



***IN VITRO* ASSAYS &
SERVICE CATALOG**

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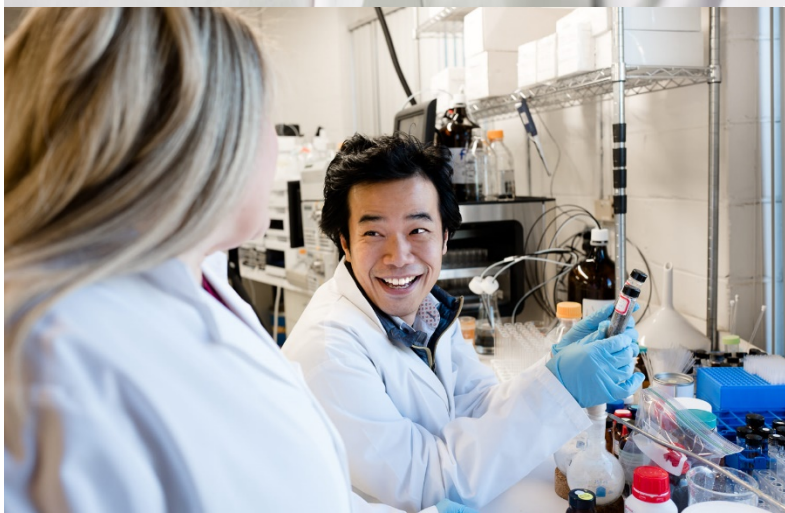
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WHO WE ARE

Signum Biosciences is a private biotech company founded in 2003 from technologies developed by Dr. Jeffrey Stock at Princeton University. With over 18 years of developing multiple ingredients and botanical extracts from discovery to fully formulated skin-care products that are on the market, Signum possesses the ability to streamline your research and product development. We specialize in producing customized claim support and dermatological efficacy testing to provide clients with robust scientific data needed to substantiate product claims and/or compare head-to-head versus competitors. We work with clients ranging from multi-national companies to virtual biotech startups, all projects are welcomed. We have highly trained scientists who can tailor a research plan to fit your requirements be it efficacy, safety, regulatory or scientific marketing. Whether you are in early discovery phase, development, clinical stage, or ready to commercialize your products, Signum can provide the following services to aid you on your product development path.

- Standard assays to determine activity profile
- Safety and regulatory support
- Customized screening
- Topical formulation development, stability, and dermal penetration studies
- Filling and packing finished products for consumer use (<2500 units)
- Scientific marketing and peer-reviewed publishing of results
- Botanical extraction, characterization, and manufacturing
- Compound synthesis and manufacturing

Signum is the solution to optimize your R&D screening, product development and customized research at a reduced cost compared to larger CRO's and CMO's. We provide superior service to differentiate your product, so contact us today. Our discussions will provide the scientific excellence and quality your product deserves.

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ASSAY CATALOG

Signum has a host of standard assays that can be performed to test your ingredient, compound, or formulated product. Below is a representative list of some of the assays we conduct regularly. We possess *in vitro* capabilities for molecular techniques including enzymatic evaluation, gene and protein expression, cell line expansion, intracellular pathway analysis using colorimetric, fluorescent, or histology-based methods.

INFLAMMATION

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
SKI-001	Human Epidermal Keratinocytes (NHEKs) or Human Reconstructed Epidermis (EpiDerm™)	TPA/PMA	Chemical irritation	Cytokine ELISA	Glucocorticoid
SKI-002		UVB	Photodamage	Sunburn Cells	Vitamin C
SKI-003				DNA pyrimidine dimers	
SKI-004				Lipid Peroxides	
SKI-005					
SKI-006	Peripheral Blood Mononuclear Cells (PBMC)	anti-CD3/CD28	T-cell activation	Th2/Th17-marker ELISA	TGF-beta
SKI-007	Human Dermal Microvascular Endothelial Cells (HDMECs)	ATP-gS	ATP inflammation	MTS Viability, Cytokine ELISA	Glucocorticoid
SKI-008		anti-microbial peptide (LL-37)	Cathelicidin		
SKI-009		Nickel sulfate	Nickel Allergy		
SKI-010	Human Epidermal Keratinocytes (NHEKs)	<i>C. acnes</i>	IL-8, IL-1b		Dexamethasone
SKI-011	Human Reconstructed Cornea (EpiOcular™)	Dry Eye	Viability, MMP9		
SKI-012	Human Epidermal Keratinocytes (NHEKs)	TPA/PMA or UVB	COX-2	ELISA	Indomethacin or Diclofenac
SKI-013	Human COX-2 Enzyme	Arachidonic Acid Substrate	COX-2 inhibition	Biochemical	

AGING

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
SKA-001	Human Epidermal Keratinocytes (NHEKs)	Cell Confluence	Epidermal Differentiation	Keratin-1, Filaggrin, Loricrin	Adapalene
SKA-002		Blue Light	Photoaging	Viability, HAS2	Vitamin C
SKA-003	Human Adult Dermal Fibroblasts (HDFs) or Human Reconstructed Epidermis (EpiDermFT™)	Basal	Extra cellular matrix expression	MMPs, Collagen, Elastin, Fibronectin,	Vitamin C, TGF-beta
SKA-004		UVA	Photoaging	Laminin	
SKA-004		H ₂ O ₂	Senescence	Histology	
SKA-006	Human Epidermal Keratinocytes (NHEKs) or Human Reconstructed Epidermis	Basal or UVB	Global Gene Expression	Gene Array	Ascorbic Acid or Retinoic Acid
SKA-007	Human Epidermal Keratinocytes (HaCATs)	Nutrient Starvation	LC3-II	ELISA	Blumilight

POLLUTANT TOXICITY

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
TOX-001	Human Epidermal Keratinocytes (NHEKs)	Urban Dust Particulate	Air Pollution	MTS Viability, Cytokine ELISA	Dexamethasone
TOX-002	Human Dermal Microvascular Endothelial Cells (HDMECs)	Cadmium	Metal Pollution		
TOX-003		Nickel			

ANTI-MICROBIAL

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
AMIC-001	<i>Cutibacterium acnes</i>	Minimum inhibitory Concentration	Anti-bacterial	Culture Turbidity, Colony counting	Doxycycline
AMIC-002	<i>Staphylococcus epidermidis</i>				
AMIC-003	<i>Staphylococcus aureus</i>				
AMIC-004	<i>Streptococcus pyogenes</i>				
AMIC-005	<i>Escherichia coli</i>				
AMIC-006	<i>Pseudomonas aeruginosa</i>				Gentamycin
AMIC-007	<i>Candida albicans</i>	TYMC	Anti-fungal	Colony counting	Fluconazole
AMIC-008	<i>Aspergillus brasiliensis</i>				Benzalkonium Chloride
AMC-009	<i>M. luteus</i>	Minimum Inhibitory Concentration	Growth Inhibition	Culture Turbidity	Doxycycline
AMC-010	<i>S. hominis</i>				
AMC-011	<i>S. warneri</i>				
AMC-012	<i>S. capitis</i>				
AMC-013	<i>S. simulans</i>				
AMC-014	<i>C. xerosis</i>				
AMC-015	<i>C. granulosum</i>				

ANTIOXIDANT

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
AOX-001	Cell-free antioxidant	H ₂ O ₂	ROS scavenging	ABTS	Vitamin C, Ferulic Acid
AOX-002	Human Adult Dermal Fibroblasts (HDFs)		Intracellular ROS	DCF-DA	
AOX-003	Low Density Lipoproteins	Fe ₂ SO ₄	Lipid Peroxidation	Hydroperoxide	
AOX-004	Microsomes	NADPH/ADP/Fe ³⁺	Membrane MDA	TBARS	
AOX-005	Human Neutrophils HL-60	fMLP/PMA	Cell Oxidative Burst	Colorimetric	

SKIN WHITENING

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
SKW-001	Cell-free Tyrosinase	Basal	Tyrosinase inhibition	Colorimetric	Kojic Acid
SKW-002	Human Reconstructed Epidermis (MelanoDerm™)		Melanin content		
SKW-003	Epidermal Melanocytes				

SKIN TANNING

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
SKT-001	Human Reconstructed Epidermis (MelanoDerm™)	Basal	Melanin content	Colorimetric	IBMX
SKT-002	Epidermal Melanocytes				

WOUND HEALING

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
WH-001	Human Epidermal Keratinocytes (NHEKs)	in vitro wound (scratch assay)	Cell Migration	Histology	EGF
WH-002	Human Dermal Fibroblasts (HDFs)				FGF

METABOLISM

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
MET-001	Human Epidermal Keratinocytes (NHEKs) or Human Reconstructed Epidermis (EpiDerm™)	Basal	Mitochondrial localization	Histology	EGF

SAFETY AND REGULATORY SUPPORT

Equally important to determining if your ingredient possesses beneficial skin properties is to ensure that it is safe when topically applied. We perform a battery of tests to ensure your ingredient possesses a safety profile adherent to industry standards and can provide regulatory support in getting your novel ingredient or extract registered with the Personal Care and Products Council for INCI designation.

CATALOG #	MODEL	STIMULUS/INDUCER	ENDPOINT	METHOD	REFERENCE
SAF-001	OECD TG 439: Human Reconstructed Epidermis (EpiDerm™)	Basal	Skin Irritation	MTT	SDS
SAF-002	OECD TG 492: Human Reconstructed Cornea (EpiOcular™)	Basal	Ocular irritation	MTT	Methyl Acetate
SAF-003	OECD TG 432: Mouse BALB/3T3 Fibroblasts	UVA	Phototoxicity	Neutral	Chlorpromazine
				Red Uptake	
SAF-004	Human Reconstructed Skin (EpiDerm FT™)	UVA	Photodamage	MTT	Chlorpromazine
SAF-005		UVB			Sun Screen
SAF-006		Infrared-A			Vitamin C
SAF-007	OECD TG 428: Skin Absorption	Basal	Dermal Penetration	Franz Cell	Vehicle

FORMULATION

A big hurdle for developing and launching new skin care products is that most CMOs require 5,000-10,000-unit MOQs, leaving those looking to enter the cosmetic space with large quantities of inventory and increased upfront costs. At Signum, we specialize in working with companies that want to start with lower MOQs to help reduce the initial financial commitment and allow for flexibility with product updates and changes.

Signum has the capabilities to develop your ingredients into any desired formulation (i.e., cream, lotion, gel, toner, serum, sheet mask) or develop a finished turn-key formulation ready for market. Along with formulation development, we perform the following tests to support the commercial launch of your product:

- Stability testing
- Compatibility testing
- Preservative Efficacy Testing (PET)
- Dermal penetration testing
- Microbiological testing
- Safety testing

At Signum we don't have MOQs. Whether you want samples of a product to share with potential investors and or prospective business partners for feedback or 1,000 to 3,000 units for your initial launch, we will work with you to start you on your path to commercial success.



CUSTOMIZED SCREENING

Standard dermatological tests, while effective in many respects, do not always provide the best path forward in characterizing the activity of your ingredient or product. Given our past experience in working to develop and commercialize cosmetics, botanical extracts, pharmaceuticals and nutraceuticals, we possess the innovative capabilities in protocol design, assay development and claim support testing to customize your research plan. With the support of our knowledgeable project management team, we can demonstrate the activity of your molecule or product by personalizing an experimental plan and assay system to produce exciting scientific data to deliver your study objectives and support your product's brand goals.

OTHER SERVICES

Signum strives to offer comprehensive services to our clients and their ingredients or products no matter what stage of development they are in. We have experience taking ingredients from discovery to market and can assist you with all steps along the way. Listed below are some of the additional services that we offer.

- Botanical Extraction
 - Signum has experience fractionating botanical extracts to identify the key ingredients driving activity and characterization. Once identified the extract can be scaled up, assessed for stability, studied analytically to set specifications, and then moved into testing with several formulation prototypes
- Scientific Marketing (manuscripts, posters, etc.)
 - Signum understands the importance of giving your product credibility and differentiation from competitors. We offer scientific writing services such as manuscripts or posters for your ingredient or product which can be submitted to present in scientific conferences or for peer-reviewed publication.
- Medicinal Chemistry and Scale Manufacturing
 - Given our expertise in Rx development and synthesizing novel compounds, we can assist your efforts in synthesizing compounds, making a series of derivatives, or scaling up your current ingredient to kilo scale. Beyond that, our Florida facility can perform large scale manufacturing to 100+ kg once your product is on the market

Early development and precise strategy can reduce costs and accelerate timelines. Contact us to learn more about all our services and how Signum Biosciences can bring maximum benefit to your development program and product.

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THANK YOU