliminating the main cause of deaths and costly hospitalizations caused by foodborne bacteria
- Treating the food during processing or killing bad bacteria in animals prior to harvesting
- opportunity to build a high value, sustainable, novel food company



# Bacteriocins

## non-antibiotic biologics invented by nature

- Evolved by nature and used by bacteria themselves to fight related germs
- Up to one million times more active than antibiotics, completely safe for humans and animals, and easy to produce in green plants
- Highly specific, killing just one bacterial species
- Huge diversity of bacteriocins in bacterial genomes, with different mechanisms of action
- Active on all multidrug resistant bacteria



# Achievements

with 12 million in equity financing since 2011

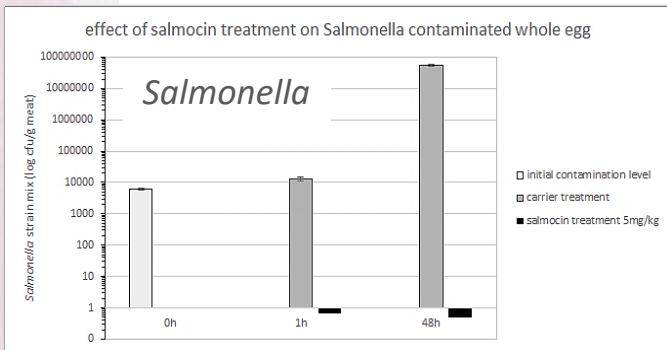
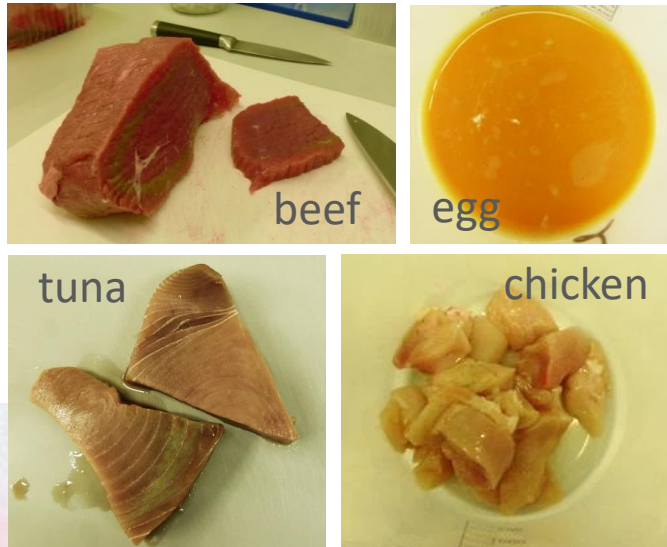
- We mined extensively bacterial genomes and identified protein candidates that:
  - are highly active against all *Salmonella* pathovars
  - are highly active against *Escherichia coli* O157:H7, 'Big Seven' pathovars
  - Have high potency *in vitro*, on food matrices and in live animals
- Five FDA GRAS registrations for bacteriocins as antibacterials in USA secured, with registration in other countries/regions ongoing
- Developed a scalable manufacturing process; conducted open field and greenhouse studies; started pilot scale production in 2021 in Spain
- Expanded dominant IP position. Filed major patents to assure broad exclusivity



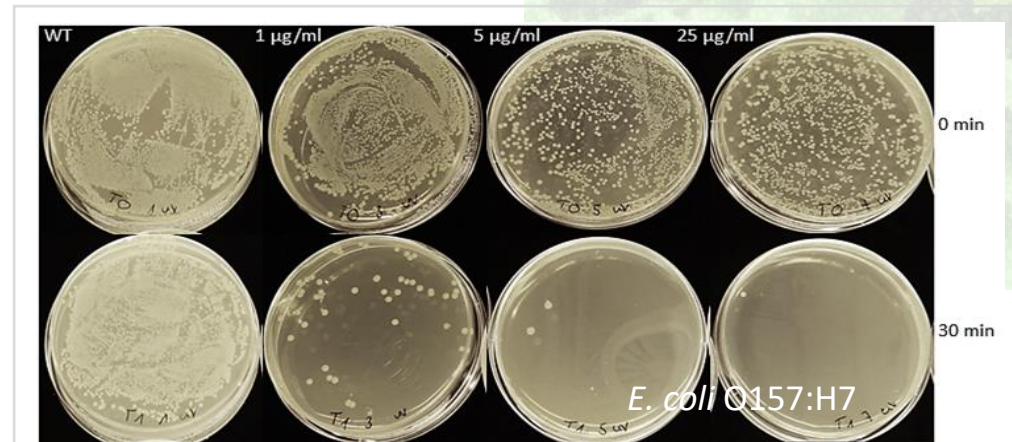
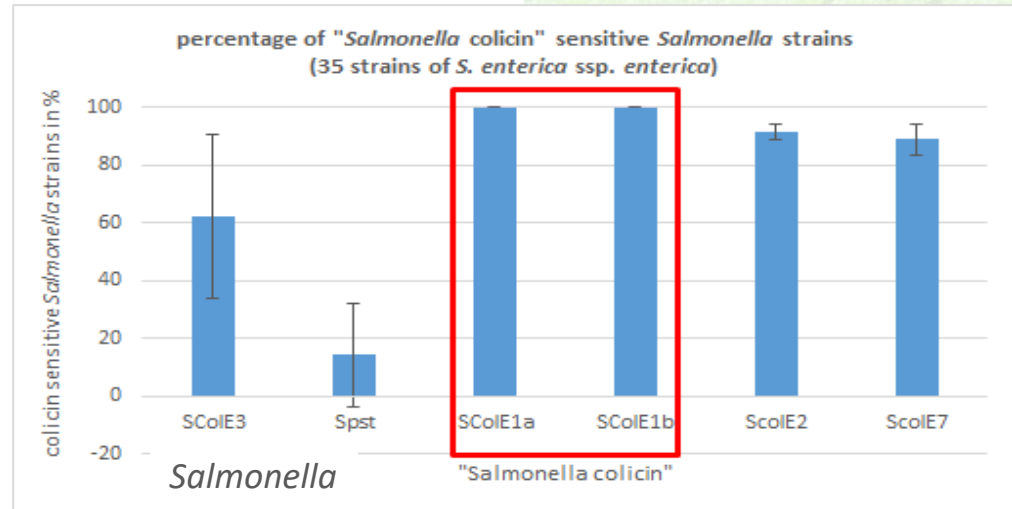
# Bacteriocins

mined and extensively researched by our scientists

tested on different food matrices



tested with all strains, *in vitro* & *in vivo*



# First-In-Class Regulatory Approvals



- GRAS ('Generally Recognized As Safe') is a regulatory approval path for food substances in USA, the largest market
- Five GRAS regulatory approvals for products secured, two in preparation
- **Products approved as food processing aids** (no need for labelling)
- Approvals for treatment of live animals (removal of bacteria before harvesting) in development
- Nomad intends to seek approvals in other important regions/countries: EU, Japan, China
- Approvals for our products in new markets (e.g. veterinary medicines) are being explored



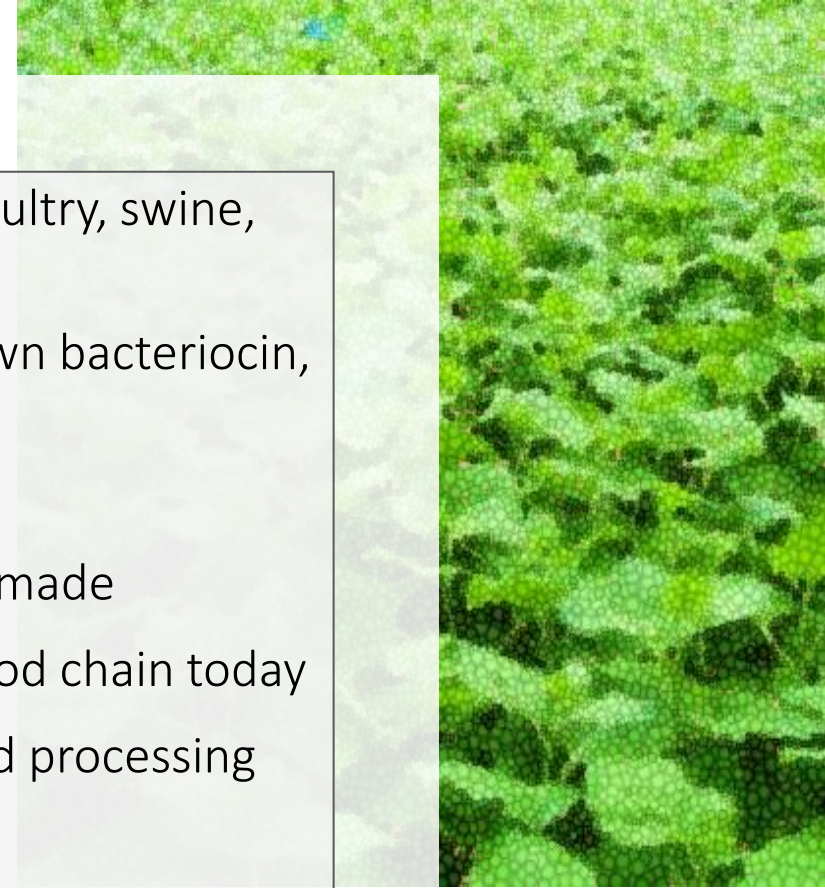
Nambawan Biotech GRAS Submissions/Acceptances\*

Product/Origin	GRAS GRN	Submission Date	Response Date
Colicins/ <i>Escherichia coli</i>	593	07/2015	12/2015 - FDA
Colicins/ <i>E. coli</i>	676	04/2018	01/2017 - USDA 05/2017 - FDA
<i>Nicotiana</i> as GRAS host	775	04/2018	10/2018 - FDA
Endolysins/ <i>Clostridium perfringens</i>	802	07/2018	04/2019 - FDA
Salmocins/ <i>Salmonella enterica</i>	824	11/2018	10/2019 - FDA 10/2020 - USDA

\*All approved bacteriocins are 'food processing aids'.  
Colicins & Salmocins also listed in USDA/FSIS Directive 7120.1

# Our Lead Product: NMW 02 Salmocin

- NMW02 for control of *Salmonella* in processing of poultry, swine, fish meat and eggs as **food processing aid**
- Natural protein, non-antibiotic, the most potent known bacteriocin, active in nanomolar concentrations
- Broadly active against **all** *Salmonella* pathovars
- Safe, doesn't damage natural gut microbiome, plant-made
- Breakthrough product: no control of *Salmonella* in food chain today
- **180 - 1.990 million potential market (USA only)** – food processing plus treatment of live animals
- **Approved in USA** by FDA and USDA

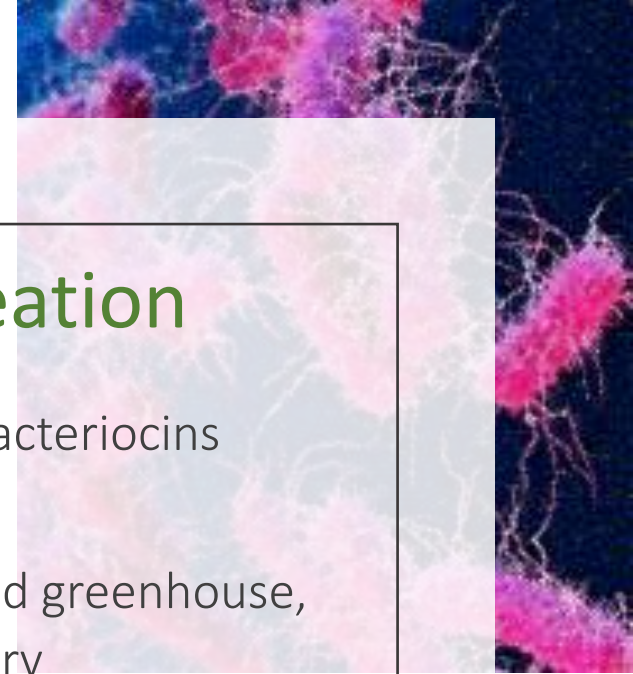




# Strategy

## match between technology and value creation

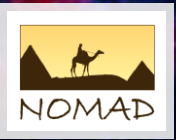
- Develop green plant hosts with economically superior high content of bacteriocins controlling *Salmonella* and *STEC Escherichia coli*
- Develop industrial versions of producer plant cultivation in open field and greenhouse, along with a scalable GMP-certified purification process, secure necessary manufacturing licenses
- Secure long-term commercial agreements with contract plant growers and CMOs for entering the market
- Continue and expand number of potential strategic clients by providing test product samples and negotiating partnership agreements; expand the team; be ready for exit through trade sale or going public



# Pilot Production

Extremadura, Spain, 2021





# Summary

NAMBAWAN is a pioneering developer, and soon, producer of natural non-antibiotic antibacterials for broad control of *Salmonella* and *Escherichia coli* in food products



State of the art green technologies with strong IP



Strong team, board and scientific advisors



Risk-hedged pipeline of approved product candidates



Opportunity for IPO or trade sale as leading food company