The lack of proper PPE for primary head protection has been a problem in many industries. Workers constantly expose their heads and faces to harmful substances in their daily jobs or to sunlight over extended periods of time.

VitaFlex LLC provides a practical solution by creating a series of soft-stretch protective hoods from revolutionary latex-free elastic nonwoven composites. The FDA guiding principles for surgical masks were followed throughout the development process.

Spunmelt nonwoven fabrics are a “breathable barrier” made by fiber spinning technologies. Their dense fiber-composite structures have ultrafine intertexture openings for air to flow through while maintaining particle filtration quality. They are irreplaceable materials for making face masks and surgical gowns. Our patented technology transforms a wide range of spunmelt nonwovens into soft and cross-stretch elastic fabrics, without adding latex or other elastomers. This enables finished products to be form-fitting while maintaining their cool, breathable barrier quality.

The latex-free elastic nonwoven technologies and the materials have been globally co-patented by DuPont® and Dr. De-Sheng Tsai. The precursor nonwovens are sourced from the most advanced lines in the southeastern states. The conversion and manufacturing processes are done in Burlington, North Carolina.

VitaFlex's Biosafety Hoods
Primary Head Protection for Biohazard Control & Infection Prevention

By combining advanced elastic composites into their triple-layer structure, the Biosafety hoods provide superior barrier functionality while maintaining excellent breathability for comfortable wear.

<table>
<thead>
<tr>
<th>Triple Layer Structure</th>
<th>BioSafety Hood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basis Weight</td>
<td>SMS/SS/SMS</td>
</tr>
<tr>
<td>Thickness</td>
<td>0.40 mm</td>
</tr>
<tr>
<td>ΔP (mm H2O/cm²)</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>MIL-M-36954C</td>
<td></td>
</tr>
<tr>
<td>Breathability/Perception</td>
<td>Normal/Cool</td>
</tr>
<tr>
<td>Synthetic Blood Penetration Resistance</td>
<td>Pass at 80 mmHg</td>
</tr>
<tr>
<td>Particle Filtration Efficiency @ 1 µm</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Bacteria Filtration Efficiency ASTM F2101-14</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Particle Shed Analysis Helmke Drum Particle Counts</td>
<td>1,850 of ≥0.3 µm</td>
</tr>
</tbody>
</table>

- Protect scientists and technicians in a variety of bio-labs or when working around bio-hazardous waste or sewage
- Provide safety and health protection for morticians when caring for corpses: embalming, processing for cremation, and after task cleanup
- Prevent healthcare workers from contact transmission in many daily jobs such as performing surgery procedures, reprocessing devices, cleaning contaminated rooms and furniture, bundling dirty bedding, and handling biomedical waste.
**Primary Head Protection was the critical component missing in conventional PPE** because there was no material available for making protective hoods that are form-fit to the wearer’s head and comfortable for extended wear.

**Latex-free Elastic Nonwoven Fabrics** are the breakthrough materials that give an elastic structure while maintaining the breathability and barrier functionality of nonwovens. The **elasticity** enables the making of protective hoods that are form-fitting on the wearer’s head and becoming an effective isolation layer next to the skin. We have created **soft-stretch hoods** made from our newly developed elastic nonwoven fabrics to meet the safety requirements of many industries.

**Keeping Heads Cool** was a major criterion when we developed the **Biosafety hoods to be worn for extended periods of time**. Throughout the development process, the FDA guiding principles for surgical masks were followed. An indicator of breathability is to measure the differential pressure (∆P, mm H₂O/cm²) across the web structure according to test method MIL-M-36954C. **FDA guidance** on surgical masks states that the wearer will feel hot when wearing a mask having a ∆P of more than 5. **The ∆P of the Biosafety hoods’ structures is constructed to be less than 3**, so the wearer can breathe normally. The wearer should feel cool and comfortable in extended wearing due to the low ∆P of the hood’s structure allowing perspiration vapor to escape through it. **There is no unbearable heat or humidity build up inside the hood.**

**The Filtration Efficiency of Biosafety Hood** were engineered to filter particulates of 1 µm and larger at a flow rate of 1 cubic foot per minute (CFM) or 28.3 liters per minute (LPM). Since it fits tightly against the wearer’s hair and skin, no air flows through the hood, so **airborne particles rarely penetrate through to the wearer.**

**Blood Splash Resistance** was tested with ASTM Method 1862 in considering the reality that workers’ heads are always at a higher position above their work subjects and never put their head or face tightly against a pot of pressurized blood or body fluid. To qualify the hoods’ structures for splash resistance, synthetic blood was sprayed onto the surface of hood at a distance of one foot, at three different velocities corresponding to a human blood pressure of 10.6, 16.0 and 21.3 kPa (80, 120 and 160 mm Hg). **The current version is qualified as level 1 barrier.**

**Standard PPE Donning/Doffing Procedures**

**BiosSafety Hood is the first PPE to put on, and the last taken off**

**The structures of our hoods have high filtration efficiency**. When worn properly, they provide excellent respiratory protection. Since they do not have an adjustment mechanism, it needs to be worn under safety goggles to properly seal around the wearer’s nose.

**The correct donning sequence is to put on our hood first, followed by goggles to protect the eyes.** This completes full coverage of the head, face and neck (as shown in the photo to the right).

**In extreme situations, a mask or a full-face respirator can be worn over the hood.** The structures of the hoods are very thin, only 0.3 - 0.4 mm. Many users have confirmed our internal tests that it provides an additional layer of barrier, a soft cushion of comfort, and reduces respirator movement from work or sweat.

**Please note:** Fit test your respirator as always with our hood to confirm its seal. If the full-cover hood interferes with the fit, use the open-face style that allows the respirator direct contact with the skin.
Practical Solutions for The Problems of Conventional PPE

1. **The Disposable N-95 Masks** are commonly used by healthcare workers for respiratory protection. However, N-95 masks do not fit well on many people due to varied face shapes. Their latex straps are either too loose or too tight for proper fit. Also, fit testing cannot always guarantee against leakage since the mask can move while working. In reality, a protective hood is also needed to block the airborne droplets expelled at high velocity from a patient’s coughing and sneezing that spray on the face and neck or fall on the hair. Those contaminants pose an equal or greater infection risk from subsequent contact transmission.

Biosafety hood can be comfortably worn with a mask or respirator to keep the entire head, face and neck protected. Many workers have confirmed with our internal tests that wearing our soft-stretch hood under a mask (photo on the left) provides an additional layer of barrier and reduces gapping.

Fit testing your respirator as always with our soft-stretch hood to confirm its seal. If the hood interferes with the fit, try wearing it over the mask (photo on the right).

2. **The Hooded Coveralls** have been criticized for severely restricting the wearer’s head movement and mobility. While working, the coverall hood easily pulls away from the wearer’s face. Usually, duct tape has to be used to attach it to the face shield of a respirator. This actually worsens the problem of restricting head movement.

The updated guidance of the CDC recommends the use of coveralls without integrated hoods. It is practical and economical to wear our Biosafety hood with an un-hooded coverall suit. Wearing two hoods is recommended. That way, the outer layer can be removed upon being contaminated while the inner layer remains in place keeping the wearer protected until there is no longer a danger and the respirator has been removed.

3. **Powered Air Purification Respirator (PAPR)** provides complete coverage for the head. However, of great concern is that the removal of the PAPR hood would immediately expose the wearer’s head to contaminants accumulated on the suit. Even changing the doffing procedure to remove the PAPR last leaves a risk of accidental self-contamination from the contaminated PAPR.

Our Biosafety hoods should be the first PPE put on and the last removed. Wearing a Biosafety hood under the PAPR keeps the head protected from contact transmission when removing the remaining protective apparel.

**Caution:** VitaFlex’s soft-stretch hoods are NOT a respiratory protection device and NOT for replacing mask in OSHA requirements. Not for blocking concentrate detergents, high viscosity solutions, organic solvent, toxic or bio-hazard gases, fumes, or vapors. Not for blocking pressurized liquid and particles.

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Retail pack of 6 hoods is available at Amazon.com with a search for “VitaFlex Soft-stretch Hood”.

For economical 50/100Pk or Bulk Case: Call toll-free 888-616-8848 or Order online at www.vitaflexUSAstore.com.
1. Tap “Product on Sales” to open webpage, and
2. Click the image of “Primary Head Protection” to find all kinds of soft-stretch hoods.
Conventional Materials for Making Disposable Protective Hoods

The conventional materials were stiff. Due to the lack of dimensional stretchability, the hoods have to be made baggy. They do not fit well even when incorporated with elastic components. Consequently, the purpose of providing a layer of isolation is lost.

Personal Protective Equipment (PPE) is worn to minimize exposure to harmful substances and reduce workplace illnesses. Disposable protective hoods are commonly made of plastic film laminates, Tyvek sheets or nonwoven fabrics for their barrier functionality and low cost.

1. **Plastic Films** are the best material in shielding against corrosive chemicals and organic solvents with their chemical inertness and absolute imperviousness to liquids. The film laminates on textile are to obtain high strength against tearing and puncturing. They are used for making hazmat suits. Laminates with nonwoven backing, having low strength against tearing and puncturing, are used for disposable protective apparel.

   The hoods made of film laminates are impervious to air, so they have to be equipped with an air-fed system. They are bulky, inconvenient and expensive for many daily jobs.

2. **Tyvek Sheets**, like plastic film laminates, are impervious to liquids and chemically inert. They are used to make light-duty hazmat suits because their protection against puncture or abrasion is limited. Tyvek sheets are called “breathable material” by having a moisture vapor transmission rate (MVTR) of 5-10 liters/m²/24 hours tested at 100°F. However, the term “Breathable” used to describe their structure can be misleading. Such low volume of transmittable air is not adequate for human breathing since the average human respiratory rate requires at least 5 liters/minute.

   Tyvek hoods are unbearably hot. Without being equipped with an air-fed system, it can cause uncomfortable anxiety, dizziness, and exhaustion from the buildup of body heat and humidity. The design of exposing the wearer’s face is most likely to avoid suffocation accidents.

3. **Nonwoven Fabrics** are the best material for achieving a balance between “breathability” and “barrier functionality”. Spunmelt nonwovens made of polypropylene (PP) fibers are popularly used for making face masks, and coverall suits.

   A common problem of spunmelt nonwovens is their stiffness. When making nonwoven hoods barrier functional, the high basis weight material is too stiff to fit well even when incorporated with elastic components. Consequently, nonwoven hoods are not popular. In 2014, the incident of healthcare workers in Texas contracting the Ebola virus disease while caring for an infected patient was an example of the terrible failure of conventional nonwoven head coverings.