



Comparison between OX and Botiss Products

Feature	OsteOXenon	Cerabone	Comment
Deantigenation process	Enzymatic, low temperature (37°C)	Thermal, high temperature (600°C)	<p>The thermal process alters the surface of the bone. Cells can not adhere over it properly. For this reason Cerabone is scarcely resorbable.</p> <p>On the other hand the enzymatic process is mild (normal body temperature): the surface of the bone is not altered and cell adhesion is ok. This means OX will be reabsorbed at a physiological rate</p>
Resorption time	Physiologic (6 to 12 months)	Not physiologic (at 10 years about 5-10% material still present)	With Cerabone a real regeneration (i.e. achieving again the bone of the patient, and the patient's bone only) is not possible. OX allows to do that. Grafting OX implants will be placed, or finally will be surrounded, only by vital, functioning bone.
Bone (natural) collagen	Present	Absent	<p>The thermal method destroys everything, comprising natural bone collagen. Cerabone has no bone collagen. OX preserves bone collagen unaltered. This means:</p> <ul style="list-style-type: none"> a) better mechanical qualities b) better biological qualities
Mechanical properties	Normal physiologic mechanical strength	Very fragile	Since it has no bone collagen, Cerabone is very fragile. It can not be manufactured as resistant-to-load blocks but as granules only. OX, instead, has the natural resistance of natural bone and can be manufactured as tough, resistant blocks.
Biological properties	Normal cell adhesion on material	Impaired cell adhesion	Since it has no bone collagen, Cerabone can not be recognized by cells. Osteoxenon, instead, can. The remodeling is much more physiologic.
Formats	Many formats (comprising flexible sheets)	Only granules	Due to the production process, OX bone substitutes can be manufactured in many different sizes and formats. Cerabone has no mechanical resistance and can be manufactured only as granules or a mixture between granules and collagen, in shape of block, that yet is not a real block.

Feature	OsteOXenon	Maxresorb – Maxresorb Injectable	Comment
Deantigenation process	Enzymatic, low temperature (37°C)	Not-deantigenic, since synthetic	Synthetic molecules, like the ones that make Maxresorb, are a compromise between cheap production price and mimicking the natural behavior of natural bone. Maxresorb is made of “60% hydroxyapatite (HA) and 40% beta-tri-calcium phosphate (β -TCP) results in two mineral phases of activity: it supports the formation of new vital bone and maintains the volume and mechanical stability”: that is to say there is a part that resorbs in a fast way (too fast: β -TCP) and for that reason a second, nearly not resorbable phase, was added (HA) just to find a compromise. OX material, instead, has a biological physiological behavior.
Resorption time	Physiologic (6 to 12 months)	Not physiologic (two components with different behaviour)	The resorption properties of Maxresorb are not physiological nor natural: one component (β -TCP) is partially dissolved by water, the other one (HA) is scarcely recognized by osteoclasts. OX, instead, is perfectly recognized by osteoclasts and osteoblasts and behaves in a physiological way when grafted.
Bone (natural) collagen	Present	Absent	Since Maxresorb is synthetic natural bone collagen is obviously absent, and all the biological properties that collagen gives to natural bone are totally lost. OX preserves bone collagen unaltered. This means: a) better mechanical qualities b) better biological qualities
Mechanical properties	Normal physiologic mechanical strength	Very fragile or unnatural	Since it has no bone collagen, Maxresorb has quite different mechanical properties than natural bone. OX, instead, has the natural resistance of natural bone and can be manufactured as tough, resistant blocks.
Biological properties	Normal cell adhesion on material	Impaired cell adhesion	Since it has no bone collagen, Maxresorb won't be recognized by cells. Osteoxenon, instead, can. The remodeling is much more physiologic.
Formats	Many formats (comprising flexible sheets)	Only granules	Due to the production process, OX bone substitutes can be manufactured in many different sizes and formats. Maxresorb has low resistance and can be manufactured only as granules or a mixture between granules and collagen, in shape of a cylinder, that yet is not a real solid material.

Feature	OsteOXenon	Perossal	Comment
Deantigenation process	Enzymatic, low temperature (37°C)	Not-deantigenic, since synthetic	Synthetic molecules, like the ones that make Perossal, are a compromise between cheap production price and mimicking the natural behavior of natural bone. Perossal is made of "nano hydroxyapatite (HA) and calcium sulphate (β - that is to say there is a part that resorbs in a fast way (too fast: calcium sulphate) and for that reason a second, nearly not resorbable phase, was added to give stability. It is not clear why the presence of these two materials should allow for a controlled antibiotic release. OX material, instead, has a biological physiological behavior and can, of course, added with antibiotics as all grafting materials.
Resorption time	Physiologic (6 to 12 months)	Not physiologic (two components with different behaviour)	The resorption properties of Perossal are not physiological nor natural because its main component totally dissolved by water. OX, instead, is perfectly recognized by osteoclasts and osteoblasts and behaves in a physiological way when grafted.
Bone (natural) collagen	Present	Absent	Since Perossal is synthetic natural bone collagen is obviously absent, and all the biological properties that collagen gives to natural bone are totally lost. OX preserves bone collagen unaltered. This means: a) better mechanical qualities b) better biological qualities
Mechanical properties	Normal physiologic mechanical strength	Very fragile or unnatural	Since it has no bone collagen, Perossal has quite different mechanical properties than natural bone. OX, instead, has the natural resistance of natural bone and can be manufactured as tough, resistant blocks.
Biological properties	Normal cell adhesion on material	Impaired cell adhesion	Since it has no bone collagen, Perossal wont' be recognized by cells. Osteoxenon, instead, can. The remodeling is much more physiologic.

Feature	OsteOXenon	Maxgraft	Comment
Deantigenation process and features	Enzymatic, low temperature (37°C)	Doesn't undergo a deantigenation process, since human (scarse antigenic properties)	The main problem with human bone is its scarce availability, and therefore the very high price it is sold. OX bone has the same features, and a quite lower price. Moreover, at the present time, there are no known diseases transmittable from horse to humans.
All other features	Physiologic (6 to 12 months)	Physiologic (6 to 12 months)	Same, but Maxgraft costs more.