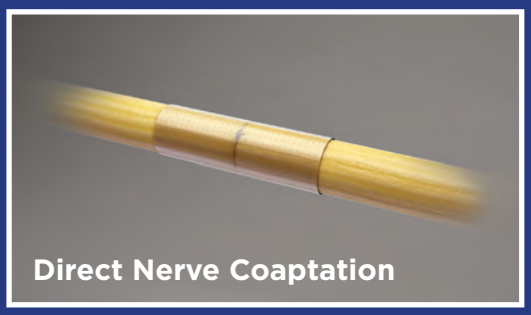
CHECKPOINT NEUROSHIELD™

CHITOSAN MEMBRANE

AN OPTIMIZED BIOMATERIAL FOR NERVE REPAIR

CLINICAL APPLICATIONS

Checkpoint NeuroShield's transparency provides surgeons clear visualization of the nerve.



CHECKPOINT NEUROSHIELD™

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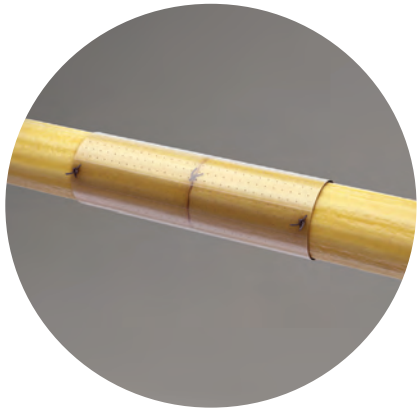
CHECKPOINT NEUROSHIELD™ is a chitosan polysaccharide membrane indicated for the repair of peripheral nerve injuries by providing a protective barrier during tissue healing.



Why Chitosan?

Chitosan, a derivative of chitin, is a natural, biodegradable polymer and is one of the most abundant organic resources on earth. Clinical and preclinical studies have shown that chitosan displays biocompatibility, biodegradability, low toxicity, and cellular compatibility, all of which are beneficial properties for neural tissue engineering.[1,2]

Anti-inflammatory[3,4]

Inhibits Fibroblast Proliferation[5]

Supports Tissue Healing[6,7]

Antimicrobial[8,17,18]

Biodegradable[7,21]

Fully Resorbs[10]

WHY PROCESSING MATTERS

An *in vitro* cell culture of chitosan membranes with a low degree of acetylation indicated selective cell adhesion, promoted Schwann cell activity and proliferation, and prevented excessive fibroblast infiltration.[6]

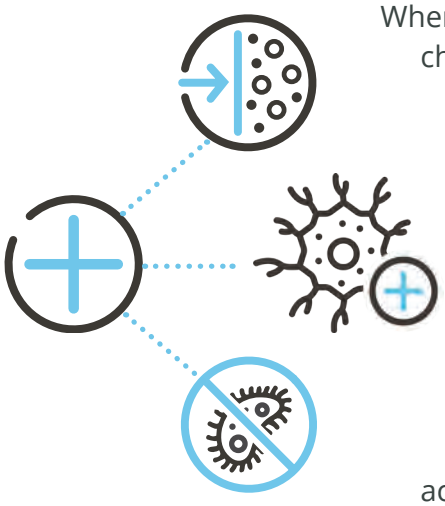
Chitosan is produced commercially by the controlled deacetylation of chitin, the most abundant marine biopolymer in nature and a major component of the shell of shrimps and other crustaceans.[6] The degree of acetylation is one of the most important chemical characteristics of chitosan processing and has a direct influence on the final product characteristics for tissue engineering applications, such as biodegradation and cellular interactions.[11,12]

Preclinical studies have shown that lower acetylated materials lead to better results in terms of increased cell adhesion and are more supportive for peripheral nerve regeneration, when compared to materials with higher degrees of acetylation.[1,12]

Checkpoint NeuroShield is processed to a degree of acetylation of 5%, which has been shown in a preclinical, *in vivo* animal model to be supportive for peripheral nerve regeneration.[1]

THE POWER OF POSITIVE

Chitosan is the only naturally occurring positively charged biopolymer.[7,16] Positive charge density is a key factor affecting the properties of chitosan for nerve repair, such as cellular adhesion and antimicrobial activity.[11]

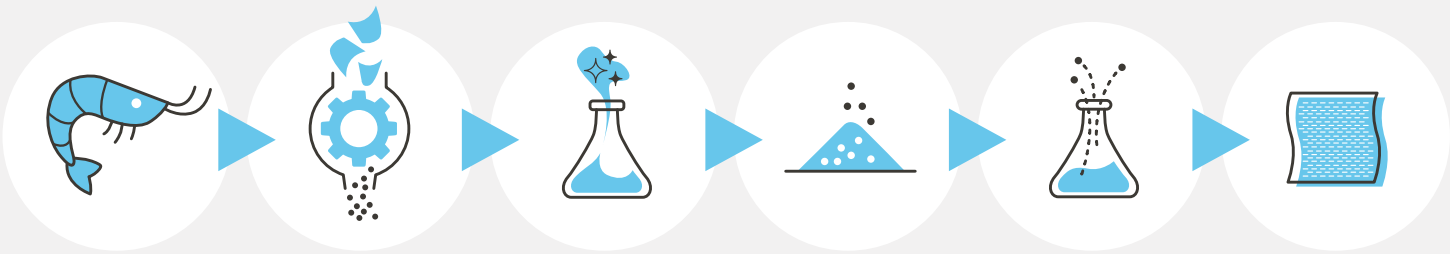


When the degree of acetylation decreases, the positive charge density of chitosan increases, thus reinforcing adhesion of fibroblasts due to its negative surface charge, considerably decreasing the proliferation of fibroblasts.[5]

Dorsal root ganglia (DRG) cell adhesion and neurite outgrowth on chitosan surfaces are affected by material characteristics, such as surface morphology, hydrophilicity, and surface charge.[12,19]

The antimicrobial activity of chitosan is influenced by several factors, such as the degree of acetylation. It is generally recognized that chitosan with a low degree of acetylation has high antimicrobial activity.[17,18]

Steps in Checkpoint NeuroShield Processing



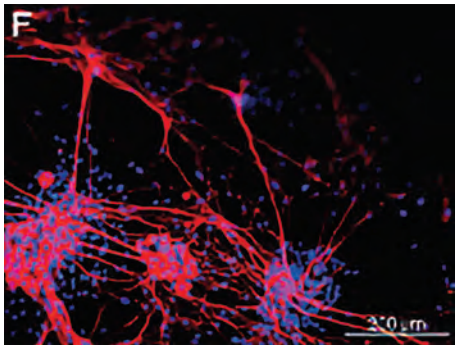
This chemical deproteinization step removes the protein component found in shellfish that commonly causes shellfish allergies.[19]

CHECKPOINT NEUROSHIELD: OPTIMIZED FOR NERVE REPAIR

Through its proprietary processing method, resulting in a degree of acetylation of 5%, Checkpoint NeuroShield has been optimized for nerve repair. In an *in vivo* animal model comparing chitosan tubes of varying degrees of acetylation, a DA of 5% was the most supportive for peripheral nerve regeneration, allowing functional and morphological nerve regeneration.[1]

Preclinical, *in vitro* studies have shown Schwann cell viability, migration, and proliferation on chitosan membranes, particularly those with a low deacetylation.[6,12,14-15]

In a rat median nerve model, Checkpoint NeuroShield supported nerve fiber regeneration and functional recovery of neuromuscular function 12 weeks after median nerve damage.[13]



Immunofluorescence of rat primary dissociated dorsal root ganglia (DRGs) axonal outgrowth when seeded on plain chitosan films.[14]

Clinical Evidence

In a clinical study, the use of Checkpoint NeuroShield as a neuroprotective barrier resulted in a statistically significant improvement in recovery compared to the control group.[20]

SAFE

No sign of intolerance or allergic reaction[20]

EFFECTIVE

Effective neuroprotective barrier[20]

EASY TO USE

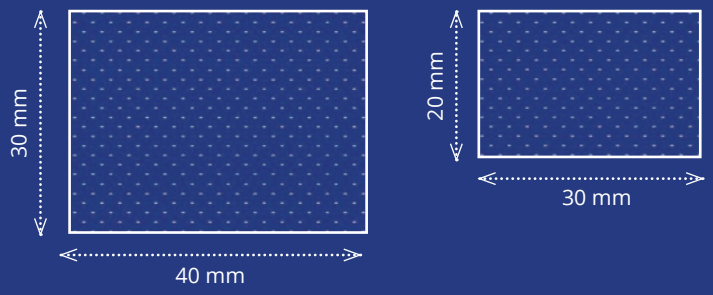
Length, difficulty, and complication rate of the "standard" procedure was not compromised[20]

ORDERING INFORMATION

Product name:
CHECKPOINT NEUROSHIELD™

Item numbers:
NS4030 | NS3020

Sizes:
40 x 30 x 0.03 mm
30 x 20 x 0.03 mm



INDICATIONS FOR USE

CHECKPOINT NEUROSHIELD™ is indicated for the repair of peripheral nerve injuries in which there is no gap or where a gap closure can be achieved by flexion of the extremity. Checkpoint NeuroShield nerve membranes are designed exclusively for single use. Allergic reactions to implanted products containing chitosan are not yet known. However, since chitosan is derived from shellfish, individuals with known shellfish allergies should exercise caution in the use of any product containing chitosan. As with all procedures carried out on peripheral nerves, there is a risk of the nerve not regenerating. Please see Instructions for Use for complete product specifications, indications, contraindications, precautions, and warnings.

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4030-MKT-007-D