How To Choose an IPL

There are many Intense Pulsed Light systems available on the market. Deciding which system to purchase can be very confusing, so you must first know what you are looking at and what really matters in terms of delivering an effective treatment. No matter what you are told by a salesperson, the difference between one IPL to the next is not an intangible concept. It can be determined by you with even the small amount of information presented in this document. This is not meant to say that all IPL systems are able to deliver acceptable results. Of course there are systems that are more effective than others and there are some with very limited capabilities.

An IPL system is basically an intense flash bulb, energized by a power source, all controlled by software on the system's computer. The computer sends a signal to the power supply of the system, which generates the electrical energy levels required by the software program on the computer, and releases it to the flash bulb. The power supply is the most expensive assembly within these devices and is the key component of all IPL systems. The quality of the power supply can be evaluated by learning how an IPL works (as you will read in this document). The components within an IPL are mostly made by 3rd parties/other companies (i.e. the flash lamp is made by a light bulb company, not by the IPL manufacturer), so the difference from one to the next may only be the outside case and the software program. If you keep these facts in mind, shopping for an IPL will be much less intimidating and confusing.

The majority of the IPL systems on the market deliver a broad-spectrum light in the wavelengths of around 450nm to 1000 or 1200nm (nanometers). This is the wavelength specification of the flash bulb combined with the IPL system's filtering technology. All IPLs on the market deliver a wavelength spectrum that is very similar and the difference between the wavelengths of one IPL to another is minimal. Because these systems are computer based, do not be swayed by the companies who say they have been around the longest and have the most proven technology: look at the computer industry and ask yourself if today's computer engineers aren't better at improving past technologies. Reverse engineering is currently a common practice in all segments of technology; improvements are made continuously in every type of computer-based product made today. Also, almost all of the electronic components that make up any IPL system are the same components used in all the others. However, that is where the similarities can end. By understanding the way they work, you will be better able to decide which system will be the best for your business.

What is the difference between a laser and an IPL (Intense Pulsed Light) system? A laser produces a specific wavelength of light energy delivered in one pulse, while an IPL produces a broad-spectrum light that is delivered in multiple pulses. The broad-spectrum light will treat a much wider range of skin conditions than a specific wavelength light. However, since the specific wavelength light can target a specific tissue abnormality, it can be much more effective on that particular condition and reduce the possibility of damage to the surrounding tissue. A broad-spectrum light IPL system can perform a wide variety of treatments more than adequately, while a specific wavelength laser can perform a few treatments exceptionally. An IPL typically has a lower price tag than a laser.

Understanding how Intense Pulsed Light (IPL) Systems work. An IPL system delivers a series of light pulses from a powerful flash bulb. This flash bulb is capable of delivering a very high level of light energy and this energy is absorbed by the skin at different levels of intensity based on the pigmentation of the tissue. You may have already experienced the concept behind a light-based system: If you wear dark colored clothes in the hot sun you will get very warm, while light or white colored clothes help you stay cooler. Light colors tend to reflect light

energy, while darker colors absorb light energy. The more light energy an object absorbs, the warmer that object will get. In an aesthetic treatment, darker colored tissue, such as the pigment in a hair follicle or the pigment in an age spot, will absorb more light energy than the surrounding, lighter colored tissue. As the amount of absorbed light energy increases, the level of heat rises, resulting in damage to those pigmented cells. Selective Photothermolysis is the theory behind all light based medical aesthetic equipment: using light energy, which is converted to heat, to selectively damage specific cells in the tissue.

Intense Pulsed Light systems are unique in the way they deliver light energy to the skin. A laser will deliver one pulse of a specific wavelength of light while an IPL will deliver numerous pulses of a broad-spectrum wavelength of light. Just as the name "Intense Pulsed Light" indicates, the light flashes are intense and pulsed; meaning the system delivers a very strong flash of light (commonly referred to as a "shot") to the skin and that "shot" is made up of multiple flashes, called pulses, within that one "shot". Those pulses are delivered in very rapid succession, so fast that the naked eye can barely detect those individual flashes/pulses within the "shot". The amount of time the light is pulsed "on" then "off" and also the time between each of the pulses is measured in milliseconds (thousandths of a second). The reason the light is pulsed is a simple concept. Darker colored tissue will absorb more light energy than lighter colored tissue and, as the tissue absorbs light energy, the temperature in that tissue will rise. That means darker colored tissue will get hotter than lighter colored tissue when exposed to the same level of light energy. Additionally, the hotter a tissue gets, the longer it will take to cool down. Light colored tissue will cool faster than dark colored tissue after both have been exposed to the same level of light energy. The time it takes for tissue to cool is called its "thermal relaxation rate". Lighter colored tissue has a shorter thermal relaxation rate than darker colored tissue. An IPL system utilizes the combination of the light energy absorption rates of the different tissues along with their thermal relaxation rates to achieve the desired results.

To better understand this concept, as an example, let's say we were using an IPL to perform hair removal on a patient with white skin and black hair and we set up the system to deliver a "shot" that consists of 3 pulses. When the trigger is pulled (or the foot switch is pressed), the "shot" will deliver all 3 pulses in what appears to be one intense flash because the 3 pulses turn on and off in very rapid succession. Pulse #1 will turn on for a few milliseconds, causing an increase in the temperature of both the black hair follicle and the surrounding white skin. However, the temperature in the follicle will be much higher than the surrounding tissue because the dark pigment in the hair will absorb more light energy than the light colored tissue. When Pulse #1 turns off, the two tissues begin to cool. The white skin will cool faster than the black hair follicle because it has absorbed less light energy than the dark tissue (the white skin has a shorter thermal relaxation rate than the black hair follicle). The time between the pulses (referred to as the Pulse Interval) is very short and neither the skin nor the follicle are allowed to completely cool down. When Pulse #2 begins, the level of heat in the follicle is at a much higher starting point than the level of heat in the skin. During Pulse #2, the heat in both tissues is increased, with the follicle attaining a much higher level of heat than the skin. When Pulse #2 turns off, both tissues will cool somewhat but the follicle will retain a significant level of heat. When Pulse #3 is delivered, because the heat in the black hair follicle is already at a very high level, this final burst of energy and heat causes sufficient damage to the follicle so that it will no longer produce hair. The surrounding white skin, even though it gets hot, does not sustain any damage.

What Makes One System More Effective Than Another? As you can determine from the basic principals of how an IPL system works (as explained above), being able to deliver a significant amount of light energy to the target tissue while avoiding damage to the surrounding tissue is what makes an IPL effective and useful. An IPL, which utilizes a broad-spectrum light,

cannot focus in on just one type of target. That is why the light from an IPL is pulsed; this pulsing technology allows the broad-spectrum light to affect the desired target while limiting the damage to the surrounding tissue. The number of pulses, the duration of each pulse and the pulse interval all combine to deliver as much light energy to the target tissue as possible in a safe manner. There are 6 skin types (Fitzpatrick 1 through 6) and each skin type can have multiple conditions and a variety of possible targets. In hair removal, there could be light brown to black colored hair, and the hair could be fine, medium or coarse in terms of thickness. In pigmented lesions (also called Photo Facial), there could be dark, medium or light colored lesions. Each condition within each skin type requires a different number of pulses, a different pulse duration and a different pulse interval. Having just one setting that is supposed to cover all situations/conditions cannot possibly be effective or safe. A system with a few possible combinations is good and a system with numerous possible combinations is ideal, as long as it is not too complex to learn how to operate.

System Parameters. As indicated earlier, an IPL is essentially a computer-controlled flash bulb. The computer sends a signal to the power supply, which provides the energy to the flash bulb, making it pulse so many times, at a specific level of power, for so many milliseconds with so many milliseconds between the pulses. The computer, and the way it varies the parameters of the treatment, is a main point you have to evaluate. The parameters that affect the treatment are Fluence, Number of Pulses, Duration of the Pulses and the Pulse Interval.

Fluence - How much power does the flash bulb deliver? Power in an IPL is measured in Fluence and designated in Joules per centimeter squared (J-cm2). The majority of medical aesthetic light based treatments are performed in the 20 to 35J-cm2 ranges. There are systems with maximum fluence settings of less than 20J-cm2 and some systems with maximum settings in the 65J-cm2 range. Without getting too complicated in explaining why some systems have a maximum fluence of more than 35J-cm2 (power is effected by the distance the light has to travel to the target, the filtering mechanism, etc.), a good rule of thumb is buying a system that can deliver from 40 to 60J-cm2.

Number of Pulses – This is the setting that determines how many pulses are being delivered to the flash bulb each time the operator pulls the trigger (or steps on the foot switch) and fires a “shot”. Having a system that can deliver a reasonable number of pulses within a “shot” is important; 3 or less is too few, while 4 to 10 is standard. If a system’s fluence is set (for example) at 20J-cm2 and 4 pulses per “shot”, the system will deliver an average of 5J-cm2 per pulse during that “shot”. Some systems have the capability to deliver exactly the same amount of Joules per pulse (i.e. exactly 5J-cm2 per pulse in the example just given). Some systems will deliver a “spiked” shot (i.e. the first pulse is 10J-cm2, the second is 5J-cm2, the third is 3J-cm2 and the fourth is 2J-cm2). A “shot” that contains consistent pulse power is more effective than one that has spikes.

Pulse Duration – This setting determines the time each of the pulses delivered in a “shot” are turned on. They are measured in milliseconds and are delivered in a very rapid succession during the “shot”. The longer the light is shinning on the target, the more energy the target absorbs. Some situations require longer pulses, some require shorter pulses. The operator needs to deliver the correct amount of light energy to be effective, but not too much to cause complications such as burns. A system should have a pulse width capability of at least 5ms or more.

Pulse Interval – This is the setting that determines the time between the pulses delivered during a “shot”. This setting is the parameter that is associated with the thermal relaxation rate of each of the tissues in the treatment area. Being able to adjust this parameter increases the system’s treatment capabilities. The higher the pulse interval capability, the more versatile the system will be for a wider range of treatment situations.

Repetition Rate – This factor is something that is overlooked by some buyers, but is critically important. The speed of the repetition rate is a direct reflection of the quality of the components in the device: the repetition rate is dictated by the technology incorporated into the power supply. A high quality power supply will be able to deliver shots in quick succession, while an inferior power supply will be slow. This specification alone can tell you a lot about the quality level of the device as a whole. The repetition rate for IPL and laser devices is listed in the system specifications in Hz (Hertz). If a system is a 1 Hz device, this means it delivers 1 shot per second. A 0.5 Hz device delivers 1 pulse every 2 seconds. A 0.33 Hz device, delivering a shot every 3 seconds, will be rather irritating to the operator since they will have to wait 3 seconds before the system will be able to deliver the next shot. Some systems require up to 8 seconds between pulses. Performing a hair removal treatment on a man's back or a woman's legs with such a device will be a tedious and drawn-out procedure. It won't take long before you/your technician and your patients become less than enamored with that system and be reluctant to use it or be treated by it. Anything slower than 1 Hz is considered to be low-technology and should be avoided.

Auto Settings and Manual Settings. The Auto Mode on an IPL are the settings determined by the manufacturer which are based on research performed by technicians in clinical situations. These settings make it easy for beginning operators with limited experience to achieve the proper results. The Auto Mode allows an IPL operator to automatically change the parameters (Pulse Number, Pulse Duration, Pulse Interval and, in some cases, Fluence) by choosing one or two simple options based on the patient's skin type and target type. The Manual Mode on an IPL allows the experienced operator to decide how to adjust each of the parameters separately, based on the needs of a more custom treatment. Some systems with a Manual Mode have thousands of possible setting combinations, making them capable of treating any skin condition suitable for IPL technology. Some IPL systems only have an Auto Mode, which means you have to rely solely on the clinical research the manufacturer has performed. Some systems have an Auto Mode with very few options, which will really limit your treatment capabilities. A system with both an Auto Mode and a Manual Mode greatly expands the machine's treatment capabilities and effectiveness.

Filters. Since the system utilizes a flash bulb that can deliver a very broad range of light wavelengths, an effective and safe IPL must have some type of filter that limits the wavelengths delivered to the patient's skin. There are filters that reflect light and there are filters that absorb light. Both types can block the light in the lower wavelengths (below 450nm). Blocking wavelengths below 400nm is important since those are the UV-A, B and C wavelengths that are unhealthy for the skin. To further improve an IPLs effectiveness for each type of treatment, filters are necessary to additionally block out other wavelengths not needed to perform specific treatments. An IPL treatment for hair removal will be much more effective if the wavelengths delivered to the skin are around 630nm and higher, so the filter must block all wavelengths below 630nm. This wavelength range blocks the wavelengths that are attracted to other pigments in the skin so most of the light energy is delivered to the hair follicle. The same concept is used for pigmented lesion, vascular and acne treatments, each having different filtering requirements. An IPL must have the option to change the filter based on the treatment type. Some systems do not have filter options, just one filter intended for all treatments, making them less effective and unsafe.

Consumables. Most IPL systems have one major consumable; the flash bulb. The bulb is much like your light bulbs at home; they will burn out after a number of uses. The difference is that your bulb at home will suddenly burn out and stop working. The flash bulb in an IPL system will slowly degrade. This degradation is based on how many "shots" the bulb has delivered. Replacing the bulb in some IPL systems can be relatively low cost (around $1,000) and the

bulbs will last for many shots (anywhere from 20,000 to 200,000 shots). There are some systems that require the replacement of the complete handset and can cost $10,000 to $15,000. Be certain to calculate that cost into your budget.

Handset/Skin Cooling. Some systems have a cooling mechanism built into the handset. Keeping the contact surface (the part that touches the patient's skin) cool is important to avoid contact burns. As mentioned in the "Filters" section, there are different technologies for blocking the light wavelengths, reflective and absorbing filters. Both types of filters generate heat but the absorbing filters will tend to generate higher levels of heat, and contact burns are possible. Keeping the part that touches the patient's skin relatively cool is imperative. Lowering the temperature of the skin before applying the light is also important. Skin chilling techniques include a chilled handset tip, a cold ultrasound gel applied to the skin, cryogenic spray applied to either the handset contact surface (recommended) or the patient's skin (not recommended since it can cause hypopigmentation), a cold air system blowing very cold air on the skin and (inexpensive) ice packs applied directly to the skin. Some manufacturers claim their handsets can keep the skin cold and are "safer than others because it reduces the chance of causing burns". However, many "chilled" IPL handsets will lose their cooling properties when performing a long treatment, rendering them ineffective in terms of cooling the skin. Find out what the temperature of the handset is and compare it to other skin chilling technologies. The "cold" handsets have a surface temperature of approximately 15 to 20° Celsius. That converts to between 59 to 68° F. Cryogenic spray is -100° F, a cold air system is -30° C, ice is at least 32° F and chilled gel can be approximately 40 to 50° F. That is a big difference in cooling capability from one technology to the next. Keeping the skin cool or cold will help reduce the sting of the light on the skin, and the colder the better when trying to reduce or remove the pain element from the treatment. Regardless of the handset cooling capabilities, all systems require some form of additional post treatment chilling of the skin. IPL operators use some or all of these techniques for pre and post treatment for both reducing the pain aspect and for lowering the skin temperature to avoid burns.

Unique names for this relatively common technology. Some companies call their technology a name other than (or in addition to) intense pulsed light in an attempt to make it sound like they have advanced their design beyond the competition. This is a great marketing idea, but nothing more. An Intense Pulsed Light system delivers light in a way that can be called **B**road **B**and **L**ight or **V**ariable **P**ulsed **L**ight. Either name describes the same technology. Some manufacturers will claim their systems do not pulse the light and say it delivers "one smooth pulse". If it is an IPL (Intense Pulsed Light) device and utilizes a broadband wavelength of light with different filters for each type of treatment, it delivers light that is pulsed. Again, they are just trying to make their system sound advanced compared to the other technologies. The most effective tactic the sales people will use when selling an aesthetic device is confusion: if they tell you something that you cannot investigate or refute, you believe they must be telling you the truth. Read the section near the end of this document that addresses the sales tactic of creating confusion.

Adding Radio Frequency (RF) to the pulses. Some companies have combined technologies in their IPL systems by adding radio frequency, referred to as RF, to broadband light. If you study RF alone, you will find that it is an electro-magnetic current that travels from one electrode to another and tends to seek the path of least resistance. It is color-blind; meaning it is not attracted to any color so any tissue will not absorb it more heavily based on color. When using it on skin, the RF power will travel from one electrode, through the skin, to the other electrode and will heat the skin equally along where the current traveled. The heating of the skin is dictated by the amount of RF power used. How the manufacturers explain the advantage of this type of system is that they say the RF will heat the skin and then you need less light to

accomplish the job of affecting the target tissue, making it safer than standard IPL technology (so they claim). They may also claim their system will be effective on white or blonde hair. How they explain that is they say the RF energy will "bend" or collect around the hair shaft, heating the follicle enough to stop the hair from growing. If you use logic and a basic knowledge of RF, the conclusion is slightly different. Yes, you will use less light energy to achieve the goal of damaging the target tissue, but you have raised the base temperature of all the tissue between the electrodes so now you have less room for the light to perform it's task and less room for error, increasing the risk of causing a burn. In terms of having an effect on white or blonde hair, what would cause RF to collect around a hair shaft? This can't be sufficiently explained and most potential buyers who listen to this sales pitch don't even ask that question (remember the confusion tactic). The RF current will travel from one electrode to another, looking for the path of least resistance, and will not collect anywhere in between. The operator has to be careful to make sure the two electrodes are in full contact with the skin, otherwise there is a possibility that the RF energy will create an arc on the patient's skin, causing a serious burn. This combined technology is more expensive than standard IPLs and the results will not be different than what you would get from a well designed standard IPL system.

Combination Systems. There are many systems on the market that are just an IPL and there are also a number of systems on the market that combine an IPL with another technology. Additionally, there are machines that combine an IPL with two or more different laser technologies. The most common combination system is an IPL with a Long Pulse Nd:YAG laser. This system is good when you want a hair removal system that is equally effective on all skin types and can treat leg/facial veins, plus have the capability to treat all the other skin abnormalities a standard IPL can handle. If you are considering this type of unit, there are three things to think about. 1) Some of the IPL/YAG combo systems have a very weak YAG component, primarily the systems with the YAG laser-generating component in the handset. These machines may be good for hair removal but not very effective for a leg vein removal treatment (which a powerful YAG laser can do very well; however, if you understand the limitations of this type of device, you will not be disappointed with its capabilities.) 2) You cannot schedule two patients for the same time slot since you only have one machine. Wheeling the laser from one room to the next in front of your patients will not look very professional, plus may expose your system to undo stress and jarring, possibly causing calibration issues (see Calibration, below). 3) Most IPL/YAG combo systems are expensive. Of course, the combo system that has the IPL with two or more additional technologies can provide your practice with many treatment options, but they are very expensive. Any of the combo systems are limiting in terms of expanding your practice since you cannot schedule more than one patient per time slot. The situation where a combo system makes the most sense is in a practice that has limited space or a single practitioner/operator clinic. Some doctors have a difficult time looking at their medical aesthetics practice as a business. Practicing medicine is a business. You couldn't keep your practice open if you do not make a profit, no matter if you operated a family medicine facility or any other type of practice. Planning for expansion of the business is good business. No one knows the future of medical aesthetics, but you can be sure that it will get more competitive. Lowering your prices to compete with the market will result in lower profit, meaning you will need to increase your business volume to maintain the bottom line. Setting up a facility with only one treatment room is planning for limited success. Owning a combination system is only practical if you have a small aesthetics practice and do not plan to build on it. Even with that frame of mind, you may still find that owning two separate systems, one IPL and one YAG laser for example, may cost about the same and then give you the option of expanding your number of treatment rooms in the future.

Calibration. This issue is more of a factor when looking at lasers than IPLs (except with combination units, as described above). Some lasers fall out of calibration rather easily and can

be very expensive to repair. There are some IPL systems on the market that the manufacturer will tout as safe because it has an "auto-calibration feature". They will claim it protects the patient from receiving a "spike" in the flash. The only time an IPL needs to be calibrated is when the flash bulb is replaced. When the flash bulb is replaced, some systems will need to have a technician match the output of the new flash bulb with what the computer system is telling you it is producing. The only thing that is guaranteed to happen is the flash bulb will degrade, LOWERING the power of the treatment. There is no possibility of a system delivering a power spike or an increase in power on its own. Falling out of calibration on a regular basis (for laser and IPL systems) is not a common problem with the higher quality systems and may be an indication that the manufacturer is utilizing less than top quality components.

Longest in the business/publicly traded. The manufacturers that have been in the business the longest will try to tell you their system is the most reliable and respected because they have so many units in operation. Look at almost any other industry, are the companies who were the first on the market regarded as the best or are there others who have taken the lead? Being around the longest does not mean what it used to; today's engineers and designers are capable of taking a good design and making it better, many times at a lower cost. Also, bigger companies with name brand recognition rely on the idea that people are familiar with them so they charge more for their products. Advertising in the aesthetics industry (magazine advertisements, large booths at trade shows, holding seminars, etc.) is very expensive and is the best way to get noticed. An equipment manufacturer who advertises in most of the industry magazines has a huge advertising budget and that cost gets passed on to their customers in the way of higher priced equipment. It is not always the case of "you get what you paid for" because many of those companies are spending almost all of that extra money on advertising, not research. Go online and examine the financial data for the publicly traded medical aesthetic equipment manufacturers: the marketing expenses are usually in the 35 to 40% ranges. There is an IPL manufacturer that used to spend almost $1,000,000 (1 Million Dollars) per month in advertising back when times were good. There was another aesthetic equipment manufacturer who had an advertising budget that is 50% of their revenue. This means, when you purchase a $100,000 machine from them, you are buying a $50,000 machine with the other $50,000 of your hard earned dollars going toward paying for their marketing department to reach the next buyer. Also, when thinking about a publicly traded company compared to a privately held company, do you really know which one is financially stronger? Enron and other situations involving publicly traded companies tell us that it doesn't carry as much clout or provide as much security as it did in the past. There are a few publicly traded laser manufacturers who have gone through some major financial problems and, as a result, their customers have experienced massive delays in delivery of repair parts and other customer service issues.

Warranties and Service Contracts. Before you purchase a system, find out what the extended warranty/service contract costs are on an annual basis and get it in writing. You will need to consider this for when the original warranty expires. A reasonable annual cost for a service contract is approximately 8% of the purchase price. If a company charges more for an annual service contract, you can be certain that system requires more repairs since the company who offers the service contract has to make sure it can cover its cost and make a profit on the contract. You may think having a system that occasionally breaks down is not a problem as long as you have a service contract in place. Not true. If a system breaks down on a regular basis, you will be constantly rearranging your patient schedule. You will have to cover the gaps when you can't treat your patients for the remainder of the day plus the time it takes to get a replacement system in place or when the repair personnel can get to your practice to fix your machine. If this happens on a regular basis, your patients may find it inconvenient and start looking elsewhere for their aesthetic treatments. A reasonably priced annual service contract tells you the company has confidence in the reliability of their product.

Chinese-Made IPL Devices. There are many foreign-made IPL systems available on web sites and Ebay. There are even some disposable IPL units (yes, you can buy such a unit and when the flashlamp burns out, you throw it away)! It may be enticing, but there are many horror stories out there about these systems; you are taking a chance with your money and reputation. Reliability is a major issue, in addition to getting any form of support when (not if) an issue arises. Once they have your money, you don't have any recourse if you are not satisfied. It is best to stick with manufacturers that have been in the industry for years and, if possible, are located in the U.S.A.

Creating confusion and doubt. The salespeople in this industry use many techniques to sell their equipment. If they cannot close the deal with straightforward facts regarding their system features and benefits, they then rely on creating some confusion or doubt. They achieve this by making claims about what they label as a unique feature of their device that you really can't research anywhere other than from their company. If they call their technology or a feature of their device by some acronym or special name, how do you find any data about this technology other than from their literature or web site? You can't, so you end up believing that it is a valid point, when it may or may not be of any value at all. Another tactic that they use is telling false information about the competing systems on the market. Since some salespeople cannot provide you with actual facts about the superiority of their technology, they imply that other systems are inferior. This is usually the tactic of the salespeople selling the more expensive machines and they will imply that "you get what you pay for" when considering a lower priced unit. Remember the information in this document about advertising expenses and how those costs get passed on down to you; how can a salesperson directly address that issue and justify their inflated price? They would have to admit their technology isn't more advanced, but then ask you to swallow the extra cost… for what reason? The salespeople that sell the limited capability, low priced units will try to make it sound like IPLs are all the same, so why pay more than you need to? Well, now you know what the real differences are and how to evaluate them.

Conclusion. If you know the truth and understand the technology, you will be able to determine what is fact and what is fiction. These machines are not magically producing results. The factors that separate a reasonably priced, quality system from one that is overpriced or has questionable functionality is something you, with even a small amount of equipment knowledge, can determine. Don't be intimidated and make sure you get a clear answer about all your questions before you buy.