# Lesson 4

- Pulsing and contra indications

PBM lasers can be

- continuous
- pulsed
- superpulsed

# Pulsing

1. ”Chopping” = on/off

2. Superpulsing
- peak power
- average power

Chopping means that the continuous beam is turned on and off by a mechanic or electronic device. This means that the energy is reduced in accordance with the number of pulses and the length of the ”off” mode.

The superpulsed lasers have very high ”peak power”. This is in the watt range, but only for the very brief peak (100-200 nanoseconds). What counts is the average power. Depending on the number of pulses per second and the pulse length, the average power generally becomes between 0.1 – 100 mW. Low number of pulses = low average power; highest number of pulses = maximun average power.

Some pulsed laser, but few, can present a constant average power over all frequencies.

The GaAs laser (904 nm), for instance, needs pulsing to avoid load on the diode.
Very strong lasers also need to be pulsed for this reason: heat dissipation.
Modern strong GaAlAs diodes are often ”switched”, a different mode of pulsing.

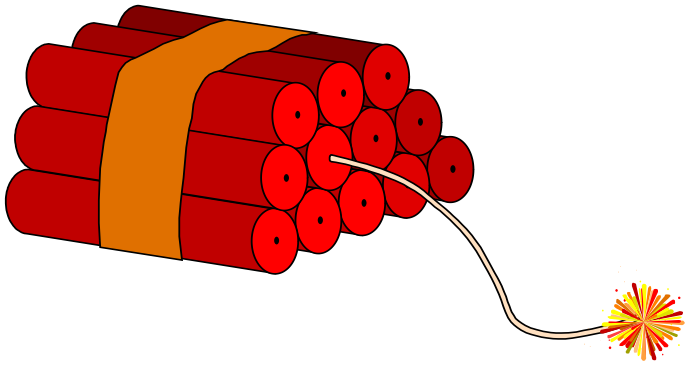
From in vitro studies, it seems that pulsing has a biological effect. ”Frequencies” are very popular in some alternative circles. But the fact is that we hardly know anything about these effects. Is 246 Hz better than 5673 Hz? And if so, for which conditions? And the possible effect of superpulsing and ”chopping” must be different.

Hashmi JT, Huang YY, Sharma SK, Kurup DB, De Taboada L, Carroll JD, Hamblin MR. Effect of pulsing in low-level light therapy. Lasers Surg Med. 2010;42(6):450-466.

# Contra indications?

# Absolute contra indications of Low Level Laser Therapy

**None!**



# Relative contra indications for Low Level Laser Therapy

- Epilepsy (visible pulsing beam only)
- Cancer tissue (for legal reasons)
- Light sensitivity (but actually unproven for wavelengths above 600 nm)
- Pregnant women (commons sense/legal issues /"forbidden acupuncture points")
- Patients with hereditary coagulation disorders (until we know more)

# Other *relative* contra indications

- **Infected areas where laser can cause increased blood flow and increased spread of infection**
- **Undiagnosed conditions**

# Nonsense contra-indications of Low Level Laser Therapy

- patients with pacemakers
- diabetes
- prior to radiation therapy

- Pacemakers are not influenced by light.
- Diabetic side effects such as non healing wounds are a strong indication for PBM.
- The cell protective effect of PBM in combination with radiation therapy was discovered in 1964.

# Rare side effects of PBM

- **Tiredness (accumulated lack of rest due to pain?)**
- **Temporary increased pain in chronic conditions (a chronic condition is converted into an acute condition)**

These two side effects are rare but patients should be informed. Such peaks indicate that the patient is a good responder. The condition may last for 12-24 hours and then drop below baseline.