



Medical



LaparoShield
Laparoscopic Smoke
Filtration System

The risks of surgical smoke

The use of lasers and electrocautery equipment during surgery leads to the generation of surgical smoke, containing potentially hazardous chemicals and particles, including viable cells and viruses.

Even a short exposure to laser smoke during minimally invasive surgery has been reported to lead to changes in the biochemical conformation of haemoglobin in patients. The fact that operating room personnel have a chronic exposure to these substances is of concern.¹

Although the chemical and physical composition of laser smoke is not yet fully understood, the substances and organisms identified so far suggest that it is prudent to regard surgical smoke as potentially hazardous.

Odour and mutagenic chemicals

Having to endure the noxious odour of surgical smoke is part of working in a modern operating room. In addition to being annoying and unpleasant, this odour is an indication of the chemical contents of the smoke, arising as by-products from the burning of proteins and lipids when using laser or electrosurgical instruments.^{2,3} In addition to possible long term effects, these chemicals may cause headaches, as well as, irritation and soreness in the eyes, nose, and throat.²⁻⁵

Some of these chemicals are listed below:

Chemicals in surgical smoke

Acrolein	Butene	Ethyl benzene	Methane	Propene
Acetonitrile	3-Butene nitrile	Ethylene	6-Methyl indole	Propylene
Acrylonitrile	Carbon disulfide	Ethynyl benzene	2-Methyl propanol	2-Propylene nitrile
Acetylene	Carbon monoxide	Formaldehyde	3-Methyl butenal	Pyridine
Alkyl benzenes	Creosols	Furfural	2-Methyl furan	Pyrrole
Benzaldehyde	1-Decene	Hexadecanoic acid	4-Methyl phenol	Styrene
Benzene	2,3-Dihydro indene	Hydrogen cyanide	Methyl pyrazine	Toluene
Benzo nitrile	Ethane	Indole	Phenol	1-Undecene
Butadiene	Ethene	Isobutene	Polyaromatic Hydrocarbons	Xylene

Viable viruses

As more medical professionals become aware of the dangers of exposure to Human Immunodeficiency virus (HIV) and Hepatitis B virus (HBV), a number of studies have been conducted to examine viral viability in electrocautery and laser smoke.

There are numerous examples of viable virus being identified in CO₂, ER:Yag, ND:Yag laser and electrocautery smokes generated at a range of power settings.⁶⁻¹¹ HIV RNA contained in laser smoke generated by a CO₂ laser may remain intact for up to 14 days.⁶

As CO₂ laser surgeons have a high incidence of nasopharyngeal lesions, the inhalation of laser plume increases their risk of acquiring nasopharyngeal warts through inhalation of laser plume which contains viable Human Papilloma virus (HPV)¹². Laryngeal papillomatosis has been linked in an ND: Yag laser surgeon to virus particles in laser plume from one of his patients.¹³

Viable cells

Numerous researchers have demonstrated that intact cells and blood components are aerosolized by lasers and ultrasonic scalpels.^{10,14-19}

Liberation of cells in the process of performing laparoscopic surgery has been considered as the cause for tumor growth at the port sites (port-site metastasis). Metastases have been documented at port sites remote to the removal area of the cancerous tissue.^{10,20-27}

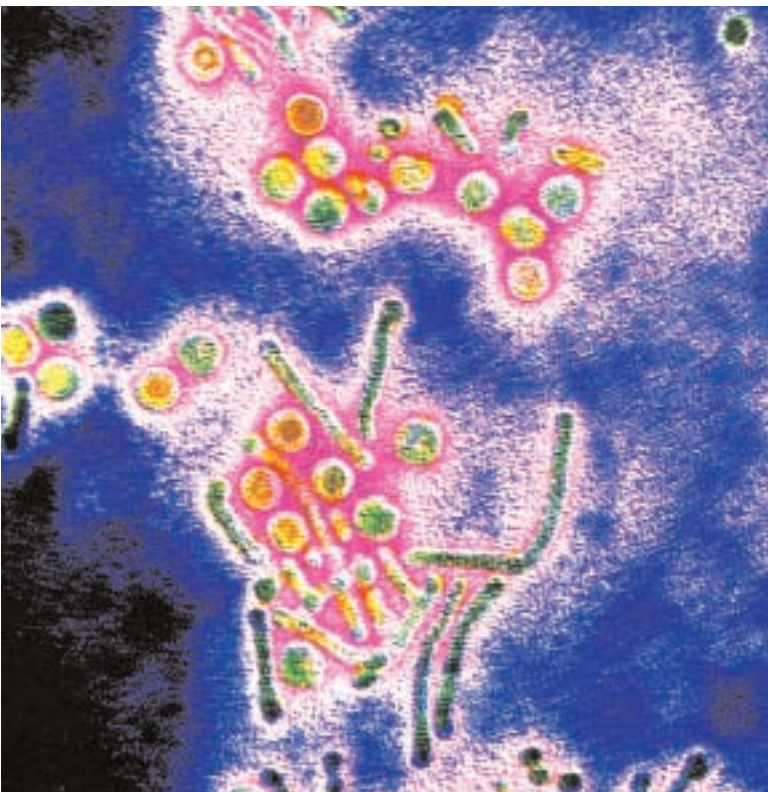


Small particles

Particles in the size range of 0.5 - 5.0 μm are considered as "lung damaging dust" because they can penetrate to the deepest regions of the lung.

In CO₂ laser plume and electrocautery smoke particles in the size range of 0.07 to 25 μm have been reported.^{28,15,16}

In animal experiments the presence of these particles caused congestive interstitial pneumonia, bronchiolitis, and emphysema.^{10,20,27}



Poor vision

Waiting for surgical smoke to clear, for a better view of the surgical site, can cause time consuming delays. Additionally, these phases of poor vision can be distracting to the surgeon during procedures.

The Pall *LaparoShield* Laparoscopic Smoke Filtration System

Patient and staff protection

The **Pall *LaparoShield*** allows safe and rapid evacuation of smoke throughout the surgical procedure. It minimises patients' and staff's exposure to potentially harmful surgical smoke.

Removing chemical contamination

The **Pall *LaparoShield*** contains an activated carbon absorbent. By removing volatile compounds from the smoke it protects against the risks from irritants and carcinogens and reduces the annoying odour.

Removing particulate contamination

The **Pall *LaparoShield*** is a high efficiency particle filter and retains >99.999% of particles at a 0.02 μm diameter (MS-2 virus), which are not retained by surgical masks^(29 - 31).

Removing viable bacteria, viruses and cells

The **Pall *LaparoShield*** removes >99.999% of bacteria, viruses and cells from surgical smoke reducing the risk of surgical staff acquiring bacterial and viral infections.

Ease of use

Easy and safe to attach

The universal luer lock connector allows for a leak-free connection to the trocar. The rotating hub prevents twisting of the tubing during connection.

Ready to use

With its double peel-pouch sterile packaging the *LaparoShield* can be easily presented into the sterile surgical field.

Easy to use

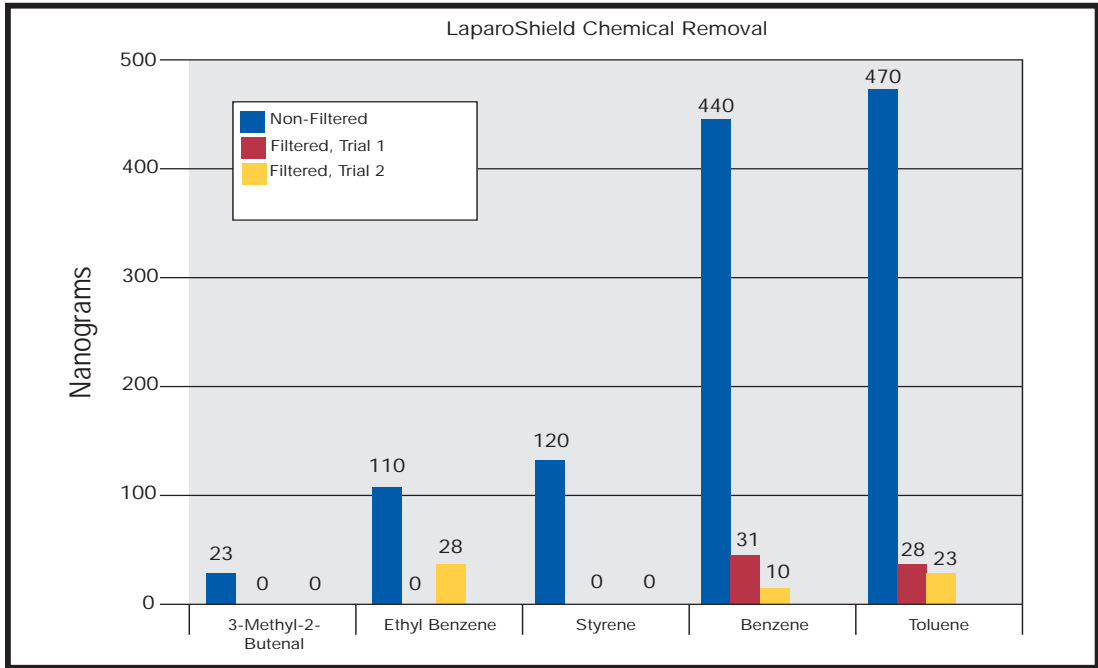
The **Pall *LaparoShield*** uses the overpressure in the patient's peritoneum to evacuate the surgical smoke. Additional electrical equipment is not needed.

Flexible

The tubing and housing of the **Pall *LaparoShield*** are made of flexible materials which facilitates its easy use in the clinical setting.

Maintain continuity of surgical procedures

Desufflation flow can be adjusted using the *LaparoShield* roller clamp thus allowing a constant gas flow to flush the peritoneum during procedures that require the extensive use of electrocautery or laser equipment. By avoiding intermittent flush steps to obtain clear vision the effective working time can be increased during the procedure.



Results of internal Pall Medical testing.
Smoke generated using electrocautery on beef liver.

Control: amount of chemical in smoke after 60 seconds of cautery and no filter.
 Trial 1: amount of chemical after filtration of smoke generated in 60 seconds of cautery.
 Trial 2: amount of chemical after filtration of smoke generated in 180 seconds of cautery.

Ordering Information

Description	Reorder No.	Packaging
LaparoShield Laparoscopic Smoke Filtration System	LSF1	10 per case Individually packaged sterile



References

- Ott DB. *OR Manager*. 1994;10:19.
- Ball K. *Today's Surg Nurse*. 1996;18(5):16-21.
- Ulmer B. *Minim Invasive Surg Nurs*. 1996;10(1):2-4.
- Lobraico RV et al. *Journal of Laser Applications*. 1988 Fall;6-8.
- Hoglan M. *Canadian Operating Room Nurs J*. 1995;13(4):10-16.
- Baggish MS et al. *Lasers Surg Med*. 1991;11(3):197-203.
- Sawchuk WS et al. *J Am Acad Dermatol*. 1989;21(1):41-9.
- Matchette LS et al. *Laser Surg Med*. 1993;13(1):18-22.
- Walker NPJ et al. *Lasers in Surgery and Medicine*. 1986;6:84-6.
- Ziegler BL et al. *Lasers Surg Med*. 1998;22(1):37-41.
- Garden JM et al. *Clin Inves*. 1988;259(8):1199-1202.
- Gloster H, Roenigk R. *J Am Acad Dermatol*. 1995;32(3):436-41.
- Hallmo P, Naess O. *Eur Arch Otolaryngol*. 1991;248:425-7.
- Champault G et al. *British Journal of Surgery*. 1996;84:993-5.
- DesCoutaux JG et al. *Surg Endosc*. 1996;19:152-8.
- Heinsohn P et al. *Applied Occupational Environ Hyg*. 1991;6(9):773-6.
- Fletcher JN et al. *Am J Surg*. 1999;178(1):57-9.
- Nduka CC et al. *Surg Endosc*. 1998;12(8):1031-4.
- Oosterhuis JW et al. *Cancer*. 1982;49(1):61-7.
- Cavina E et al. *Surg Endosc*. 1998;12:1294-6.
- Kim SH et al. *Surg Endosc*. 1999;13:821.
- Lee SW et al. *Dis Colon Rectum*. 1999;42(3):319-26.
- Martinez J et al. *Int Surg*. 1995;80(4):315-21.
- Savalgi RS. *Semin Surg Oncol*. 1998;15(3):189-93.
- Textler ML et al. *Surg Endosc*. 1998;12:1297-9.
- Wang PH et al. *Gynecol Oncol*. 1999;72(1):38-44.
- Tseng LN et al. *Surg Endosc*. 1998;12(1):1377-80.
- Nezhat C et al. *Surg Med*. 1987;7:376-82.
- Baggish MS, Elbakry M. *Am J Obstet Gynecol*. 1987;156(5):1260-5.
- Wenig BL et al. *Lasers Surg Med*. 1993;13(2):242-5.
- Chen CC, Willeke K. *Am J Infect Control*. 1992;20:177-184.

Specifications

Flow rate	up to 12 L/min @ 15mmHg. adjustable with roller clamp
Bacterial/cellular filtration efficiency	>99.999%
Viral filtration efficiency	>99.999%
Inlet Fittment	Male luer lock with rotating hub
Packaging	Double pouch, sterile
Application	Single patient



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