Testing

November 16, 2024

```python
[33]: import cv2
import numpy as np
from pathlib import Path
import tifffile
import os
import sys
import matplotlib.pyplot as plt
```

```python
[51]: def list_tif_files(directory="."):
    """List all .tif files in current directory"""
    tif_files = []
    for file in os.listdir(directory):
        if file.endswith('.tif'):
            print(f"Found: {file}")
            tif_files.append(file)
    return tif_files

def count_cells(image_path):
    try:
        img = tifffile.imread(str(image_path))
    except Exception as e:
        raise ValueError(f"Error reading TIFF file: {str(e)}")

    # Convert to 8-bit if necessary
    if img.dtype != np.uint8:
        img_normalized = ((img - img.min()) * (255.0 / (img.max() - img.
    ↪min())))).astype(np.uint8)
    else:
        img_normalized = img.copy()

    # Ensure image is BGR
    if len(img_normalized.shape) == 2:
        img_normalized = cv2.cvtColor(img_normalized, cv2.COLOR_GRAY2BGR)

    # Convert to grayscale for total cell counting
    gray = cv2.cvtColor(img_normalized, cv2.COLOR_BGR2GRAY)
```

```python
    # Enhance contrast for better cell detection
    clahe = cv2.createCLAHE(clipLimit=2.0, tileGridSize=(8,8))
    gray_enhanced = clahe.apply(gray)

    # Apply Gaussian blur to reduce noise
    blurred = cv2.GaussianBlur(gray_enhanced, (5, 5), 0)

    # Use Otsu's thresholding instead of adaptive
    _, thresh = cv2.threshold(blurred, 0, 255, cv2.THRESH_BINARY_INV + cv2.
↪THRESH_OTSU)

    # Morphological operations to clean up the mask
    kernel = np.ones((3,3), np.uint8)
    opening = cv2.morphologyEx(thresh, cv2.MORPH_OPEN, kernel, iterations=1)

    # Dilate slightly to connect cell components
    dilated = cv2.dilate(opening, kernel, iterations=1)

    # Find contours for all cells
    contours, _ = cv2.findContours(dilated, cv2.RETR_EXTERNAL, cv2.
↪CHAIN_APPROX_SIMPLE)

    # Filter contours by size and circularity
    #min_cell_area = 50
    min_cell_area = 100  # Increased from 50
    max_cell_area = 2000
    valid_contours = []

    for contour in contours:
        area = cv2.contourArea(contour)
        if min_cell_area < area < max_cell_area:
            # Calculate circularity
            perimeter = cv2.arcLength(contour, True)
            circularity = 4 * np.pi * area / (perimeter * perimeter) if␣
↪perimeter > 0 else 0

            # Accept if somewhat circular (adjust thresholds as needed)
            if 0.3 < circularity < 1.0:
                valid_contours.append(contour)

    total_cells = len(valid_contours)

    # Green cell detection (keep this part as is since it's working well)
    green_channel = img_normalized[:, :, 1]
    mean_intensity = np.mean(green_channel)
    std_intensity = np.std(green_channel)
    threshold_value = mean_intensity + 2.5 * std_intensity
```

```python
    _, green_thresh = cv2.threshold(green_channel, threshold_value, 255, cv2.
↪THRESH_BINARY)
    green_thresh = cv2.morphologyEx(green_thresh, cv2.MORPH_OPEN, kernel)

    green_contours, _ = cv2.findContours(green_thresh, cv2.RETR_EXTERNAL, cv2.
↪CHAIN_APPROX_SIMPLE)

    valid_green_contours = []
    for contour in green_contours:
        area = cv2.contourArea(contour)
        if 30 < area < 1000:
            mask = np.zeros(green_channel.shape, np.uint8)
            cv2.drawContours(mask, [contour], -1, 255, -1)
            mean_intensity = cv2.mean(green_channel, mask=mask)[0]
            if mean_intensity > threshold_value:
                valid_green_contours.append(contour)

    green_cells = len(valid_green_contours)

    # Create visualization
    visualization = cv2.cvtColor(gray, cv2.COLOR_GRAY2BGR)
    # Draw all cell contours in blue
    cv2.drawContours(visualization, valid_contours, -1, (255, 0, 0), 1)
    # Draw green cell contours in green
    cv2.drawContours(visualization, valid_green_contours, -1, (0, 255, 0), 2)

    # Save visualization
    output_path = os.path.join(os.path.dirname(image_path),
                               f"{os.path.splitext(os.path.
↪basename(image_path))[0]}_analyzed.jpg")
    cv2.imwrite(output_path, visualization)

    return total_cells, green_cells, output_path



def process_image_file(image_path):
    try:
        print(f"\nProcessing {Path(image_path).name}...")
        total_cells, green_cells, output_path = count_cells(image_path)
        print(f"Total cells detected: {total_cells}")
        print(f"Green fluorescent cells: {green_cells}")
        print(f"Analysis visualization saved to: {output_path}")

    except Exception as e:
```

```python
              print(f"Error processing {image_path}: {str(e)}")
```

```python
[17]: def list_tif_files(directory="."):
          """Recursively list all .tif files in directory and its subdirectories"""
          tif_files = []

          print(f"Searching for .tif files in: {os.path.abspath(directory)}")

          try:
              # Walk through directory tree
              for root, dirs, files in os.walk(directory):
                  for file in files:
                      if file.endswith('.tif'):
                          full_path = os.path.join(root, file)
                          if os.path.isfile(full_path):
                              relative_path = os.path.relpath(root, directory)
                              print(f"Found: {file}")
                              print(f"In directory: {relative_path}")
                              print(f"Full path: {full_path}\n")
                              tif_files.append(full_path)
                          else:
                              print(f"Warning: {file} exists but is not accessible")

              if not tif_files:
                  print("No .tif files found!")
              else:
                  print(f"\nFound {len(tif_files)} .tif files in total")

          except Exception as e:
              print(f"Error accessing directory: {e}")

          return tif_files

      # Test the file access
      print(f"Current working directory: {os.getcwd()}")
      print("\nSearching for .tif files recursively...")
      tif_files = list_tif_files()
      print(f"\nTotal .tif files found: {len(tif_files)}")

      # Optionally, print a summary of directories where files were found
      if tif_files:
          directories = set(os.path.dirname(file) for file in tif_files)
          print("\nFiles found in these directories:")
          for directory in directories:
              count = sum(1 for file in tif_files if os.path.dirname(file) ==␣
      ↪directory)
              print(f"{directory}: {count} files")
```

```
Current working directory: /Users/pranavdhinakar/Documents/Charles/Data

Searching for .tif files recursively…
Searching for .tif files in: /Users/pranavdhinakar/Documents/Charles/Data
Found: DFCP1 1ug 2.tif
In directory: trial 2/48h/DFCP1 1ug
Full path: ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 2.tif


Found: DFCP1 1ug 3.tif
In directory: trial 2/48h/DFCP1 1ug
Full path: ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 3.tif


Found: DFCP1 1ug 1.tif
In directory: trial 2/48h/DFCP1 1ug
Full path: ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 1.tif


Found: atg13 0.5ug 1.tif
In directory: trial 2/48h/atg13 0.5
Full path: ./trial 2/48h/atg13 0.5/atg13 0.5ug 1.tif


Found: atg13 0.5ug 2.tif
In directory: trial 2/48h/atg13 0.5
Full path: ./trial 2/48h/atg13 0.5/atg13 0.5ug 2.tif


Found: atg13 0.5ug 3.tif
In directory: trial 2/48h/atg13 0.5
Full path: ./trial 2/48h/atg13 0.5/atg13 0.5ug 3.tif


Found: atg13 2ug 1.tif
In directory: trial 2/48h/atg13 2ug
Full path: ./trial 2/48h/atg13 2ug/atg13 2ug 1.tif


Found: atg13 2ug 2.tif
In directory: trial 2/48h/atg13 2ug
Full path: ./trial 2/48h/atg13 2ug/atg13 2ug 2.tif


Found: atg13 2ug 3.tif
In directory: trial 2/48h/atg13 2ug
Full path: ./trial 2/48h/atg13 2ug/atg13 2ug 3.tif


Found: DFCP1 2ug 1.tif
In directory: trial 2/48h/DFCP1 2ug
Full path: ./trial 2/48h/DFCP1 2ug/DFCP1 2ug 1.tif


Found: DFCP1 2ug 2.tif
In directory: trial 2/48h/DFCP1 2ug
Full path: ./trial 2/48h/DFCP1 2ug/DFCP1 2ug 2.tif
```

```
Found: DFCP1 2ug 3.tif
In directory: trial 2/48h/DFCP1 2ug
Full path: ./trial 2/48h/DFCP1 2ug/DFCP1 2ug 3.tif

Found: atg13 1ug 2.tif
In directory: trial 2/48h/atg13 1ug
Full path: ./trial 2/48h/atg13 1ug/atg13 1ug 2.tif

Found: atg13 1ug 3.tif
In directory: trial 2/48h/atg13 1ug
Full path: ./trial 2/48h/atg13 1ug/atg13 1ug 3.tif

Found: atg13 1ug 1.tif
In directory: trial 2/48h/atg13 1ug
Full path: ./trial 2/48h/atg13 1ug/atg13 1ug 1.tif

Found: DFCP1 0.5ug 3.tif
In directory: trial 2/48h/DFCP1 0.5ug
Full path: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 3.tif

Found: DFCP1 0.5ug 2.tif
In directory: trial 2/48h/DFCP1 0.5ug
Full path: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 2.tif

Found: DFCP1 0.5ug 1.tif
In directory: trial 2/48h/DFCP1 0.5ug
Full path: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 1.tif

Found: control 3.tif
In directory: trial 2/48h/control
Full path: ./trial 2/48h/control/control 3.tif

Found: control 2.tif
In directory: trial 2/48h/control
Full path: ./trial 2/48h/control/control 2.tif

Found: control 1.tif
In directory: trial 2/48h/control
Full path: ./trial 2/48h/control/control 1.tif

Found: DFCP1 1ug 2.tif
In directory: trial 2/72h/DFCP1 1ug
Full path: ./trial 2/72h/DFCP1 1ug/DFCP1 1ug 2.tif

Found: DFCP1 1ug 3.tif
In directory: trial 2/72h/DFCP1 1ug
Full path: ./trial 2/72h/DFCP1 1ug/DFCP1 1ug 3.tif
```

```
Found: DFCP1 1ug 1.tif
In directory: trial 2/72h/DFCP1 1ug
Full path: ./trial 2/72h/DFCP1 1ug/DFCP1 1ug 1.tif

Found: atg13 2ug 1.tif
In directory: trial 2/72h/atg13 2ug
Full path: ./trial 2/72h/atg13 2ug/atg13 2ug 1.tif

Found: atg13 2ug 2.tif
In directory: trial 2/72h/atg13 2ug
Full path: ./trial 2/72h/atg13 2ug/atg13 2ug 2.tif

Found: atg13 2ug 3.tif
In directory: trial 2/72h/atg13 2ug
Full path: ./trial 2/72h/atg13 2ug/atg13 2ug 3.tif

Found: DFCP1 2ug 1.tif
In directory: trial 2/72h/DFCP1 2ug
Full path: ./trial 2/72h/DFCP1 2ug/DFCP1 2ug 1.tif

Found: DFCP1 2ug 2.tif
In directory: trial 2/72h/DFCP1 2ug
Full path: ./trial 2/72h/DFCP1 2ug/DFCP1 2ug 2.tif

Found: DFCP1 2ug 3.tif
In directory: trial 2/72h/DFCP1 2ug
Full path: ./trial 2/72h/DFCP1 2ug/DFCP1 2ug 3.tif

Found: atg13 1ug 2.tif
In directory: trial 2/72h/atg13 1ug
Full path: ./trial 2/72h/atg13 1ug/atg13 1ug 2.tif

Found: atg13 1ug 3.tif
In directory: trial 2/72h/atg13 1ug
Full path: ./trial 2/72h/atg13 1ug/atg13 1ug 3.tif

Found: atg13 1ug 1.tif
In directory: trial 2/72h/atg13 1ug
Full path: ./trial 2/72h/atg13 1ug/atg13 1ug 1.tif

Found: atg13 0.5ug 1.tif
In directory: trial 2/72h/atg13 0.5ug
Full path: ./trial 2/72h/atg13 0.5ug/atg13 0.5ug 1.tif

Found: atg13 0.5ug 2.tif
In directory: trial 2/72h/atg13 0.5ug
Full path: ./trial 2/72h/atg13 0.5ug/atg13 0.5ug 2.tif
```

```
Found: atg13 0.5ug 3.tif
In directory: trial 2/72h/atg13 0.5ug
Full path: ./trial 2/72h/atg13 0.5ug/atg13 0.5ug 3.tif


Found: DFCP1 0.5ug 3.tif
In directory: trial 2/72h/DFCP1 0.5ug
Full path: ./trial 2/72h/DFCP1 0.5ug/DFCP1 0.5ug 3.tif


Found: DFCP1 0.5ug 2.tif
In directory: trial 2/72h/DFCP1 0.5ug
Full path: ./trial 2/72h/DFCP1 0.5ug/DFCP1 0.5ug 2.tif


Found: DFCP1 0.5ug 1.tif
In directory: trial 2/72h/DFCP1 0.5ug
Full path: ./trial 2/72h/DFCP1 0.5ug/DFCP1 0.5ug 1.tif


Found: control 3.tif
In directory: trial 2/72h/control
Full path: ./trial 2/72h/control/control 3.tif


Found: control 2.tif
In directory: trial 2/72h/control
Full path: ./trial 2/72h/control/control 2.tif


Found: control 1.tif
In directory: trial 2/72h/control
Full path: ./trial 2/72h/control/control 1.tif


Found: dfcp1 1ug 2.tif
In directory: trial 2/24 hours/dfcp1 1ug
Full path: ./trial 2/24 hours/dfcp1 1ug/dfcp1 1ug 2.tif


Found: dfcp1 1ug 3.tif
In directory: trial 2/24 hours/dfcp1 1ug
Full path: ./trial 2/24 hours/dfcp1 1ug/dfcp1 1ug 3.tif


Found: dfcp1 1ug 1.tif
In directory: trial 2/24 hours/dfcp1 1ug
Full path: ./trial 2/24 hours/dfcp1 1ug/dfcp1 1ug 1.tif


Found: Atg13 0.5ug 2.tif
In directory: trial 2/24 hours/atg13 0.5
Full path: ./trial 2/24 hours/atg13 0.5/Atg13 0.5ug 2.tif


Found: Atg13 0.5ug 3.tif
In directory: trial 2/24 hours/atg13 0.5
Full path: ./trial 2/24 hours/atg13 0.5/Atg13 0.5ug 3.tif
```

```
Found: Atg13 2ug 1.tif
In directory: trial 2/24 hours/atg13 2ug
Full path: ./trial 2/24 hours/atg13 2ug/Atg13 2ug 1.tif

Found: Atg13 2ug 2.tif
In directory: trial 2/24 hours/atg13 2ug
Full path: ./trial 2/24 hours/atg13 2ug/Atg13 2ug 2.tif

Found: Atg13 2ug 3.tif
In directory: trial 2/24 hours/atg13 2ug
Full path: ./trial 2/24 hours/atg13 2ug/Atg13 2ug 3.tif

Found: dfcp1 2ug 1.tif
In directory: trial 2/24 hours/dfcp1 2ug
Full path: ./trial 2/24 hours/dfcp1 2ug/dfcp1 2ug 1.tif

Found: dfcp1 2ug 2.tif
In directory: trial 2/24 hours/dfcp1 2ug
Full path: ./trial 2/24 hours/dfcp1 2ug/dfcp1 2ug 2.tif

Found: dfcp1 2ug 3.tif
In directory: trial 2/24 hours/dfcp1 2ug
Full path: ./trial 2/24 hours/dfcp1 2ug/dfcp1 2ug 3.tif

Found: Atg13 1ug 2.tif
In directory: trial 2/24 hours/atg13 1ug
Full path: ./trial 2/24 hours/atg13 1ug/Atg13 1ug 2.tif

Found: Atg13 1ug 3.tif
In directory: trial 2/24 hours/atg13 1ug
Full path: ./trial 2/24 hours/atg13 1ug/Atg13 1ug 3.tif

Found: Atg13 1ug 1.tif
In directory: trial 2/24 hours/atg13 1ug
Full path: ./trial 2/24 hours/atg13 1ug/Atg13 1ug 1.tif

Found: dfcp1 0.5ug 3.tif
In directory: trial 2/24 hours/dfcp1 0.5ug
Full path: ./trial 2/24 hours/dfcp1 0.5ug/dfcp1 0.5ug 3.tif

Found: dfcp1 0.5ug 2.tif
In directory: trial 2/24 hours/dfcp1 0.5ug
Full path: ./trial 2/24 hours/dfcp1 0.5ug/dfcp1 0.5ug 2.tif

Found: dfcp1 0.5ug 1.tif
In directory: trial 2/24 hours/dfcp1 0.5ug
Full path: ./trial 2/24 hours/dfcp1 0.5ug/dfcp1 0.5ug 1.tif
```

```
Found: control 3.tif
In directory: trial 2/24 hours/control
Full path: ./trial 2/24 hours/control/control 3.tif

Found: control 2.tif
In directory: trial 2/24 hours/control
Full path: ./trial 2/24 hours/control/control 2.tif

Found: control 1.tif
In directory: trial 2/24 hours/control
Full path: ./trial 2/24 hours/control/control 1.tif

Found: DFCP1 1ug 2.tif
In directory: trial 1/72 hours/DFCP1 1ug
Full path: ./trial 1/72 hours/DFCP1 1ug/DFCP1 1ug 2.tif

Found: DFCP1 1ug 3.tif
In directory: trial 1/72 hours/DFCP1 1ug
Full path: ./trial 1/72 hours/DFCP1 1ug/DFCP1 1ug 3.tif

Found: DFCP1 1ug 1.tif
In directory: trial 1/72 hours/DFCP1 1ug
Full path: ./trial 1/72 hours/DFCP1 1ug/DFCP1 1ug 1.tif

Found: ATG13 2ug 1.tif
In directory: trial 1/72 hours/ATG13 2ug
Full path: ./trial 1/72 hours/ATG13 2ug/ATG13 2ug 1.tif

Found: ATG13 2ug 2.tif
In directory: trial 1/72 hours/ATG13 2ug
Full path: ./trial 1/72 hours/ATG13 2ug/ATG13 2ug 2.tif

Found: ATG13 2ug 3.tif
In directory: trial 1/72 hours/ATG13 2ug
Full path: ./trial 1/72 hours/ATG13 2ug/ATG13 2ug 3.tif

Found: DFCP1 2ug 1.tif
In directory: trial 1/72 hours/DFCP1 2ug
Full path: ./trial 1/72 hours/DFCP1 2ug/DFCP1 2ug 1.tif

Found: DFCP1 2ug 2.tif
In directory: trial 1/72 hours/DFCP1 2ug
Full path: ./trial 1/72 hours/DFCP1 2ug/DFCP1 2ug 2.tif

Found: DFCP1 2ug 3.tif
In directory: trial 1/72 hours/DFCP1 2ug
Full path: ./trial 1/72 hours/DFCP1 2ug/DFCP1 2ug 3.tif
```

```
Found: ATG13 1ug 1 (1).tif
In directory: trial 1/72 hours/ATG13 1ug
Full path: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 1 (1).tif

Found: ATG13 1ug 2.tif
In directory: trial 1/72 hours/ATG13 1ug
Full path: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 2.tif

Found: ATG13 1ug 3.tif
In directory: trial 1/72 hours/ATG13 1ug
Full path: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 3.tif

Found: ATG13 1ug 1.tif
In directory: trial 1/72 hours/ATG13 1ug
Full path: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 1.tif

Found: ATG13 1ug 1 (3).tif
In directory: trial 1/72 hours/ATG13 1ug
Full path: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 1 (3).tif

Found: ATG13 0.5ug 1.tif
In directory: trial 1/72 hours/ATG13 0.5ug
Full path: ./trial 1/72 hours/ATG13 0.5ug/ATG13 0.5ug 1.tif

Found: ATG13 0.5ug 2.tif
In directory: trial 1/72 hours/ATG13 0.5ug
Full path: ./trial 1/72 hours/ATG13 0.5ug/ATG13 0.5ug 2.tif

Found: ATG13 0.5ug 3.tif
In directory: trial 1/72 hours/ATG13 0.5ug
Full path: ./trial 1/72 hours/ATG13 0.5ug/ATG13 0.5ug 3.tif

Found: DFCP1 0.5ug 3.tif
In directory: trial 1/72 hours/DFCP1 0.5ug
Full path: ./trial 1/72 hours/DFCP1 0.5ug/DFCP1 0.5ug 3.tif

Found: DFCP1 0.5ug 2.tif
In directory: trial 1/72 hours/DFCP1 0.5ug
Full path: ./trial 1/72 hours/DFCP1 0.5ug/DFCP1 0.5ug 2.tif

Found: DFCP1 0.5ug 1.tif
In directory: trial 1/72 hours/DFCP1 0.5ug
Full path: ./trial 1/72 hours/DFCP1 0.5ug/DFCP1 0.5ug 1.tif

Found: control 3.tif
In directory: trial 1/72 hours/control
Full path: ./trial 1/72 hours/control/control 3.tif
```

```
Found: control 2.tif
In directory: trial 1/72 hours/control
Full path: ./trial 1/72 hours/control/control 2.tif

Found: control 1.tif
In directory: trial 1/72 hours/control
Full path: ./trial 1/72 hours/control/control 1.tif

Found: DFCP1 1ug 2.tif
In directory: trial 1/48 hours/DFCP1 1ug
Full path: ./trial 1/48 hours/DFCP1 1ug/DFCP1 1ug 2.tif

Found: DFCP1 1ug 3.tif
In directory: trial 1/48 hours/DFCP1 1ug
Full path: ./trial 1/48 hours/DFCP1 1ug/DFCP1 1ug 3.tif

Found: DFCP1 1ug 1.tif
In directory: trial 1/48 hours/DFCP1 1ug
Full path: ./trial 1/48 hours/DFCP1 1ug/DFCP1 1ug 1.tif

Found: ATG13 0.5ug 1.tif
In directory: trial 1/48 hours/atg13 0.5
Full path: ./trial 1/48 hours/atg13 0.5/ATG13 0.5ug 1.tif

Found: ATG13 0.5ug 2.tif
In directory: trial 1/48 hours/atg13 0.5
Full path: ./trial 1/48 hours/atg13 0.5/ATG13 0.5ug 2.tif

Found: ATG13 0.5ug 3.tif
In directory: trial 1/48 hours/atg13 0.5
Full path: ./trial 1/48 hours/atg13 0.5/ATG13 0.5ug 3.tif

Found: ATG13 2ug2.tif
In directory: trial 1/48 hours/ATG13 2ug
Full path: ./trial 1/48 hours/ATG13 2ug/ATG13 2ug2.tif

Found: ATG13 2ug 1.tif
In directory: trial 1/48 hours/ATG13 2ug
Full path: ./trial 1/48 hours/ATG13 2ug/ATG13 2ug 1.tif

Found: ATG13 2ug 3.tif
In directory: trial 1/48 hours/ATG13 2ug
Full path: ./trial 1/48 hours/ATG13 2ug/ATG13 2ug 3.tif

Found: DFCP1 1ug 2.tif
In directory: trial 1/48 hours/DFCP1 2ug
Full path: ./trial 1/48 hours/DFCP1 2ug/DFCP1 1ug 2.tif
```

```
Found: DFCP1 1ug 3.tif
In directory: trial 1/48 hours/DFCP1 2ug
Full path: ./trial 1/48 hours/DFCP1 2ug/DFCP1 1ug 3.tif

Found: DFCP1 1ug 1.tif
In directory: trial 1/48 hours/DFCP1 2ug
Full path: ./trial 1/48 hours/DFCP1 2ug/DFCP1 1ug 1.tif

Found: ATG13 1ug 2.tif
In directory: trial 1/48 hours/ATG13 1ug
Full path: ./trial 1/48 hours/ATG13 1ug/ATG13 1ug 2.tif

Found: ATG13 1ug 3.tif
In directory: trial 1/48 hours/ATG13 1ug
Full path: ./trial 1/48 hours/ATG13 1ug/ATG13 1ug 3.tif

Found: ATG13 1ug 1.tif
In directory: trial 1/48 hours/ATG13 1ug
Full path: ./trial 1/48 hours/ATG13 1ug/ATG13 1ug 1.tif

Found: DFCP1 0.5ug 3.tif
In directory: trial 1/48 hours/DFCP1 0.5ug
Full path: ./trial 1/48 hours/DFCP1 0.5ug/DFCP1 0.5ug 3.tif

Found: DFCP1 0.5ug 2.tif
In directory: trial 1/48 hours/DFCP1 0.5ug
Full path: ./trial 1/48 hours/DFCP1 0.5ug/DFCP1 0.5ug 2.tif

Found: DFCP1 0.5ug 1.tif
In directory: trial 1/48 hours/DFCP1 0.5ug
Full path: ./trial 1/48 hours/DFCP1 0.5ug/DFCP1 0.5ug 1.tif

Found: control 48h.tif
In directory: trial 1/48 hours/control
Full path: ./trial 1/48 hours/control/control 48h.tif

Found: control 48h 3.tif
In directory: trial 1/48 hours/control
Full path: ./trial 1/48 hours/control/control 48h 3.tif

Found: control 48h 2.tif
In directory: trial 1/48 hours/control
Full path: ./trial 1/48 hours/control/control 48h 2.tif

Found: DFCP1 1ug 4.tif
In directory: trial 1/24 hours/DFCP1 1ug
Full path: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 4.tif
```

```
Found: DFCP1 1ug 2.tif
In directory: trial 1/24 hours/DFCP1 1ug
Full path: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 2.tif

Found: DFCP1 1ug 3.tif
In directory: trial 1/24 hours/DFCP1 1ug
Full path: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 3.tif

Found: DFCP1 1ug 1.tif
In directory: trial 1/24 hours/DFCP1 1ug
Full path: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 1.tif

Found: ATG13 2ug 1.tif
In directory: trial 1/24 hours/ATG13 2ug
Full path: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 1.tif

Found: ATG13 2ug 2.tif
In directory: trial 1/24 hours/ATG13 2ug
Full path: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 2.tif

Found: ATG13 2ug 3.tif
In directory: trial 1/24 hours/ATG13 2ug
Full path: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 3.tif

Found: ATG13 2ug 4.tif
In directory: trial 1/24 hours/ATG13 2ug
Full path: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 4.tif

Found: DFCP1 2ug 4.tif
In directory: trial 1/24 hours/DFCP1 2ug
Full path: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 4.tif

Found: DFCP1 2ug 1.tif
In directory: trial 1/24 hours/DFCP1 2ug
Full path: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 1.tif

Found: DFCP1 2ug 2.tif
In directory: trial 1/24 hours/DFCP1 2ug
Full path: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 2.tif

Found: DFCP1 2ug 3.tif
In directory: trial 1/24 hours/DFCP1 2ug
Full path: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 3.tif

Found: ATG13 1ug 2.tif
In directory: trial 1/24 hours/ATG13 1ug
Full path: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 2.tif
```

```
Found: ATG13 1ug 3.tif
In directory: trial 1/24 hours/ATG13 1ug
Full path: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 3.tif

Found: ATG13 1ug 1.tif
In directory: trial 1/24 hours/ATG13 1ug
Full path: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 1.tif

Found: ATG13 1ug 4.tif
In directory: trial 1/24 hours/ATG13 1ug
Full path: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 4.tif

Found: 2ug 4.tif
In directory: trial 1/24 hours/ATG13 0.5ug
Full path: ./trial 1/24 hours/ATG13 0.5ug/2ug 4.tif

Found: 2ug 1.tif
In directory: trial 1/24 hours/ATG13 0.5ug
Full path: ./trial 1/24 hours/ATG13 0.5ug/2ug 1.tif

Found: 2ug 3.tif
In directory: trial 1/24 hours/ATG13 0.5ug
Full path: ./trial 1/24 hours/ATG13 0.5ug/2ug 3.tif

Found: 2ug 2.tif
In directory: trial 1/24 hours/ATG13 0.5ug
Full path: ./trial 1/24 hours/ATG13 0.5ug/2ug 2.tif

Found: DFCP1 0.5ug 4.tif
In directory: trial 1/24 hours/DFCP1 0.5ug
Full path: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug 4.tif

Found: DFCP1 0.5ug 3.tif
In directory: trial 1/24 hours/DFCP1 0.5ug
Full path: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug 3.tif

Found: DFCP1 0.5ug 2.tif
In directory: trial 1/24 hours/DFCP1 0.5ug
Full path: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug 2.tif

Found: DFCP1 0.5ug 1.tif
In directory: trial 1/24 hours/DFCP1 0.5ug
Full path: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug 1.tif


Found 130 .tif files in total

Total .tif files found: 130
```

```
Files found in these directories:
./trial 2/24 hours/control: 3 files
./trial 2/48h/atg13 0.5: 3 files
./trial 1/72 hours/control: 3 files
./trial 1/24 hours/DFCP1 1ug: 4 files
./trial 1/48 hours/ATG13 1ug: 3 files
./trial 2/48h/control: 3 files
./trial 1/72 hours/ATG13 1ug: 5 files
./trial 1/24 hours/ATG13 2ug: 4 files
./trial 1/48 hours/DFCP1 0.5ug: 3 files
./trial 1/24 hours/ATG13 1ug: 4 files
./trial 2/48h/DFCP1 0.5ug: 3 files
./trial 2/24 hours/atg13 2ug: 3 files
./trial 1/72 hours/DFCP1 1ug: 3 files
./trial 2/24 hours/atg13 1ug: 3 files
./trial 2/48h/DFCP1 1ug: 3 files
./trial 1/72 hours/ATG13 0.5ug: 3 files
./trial 2/48h/atg13 1ug: 3 files
./trial 1/48 hours/DFCP1 1ug: 3 files
./trial 2/72h/atg13 2ug: 3 files
./trial 2/48h/DFCP1 2ug: 3 files
./trial 1/48 hours/ATG13 2ug: 3 files
./trial 1/48 hours/DFCP1 2ug: 3 files
./trial 1/48 hours/atg13 0.5: 3 files
./trial 2/72h/atg13 1ug: 3 files
./trial 2/72h/DFCP1 2ug: 3 files
./trial 2/72h/atg13 0.5ug: 3 files
./trial 2/24 hours/dfcp1 2ug: 3 files
./trial 2/24 hours/dfcp1 1ug: 3 files
./trial 1/72 hours/ATG13 2ug: 3 files
./trial 2/24 hours/atg13 0.5: 2 files
./trial 1/24 hours/ATG13 0.5ug: 4 files
./trial 2/48h/atg13 2ug: 3 files
./trial 1/72 hours/DFCP1 0.5ug: 3 files
./trial 2/72h/DFCP1 0.5ug: 3 files
./trial 2/72h/DFCP1 1ug: 3 files
./trial 1/72 hours/DFCP1 2ug: 3 files
./trial 2/72h/control: 3 files
./trial 1/48 hours/control: 3 files
./trial 2/24 hours/dfcp1 0.5ug: 3 files
./trial 1/24 hours/DFCP1 2ug: 4 files
./trial 1/24 hours/DFCP1 0.5ug: 4 files
```

```python
[53]: def process_files(file_paths, save_visualizations=True):
          """
          Process multiple image files and generate reports
```

```python
    Parameters:
    file_paths : list of str
        List of file paths to process
    save_visualizations : bool
        Whether to save visualization images
    """
    results = []

    for file_path in file_paths:
        try:
            print(f"\nProcessing: {os.path.basename(file_path)}")
            print(f"From directory: {os.path.dirname(file_path)}")

            # Process the image and get results
            total_cells, green_cells, output_path = count_cells(file_path)

            # Store results
            result = {
                'filename': os.path.basename(file_path),
                'directory': os.path.dirname(file_path),
                'total_cells': total_cells,
                'green_cells': green_cells,
                'green_percentage': round((green_cells / total_cells * 100), 2) ␣
↪if total_cells > 0 else 0,
                'visualization_path': output_path if save_visualizations else␣
↪None
            }
            results.append(result)

            # Print individual file results
            print("\nResults:")
            print(f"Total cells: {total_cells}")
            print(f"Green cells: {green_cells}")
            print(f"Green percentage: {result['green_percentage']}%")
            if save_visualizations:
                print(f"Visualization saved to: {output_path}")

        except Exception as e:
            print(f"Error processing {file_path}: {str(e)}")

    return results

# Example usage for a single file:
# Choose the first file from our list for testing
if tif_files:
    test_file = tif_files[15]
```

```python
    print(f"\nTesting with single file: {test_file}")
    results = process_files([test_file])

    # You can access the results as a list of dictionaries
    if results:
        print("\nProcessing complete! Results available in 'results' variable")
else:
    print("No files available to process!")


"""
# Example for multiple files (commented out for now):
# Process specific files by index
selected_indices = [0, 1, 2]  # Process first three files
selected_files = [tif_files[i] for i in selected_indices]
results = process_files(selected_files)

# Or process files by pattern
selected_files = [f for f in tif_files if "DFCP1" in f]
results = process_files(selected_files)
"""
```

Testing with single file: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 3.tif

Processing: DFCP1 0.5ug 3.tif
From directory: ./trial 2/48h/DFCP1 0.5ug

Results:
Total cells: 310
Green cells: 28
Green percentage: 9.03%
Visualization saved to: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 3_analyzed.jpg

Processing complete! Results available in 'results' variable

```
[53]: '\n# Example for multiple files (commented out for now):\n# Process specific
      files by index\nselected_indices = [0, 1, 2]  # Process first three
      files\nselected_files = [tif_files[i] for i in selected_indices]\nresults =
      process_files(selected_files)\n\n# Or process files by pattern\nselected_files =
      [f for f in tif_files if "DFCP1" in f]\nresults =
      process_files(selected_files)\n'
```

```python
[44]: def display_tiff_images(file_paths, figsize=(15, 15)):
          """
          Display one or multiple TIFF images in a grid layout

          Parameters:
              file_paths: Single path string or list of path strings
```

```python
        figsize: Tuple specifying figure size (width, height)
    """
    # Convert single path to list
    if isinstance(file_paths, str):
        file_paths = [file_paths]

    # Calculate grid dimensions
    n_images = len(file_paths)
    if n_images == 1:
        # For single image, create a single subplot
        fig, ax = plt.subplots(1, 1, figsize=figsize)

        try:
            # Read image
            img = tifffile.imread(str(file_paths[0]))

            # Convert to 8-bit if necessary
            if img.dtype != np.uint8:
                img = ((img - img.min()) * (255.0 / (img.max() - img.min()))).
↪astype(np.uint8)

            # Display image
            ax.imshow(img, cmap='gray')
            ax.axis('off')

            # Add title (filename without path)
            title = os.path.basename(file_paths[0])
            ax.set_title(title, fontsize=10, pad=5)

        except Exception as e:
            ax.text(0.5, 0.5, f'Error loading image:\n{str(e)}',
                    ha='center', va='center', color='red',
                    transform=ax.transAxes, wrap=True)
            ax.axis('off')

    else:
        # Multiple images: use grid layout
        cols = min(3, n_images)  # Max 3 columns
        rows = (n_images + cols - 1) // cols
        fig, axes = plt.subplots(rows, cols, figsize=figsize)
        axes = axes.ravel()

        # Display each image
        for idx, (ax, file_path) in enumerate(zip(axes, file_paths)):
            try:
                # Read image
                img = tifffile.imread(str(file_path))
```

```python
                # Convert to 8-bit if necessary
                if img.dtype != np.uint8:
                    img = ((img - img.min()) * (255.0 / (img.max() - img.
 ↪min()))).astype(np.uint8)

                # Display image
                ax.imshow(img, cmap='gray')
                ax.axis('off')

                # Add title (filename without path)
                title = os.path.basename(file_path)
                ax.set_title(title, fontsize=10, pad=5)

            except Exception as e:
                ax.text(0.5, 0.5, f'Error loading image:\n{str(e)}',
                        ha='center', va='center', color='red',
                        transform=ax.transAxes, wrap=True)
                ax.axis('off')

        # Hide empty subplots
        for idx in range(len(file_paths), len(axes)):
            axes[idx].axis('off')

    plt.tight_layout()
    return fig

# Example usage:
# Single image
print(tif_files[15]) # print the path of the image
display_tiff_images(tif_files[15])

# Multiple images
# display_tiff_images(tif_files[0:5])
```
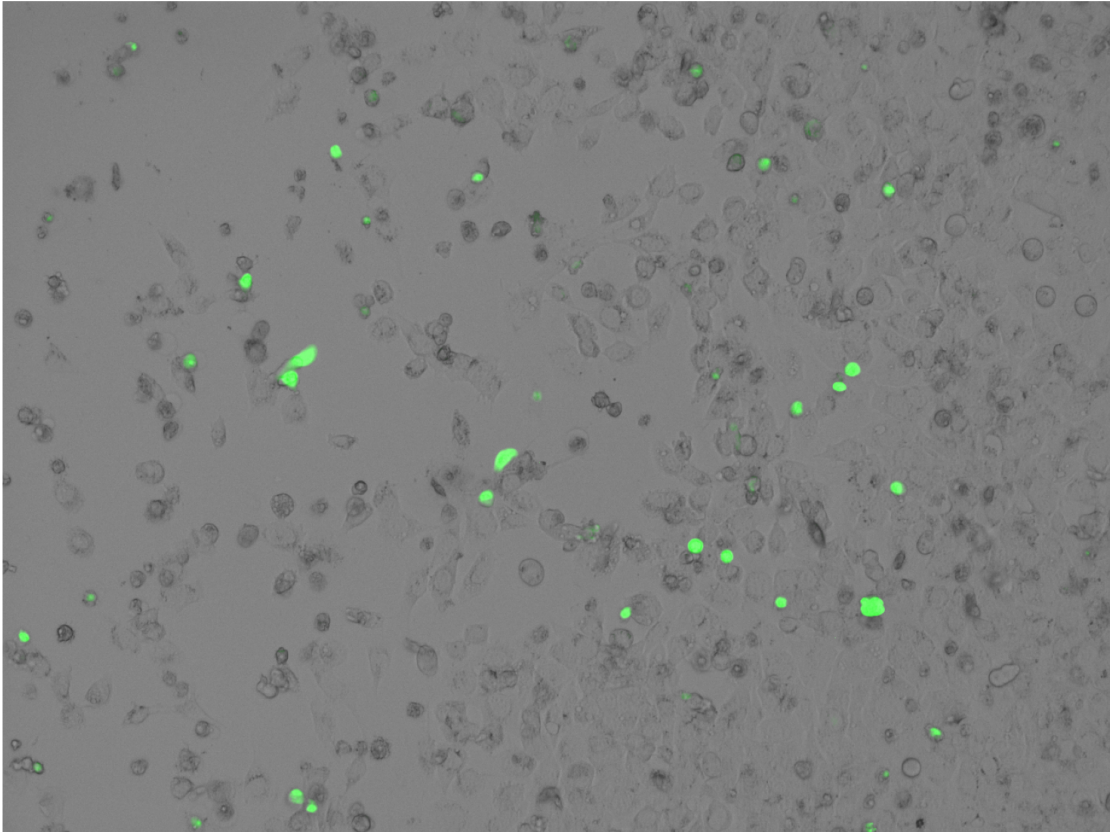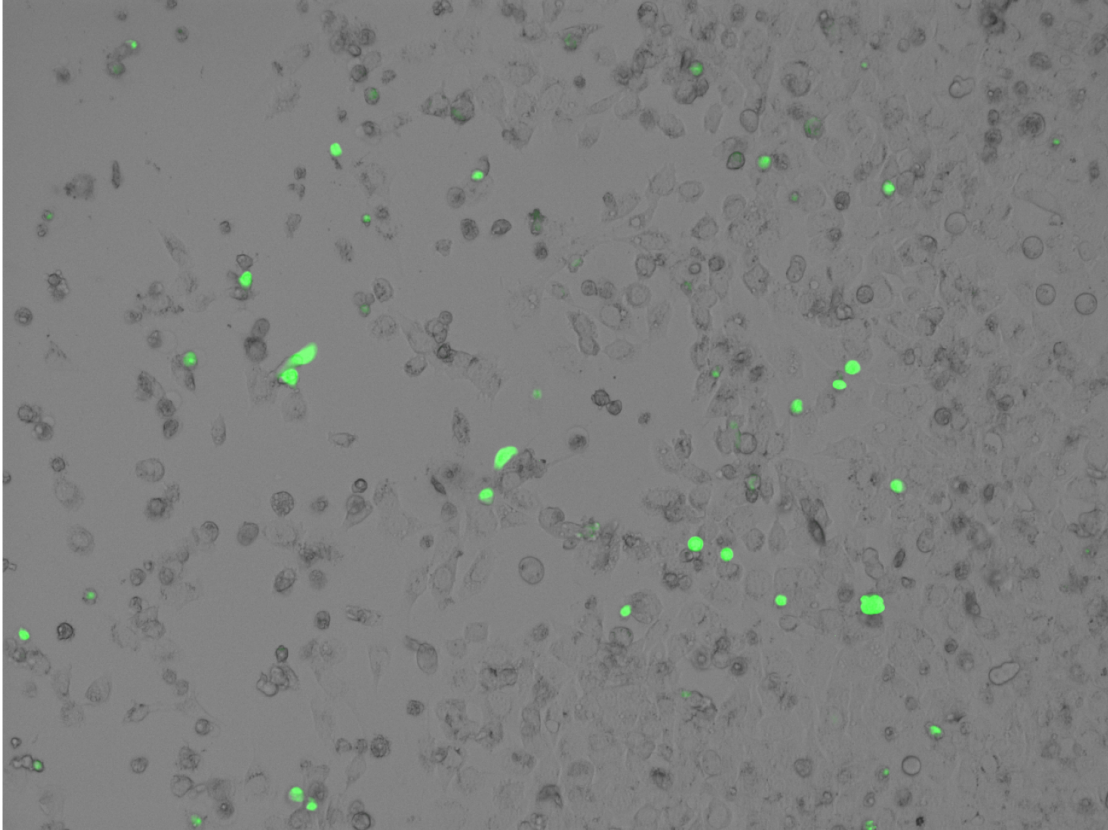
./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 3.tif

[44]:

DFCP1 0.5ug 3.tif

[54]:
```python
import pandas as pd

def process_all_files_to_csv(tif_files, output_csv_path="cell_counts.csv"):
    """
    Process all TIF files and save results to CSV

    Parameters:
    tif_files : list of str
        List of TIF file paths
    output_csv_path : str
        Path where the CSV file will be saved
    """
    # Process all files
    print(f"Processing {len(tif_files)} files...")
    results = process_files(tif_files)

    # Convert results to DataFrame
    df = pd.DataFrame([
        {
            'Index': idx,
```

```python
            'File Path': os.path.join(result['directory'], result['filename']),
            'Total Cell Count': result['total_cells'],
            'Green Cell Count': result['green_cells']
        }
        for idx, result in enumerate(results, 1)
    ])

    # Save to CSV
    df.to_csv(output_csv_path, index=False)
    print(f"\nResults saved to: {output_csv_path}")

    # Display summary
    print("\nSummary Statistics:")
    print(f"Total files processed: {len(results)}")
    print(f"Average total cells per image: {df['Total Cell Count'].mean():.2f}")
    print(f"Average green cells per image: {df['Green Cell Count'].mean():.2f}")

    return df

# Execute the processing
if tif_files:
    # You can specify a different path for the CSV if needed
    csv_path = "cell_analysis_results.csv"

    # Process all files and get the DataFrame
    results_df = process_all_files_to_csv(tif_files, csv_path)

    # Display first few rows of the results
    print("\nFirst few rows of the results:")
    print(results_df.head())
else:
    print("No files available to process!")
```

Processing 130 files…

Processing: DFCP1 1ug 2.tif
From directory: ./trial 2/48h/DFCP1 1ug

Results:
Total cells: 251
Green cells: 15
Green percentage: 5.98%
Visualization saved to: ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 2_analyzed.jpg

Processing: DFCP1 1ug 3.tif
From directory: ./trial 2/48h/DFCP1 1ug

Results:

```
Total cells: 251
Green cells: 15
Green percentage: 5.98%
Visualization saved to: ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 3_analyzed.jpg


Processing: DFCP1 1ug 1.tif
From directory: ./trial 2/48h/DFCP1 1ug

Results:
Total cells: 244
Green cells: 17
Green percentage: 6.97%
Visualization saved to: ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 1_analyzed.jpg


Processing: atg13 0.5ug 1.tif
From directory: ./trial 2/48h/atg13 0.5

Results:
Total cells: 75
Green cells: 21
Green percentage: 28.0%
Visualization saved to: ./trial 2/48h/atg13 0.5/atg13 0.5ug 1_analyzed.jpg


Processing: atg13 0.5ug 2.tif
From directory: ./trial 2/48h/atg13 0.5

Results:
Total cells: 114
Green cells: 25
Green percentage: 21.93%
Visualization saved to: ./trial 2/48h/atg13 0.5/atg13 0.5ug 2_analyzed.jpg


Processing: atg13 0.5ug 3.tif
From directory: ./trial 2/48h/atg13 0.5

Results:
Total cells: 310
Green cells: 28
Green percentage: 9.03%
Visualization saved to: ./trial 2/48h/atg13 0.5/atg13 0.5ug 3_analyzed.jpg


Processing: atg13 2ug 1.tif
From directory: ./trial 2/48h/atg13 2ug

Results:
Total cells: 172
Green cells: 5
Green percentage: 2.91%
```

```
Visualization saved to: ./trial 2/48h/atg13 2ug/atg13 2ug 1_analyzed.jpg

Processing: atg13 2ug 2.tif
From directory: ./trial 2/48h/atg13 2ug

Results:
Total cells: 150
Green cells: 8
Green percentage: 5.33%
Visualization saved to: ./trial 2/48h/atg13 2ug/atg13 2ug 2_analyzed.jpg

Processing: atg13 2ug 3.tif
From directory: ./trial 2/48h/atg13 2ug

Results:
Total cells: 125
Green cells: 1
Green percentage: 0.8%
Visualization saved to: ./trial 2/48h/atg13 2ug/atg13 2ug 3_analyzed.jpg

Processing: DFCP1 2ug 1.tif
From directory: ./trial 2/48h/DFCP1 2ug

Results:
Total cells: 251
Green cells: 15
Green percentage: 5.98%
Visualization saved to: ./trial 2/48h/DFCP1 2ug/DFCP1 2ug 1_analyzed.jpg

Processing: DFCP1 2ug 2.tif
From directory: ./trial 2/48h/DFCP1 2ug

Results:
Total cells: 249
Green cells: 13
Green percentage: 5.22%
Visualization saved to: ./trial 2/48h/DFCP1 2ug/DFCP1 2ug 2_analyzed.jpg

Processing: DFCP1 2ug 3.tif
From directory: ./trial 2/48h/DFCP1 2ug

Results:
Total cells: 287
Green cells: 16
Green percentage: 5.57%
Visualization saved to: ./trial 2/48h/DFCP1 2ug/DFCP1 2ug 3_analyzed.jpg

Processing: atg13 1ug 2.tif
```

```
From directory: ./trial 2/48h/atg13 1ug

Results:
Total cells: 78
Green cells: 13
Green percentage: 16.67%
Visualization saved to: ./trial 2/48h/atg13 1ug/atg13 1ug 2_analyzed.jpg

Processing: atg13 1ug 3.tif
From directory: ./trial 2/48h/atg13 1ug

Results:
Total cells: 157
Green cells: 8
Green percentage: 5.1%
Visualization saved to: ./trial 2/48h/atg13 1ug/atg13 1ug 3_analyzed.jpg

Processing: atg13 1ug 1.tif
From directory: ./trial 2/48h/atg13 1ug

Results:
Total cells: 72
Green cells: 17
Green percentage: 23.61%
Visualization saved to: ./trial 2/48h/atg13 1ug/atg13 1ug 1_analyzed.jpg

Processing: DFCP1 0.5ug 3.tif
From directory: ./trial 2/48h/DFCP1 0.5ug

Results:
Total cells: 310
Green cells: 28
Green percentage: 9.03%
Visualization saved to: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 3_analyzed.jpg

Processing: DFCP1 0.5ug 2.tif
From directory: ./trial 2/48h/DFCP1 0.5ug

Results:
Total cells: 352
Green cells: 18
Green percentage: 5.11%
Visualization saved to: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 2_analyzed.jpg

Processing: DFCP1 0.5ug 1.tif
From directory: ./trial 2/48h/DFCP1 0.5ug

Results:
```

```
Total cells: 227
Green cells: 15
Green percentage: 6.61%
Visualization saved to: ./trial 2/48h/DFCP1 0.5ug/DFCP1 0.5ug 1_analyzed.jpg


Processing: control 3.tif
From directory: ./trial 2/48h/control

Results:
Total cells: 276
Green cells: 2
Green percentage: 0.72%
Visualization saved to: ./trial 2/48h/control/control 3_analyzed.jpg


Processing: control 2.tif
From directory: ./trial 2/48h/control

Results:
Total cells: 323
Green cells: 3
Green percentage: 0.93%
Visualization saved to: ./trial 2/48h/control/control 2_analyzed.jpg


Processing: control 1.tif
From directory: ./trial 2/48h/control

Results:
Total cells: 221
Green cells: 3
Green percentage: 1.36%
Visualization saved to: ./trial 2/48h/control/control 1_analyzed.jpg


Processing: DFCP1 1ug 2.tif
From directory: ./trial 2/72h/DFCP1 1ug

Results:
Total cells: 207
Green cells: 16
Green percentage: 7.73%
Visualization saved to: ./trial 2/72h/DFCP1 1ug/DFCP1 1ug 2_analyzed.jpg


Processing: DFCP1 1ug 3.tif
From directory: ./trial 2/72h/DFCP1 1ug

Results:
Total cells: 207
Green cells: 17
Green percentage: 8.21%
```

```
Visualization saved to: ./trial 2/72h/DFCP1 1ug/DFCP1 1ug 3_analyzed.jpg

Processing: DFCP1 1ug 1.tif
From directory: ./trial 2/72h/DFCP1 1ug

Results:
Total cells: 223
Green cells: 9
Green percentage: 4.04%
Visualization saved to: ./trial 2/72h/DFCP1 1ug/DFCP1 1ug 1_analyzed.jpg

Processing: atg13 2ug 1.tif
From directory: ./trial 2/72h/atg13 2ug

Results:
Total cells: 166
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 2/72h/atg13 2ug/atg13 2ug 1_analyzed.jpg

Processing: atg13 2ug 2.tif
From directory: ./trial 2/72h/atg13 2ug

Results:
Total cells: 183
Green cells: 3
Green percentage: 1.64%
Visualization saved to: ./trial 2/72h/atg13 2ug/atg13 2ug 2_analyzed.jpg

Processing: atg13 2ug 3.tif
From directory: ./trial 2/72h/atg13 2ug

Results:
Total cells: 154
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 2/72h/atg13 2ug/atg13 2ug 3_analyzed.jpg

Processing: DFCP1 2ug 1.tif
From directory: ./trial 2/72h/DFCP1 2ug

Results:
Total cells: 226
Green cells: 8
Green percentage: 3.54%
Visualization saved to: ./trial 2/72h/DFCP1 2ug/DFCP1 2ug 1_analyzed.jpg

Processing: DFCP1 2ug 2.tif
```

```
From directory: ./trial 2/72h/DFCP1 2ug

Results:
Total cells: 290
Green cells: 4
Green percentage: 1.38%
Visualization saved to: ./trial 2/72h/DFCP1 2ug/DFCP1 2ug 2_analyzed.jpg

Processing: DFCP1 2ug 3.tif
From directory: ./trial 2/72h/DFCP1 2ug

Results:
Total cells: 217
Green cells: 9
Green percentage: 4.15%
Visualization saved to: ./trial 2/72h/DFCP1 2ug/DFCP1 2ug 3_analyzed.jpg

Processing: atg13 1ug 2.tif
From directory: ./trial 2/72h/atg13 1ug

Results:
Total cells: 119
Green cells: 1
Green percentage: 0.84%
Visualization saved to: ./trial 2/72h/atg13 1ug/atg13 1ug 2_analyzed.jpg

Processing: atg13 1ug 3.tif
From directory: ./trial 2/72h/atg13 1ug

Results:
Total cells: 110
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 2/72h/atg13 1ug/atg13 1ug 3_analyzed.jpg

Processing: atg13 1ug 1.tif
From directory: ./trial 2/72h/atg13 1ug

Results:
Total cells: 106
Green cells: 1
Green percentage: 0.94%
Visualization saved to: ./trial 2/72h/atg13 1ug/atg13 1ug 1_analyzed.jpg

Processing: atg13 0.5ug 1.tif
From directory: ./trial 2/72h/atg13 0.5ug

Results:
```

```
Total cells: 168
Green cells: 4
Green percentage: 2.38%
Visualization saved to: ./trial 2/72h/atg13 0.5ug/atg13 0.5ug 1_analyzed.jpg


Processing: atg13 0.5ug 2.tif
From directory: ./trial 2/72h/atg13 0.5ug

Results:
Total cells: 288
Green cells: 2
Green percentage: 0.69%
Visualization saved to: ./trial 2/72h/atg13 0.5ug/atg13 0.5ug 2_analyzed.jpg


Processing: atg13 0.5ug 3.tif
From directory: ./trial 2/72h/atg13 0.5ug

Results:
Total cells: 182
Green cells: 2
Green percentage: 1.1%
Visualization saved to: ./trial 2/72h/atg13 0.5ug/atg13 0.5ug 3_analyzed.jpg


Processing: DFCP1 0.5ug 3.tif
From directory: ./trial 2/72h/DFCP1 0.5ug

Results:
Total cells: 243
Green cells: 37
Green percentage: 15.23%
Visualization saved to: ./trial 2/72h/DFCP1 0.5ug/DFCP1 0.5ug 3_analyzed.jpg


Processing: DFCP1 0.5ug 2.tif
From directory: ./trial 2/72h/DFCP1 0.5ug

Results:
Total cells: 245
Green cells: 39
Green percentage: 15.92%
Visualization saved to: ./trial 2/72h/DFCP1 0.5ug/DFCP1 0.5ug 2_analyzed.jpg


Processing: DFCP1 0.5ug 1.tif
From directory: ./trial 2/72h/DFCP1 0.5ug

Results:
Total cells: 211
Green cells: 17
Green percentage: 8.06%
```

Visualization saved to: ./trial 2/72h/DFCP1 0.5ug/DFCP1 0.5ug 1_analyzed.jpg

Processing: control 3.tif
From directory: ./trial 2/72h/control

Results:
Total cells: 332
Green cells: 4
Green percentage: 1.2%
Visualization saved to: ./trial 2/72h/control/control 3_analyzed.jpg

Processing: control 2.tif
From directory: ./trial 2/72h/control

Results:
Total cells: 249
Green cells: 3
Green percentage: 1.2%
Visualization saved to: ./trial 2/72h/control/control 2_analyzed.jpg

Processing: control 1.tif
From directory: ./trial 2/72h/control

Results:
Total cells: 220
Green cells: 4
Green percentage: 1.82%
Visualization saved to: ./trial 2/72h/control/control 1_analyzed.jpg

Processing: dfcp1 1ug 2.tif
From directory: ./trial 2/24 hours/dfcp1 1ug

Results:
Total cells: 306
Green cells: 43
Green percentage: 14.05%
Visualization saved to: ./trial 2/24 hours/dfcp1 1ug/dfcp1 1ug 2_analyzed.jpg

Processing: dfcp1 1ug 3.tif
From directory: ./trial 2/24 hours/dfcp1 1ug

Results:
Total cells: 260
Green cells: 39
Green percentage: 15.0%
Visualization saved to: ./trial 2/24 hours/dfcp1 1ug/dfcp1 1ug 3_analyzed.jpg

Processing: dfcp1 1ug 1.tif

```
From directory: ./trial 2/24 hours/dfcp1 1ug

Results:
Total cells: 239
Green cells: 43
Green percentage: 17.99%
Visualization saved to: ./trial 2/24 hours/dfcp1 1ug/dfcp1 1ug 1_analyzed.jpg

Processing: Atg13 0.5ug 2.tif
From directory: ./trial 2/24 hours/atg13 0.5

Results:
Total cells: 269
Green cells: 9
Green percentage: 3.35%
Visualization saved to: ./trial 2/24 hours/atg13 0.5/Atg13 0.5ug 2_analyzed.jpg

Processing: Atg13 0.5ug 3.tif
From directory: ./trial 2/24 hours/atg13 0.5

Results:
Total cells: 303
Green cells: 11
Green percentage: 3.63%
Visualization saved to: ./trial 2/24 hours/atg13 0.5/Atg13 0.5ug 3_analyzed.jpg

Processing: Atg13 2ug 1.tif
From directory: ./trial 2/24 hours/atg13 2ug

Results:
Total cells: 167
Green cells: 5
Green percentage: 2.99%
Visualization saved to: ./trial 2/24 hours/atg13 2ug/Atg13 2ug 1_analyzed.jpg

Processing: Atg13 2ug 2.tif
From directory: ./trial 2/24 hours/atg13 2ug

Results:
Total cells: 160
Green cells: 3
Green percentage: 1.88%
Visualization saved to: ./trial 2/24 hours/atg13 2ug/Atg13 2ug 2_analyzed.jpg

Processing: Atg13 2ug 3.tif
From directory: ./trial 2/24 hours/atg13 2ug

Results:
```

```
Total cells: 203
Green cells: 11
Green percentage: 5.42%
Visualization saved to: ./trial 2/24 hours/atg13 2ug/Atg13 2ug 3_analyzed.jpg


Processing: dfcp1 2ug 1.tif
From directory: ./trial 2/24 hours/dfcp1 2ug

Results:
Total cells: 177
Green cells: 21
Green percentage: 11.86%
Visualization saved to: ./trial 2/24 hours/dfcp1 2ug/dfcp1 2ug 1_analyzed.jpg


Processing: dfcp1 2ug 2.tif
From directory: ./trial 2/24 hours/dfcp1 2ug

Results:
Total cells: 242
Green cells: 27
Green percentage: 11.16%
Visualization saved to: ./trial 2/24 hours/dfcp1 2ug/dfcp1 2ug 2_analyzed.jpg


Processing: dfcp1 2ug 3.tif
From directory: ./trial 2/24 hours/dfcp1 2ug

Results:
Total cells: 234
Green cells: 20
Green percentage: 8.55%
Visualization saved to: ./trial 2/24 hours/dfcp1 2ug/dfcp1 2ug 3_analyzed.jpg


Processing: Atg13 1ug 2.tif
From directory: ./trial 2/24 hours/atg13 1ug

Results:
Total cells: 219
Green cells: 5
Green percentage: 2.28%
Visualization saved to: ./trial 2/24 hours/atg13 1ug/Atg13 1ug 2_analyzed.jpg


Processing: Atg13 1ug 3.tif
From directory: ./trial 2/24 hours/atg13 1ug

Results:
Total cells: 165
Green cells: 16
Green percentage: 9.7%
```

Visualization saved to: ./trial 2/24 hours/atg13 1ug/Atg13 1ug 3_analyzed.jpg

Processing: Atg13 1ug 1.tif
From directory: ./trial 2/24 hours/atg13 1ug

Results:
Total cells: 198
Green cells: 8
Green percentage: 4.04%
Visualization saved to: ./trial 2/24 hours/atg13 1ug/Atg13 1ug 1_analyzed.jpg

Processing: dfcp1 0.5ug 3.tif
From directory: ./trial 2/24 hours/dfcp1 0.5ug

Results:
Total cells: 271
Green cells: 40
Green percentage: 14.76%
Visualization saved to: ./trial 2/24 hours/dfcp1 0.5ug/dfcp1 0.5ug 3_analyzed.jpg

Processing: dfcp1 0.5ug 2.tif
From directory: ./trial 2/24 hours/dfcp1 0.5ug

Results:
Total cells: 271
Green cells: 48
Green percentage: 17.71%
Visualization saved to: ./trial 2/24 hours/dfcp1 0.5ug/dfcp1 0.5ug 2_analyzed.jpg

Processing: dfcp1 0.5ug 1.tif
From directory: ./trial 2/24 hours/dfcp1 0.5ug

Results:
Total cells: 251
Green cells: 46
Green percentage: 18.33%
Visualization saved to: ./trial 2/24 hours/dfcp1 0.5ug/dfcp1 0.5ug 1_analyzed.jpg

Processing: control 3.tif
From directory: ./trial 2/24 hours/control

Results:
Total cells: 222
Green cells: 3
Green percentage: 1.35%

```
Visualization saved to: ./trial 2/24 hours/control/control 3_analyzed.jpg

Processing: control 2.tif
From directory: ./trial 2/24 hours/control

Results:
Total cells: 238
Green cells: 3
Green percentage: 1.26%
Visualization saved to: ./trial 2/24 hours/control/control 2_analyzed.jpg

Processing: control 1.tif
From directory: ./trial 2/24 hours/control

Results:
Total cells: 181
Green cells: 1
Green percentage: 0.55%
Visualization saved to: ./trial 2/24 hours/control/control 1_analyzed.jpg

Processing: DFCP1 1ug 2.tif
From directory: ./trial 1/72 hours/DFCP1 1ug

Results:
Total cells: 19
Green cells: 1
Green percentage: 5.26%
Visualization saved to: ./trial 1/72 hours/DFCP1 1ug/DFCP1 1ug 2_analyzed.jpg

Processing: DFCP1 1ug 3.tif
From directory: ./trial 1/72 hours/DFCP1 1ug

Results:
Total cells: 27
Green cells: 1
Green percentage: 3.7%
Visualization saved to: ./trial 1/72 hours/DFCP1 1ug/DFCP1 1ug 3_analyzed.jpg

Processing: DFCP1 1ug 1.tif
From directory: ./trial 1/72 hours/DFCP1 1ug

Results:
Total cells: 45
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/DFCP1 1ug/DFCP1 1ug 1_analyzed.jpg

Processing: ATG13 2ug 1.tif
```

```
From directory: ./trial 1/72 hours/ATG13 2ug

Results:
Total cells: 76
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 2ug/ATG13 2ug 1_analyzed.jpg

Processing: ATG13 2ug 2.tif
From directory: ./trial 1/72 hours/ATG13 2ug

Results:
Total cells: 135
Green cells: 1
Green percentage: 0.74%
Visualization saved to: ./trial 1/72 hours/ATG13 2ug/ATG13 2ug 2_analyzed.jpg

Processing: ATG13 2ug 3.tif
From directory: ./trial 1/72 hours/ATG13 2ug

Results:
Total cells: 103
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 2ug/ATG13 2ug 3_analyzed.jpg

Processing: DFCP1 2ug 1.tif
From directory: ./trial 1/72 hours/DFCP1 2ug

Results:
Total cells: 117
Green cells: 2
Green percentage: 1.71%
Visualization saved to: ./trial 1/72 hours/DFCP1 2ug/DFCP1 2ug 1_analyzed.jpg

Processing: DFCP1 2ug 2.tif
From directory: ./trial 1/72 hours/DFCP1 2ug

Results:
Total cells: 115
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/DFCP1 2ug/DFCP1 2ug 2_analyzed.jpg

Processing: DFCP1 2ug 3.tif
From directory: ./trial 1/72 hours/DFCP1 2ug

Results:
```

```
Total cells: 104
Green cells: 2
Green percentage: 1.92%
Visualization saved to: ./trial 1/72 hours/DFCP1 2ug/DFCP1 2ug 3_analyzed.jpg


Processing: ATG13 1ug 1 (1).tif
From directory: ./trial 1/72 hours/ATG13 1ug

Results:
Total cells: 58
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 1
(1)_analyzed.jpg


Processing: ATG13 1ug 2.tif
From directory: ./trial 1/72 hours/ATG13 1ug

Results:
Total cells: 73
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 2_analyzed.jpg


Processing: ATG13 1ug 3.tif
From directory: ./trial 1/72 hours/ATG13 1ug

Results:
Total cells: 99
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 3_analyzed.jpg


Processing: ATG13 1ug 1.tif
From directory: ./trial 1/72 hours/ATG13 1ug

Results:
Total cells: 0
Green cells: 7
Green percentage: 0%
Visualization saved to: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 1_analyzed.jpg


Processing: ATG13 1ug 1 (3).tif
From directory: ./trial 1/72 hours/ATG13 1ug

Results:
Total cells: 51
Green cells: 0
```

```
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 1ug/ATG13 1ug 1
(3)_analyzed.jpg


Processing: ATG13 0.5ug 1.tif
From directory: ./trial 1/72 hours/ATG13 0.5ug

Results:
Total cells: 153
Green cells: 1
Green percentage: 0.65%
Visualization saved to: ./trial 1/72 hours/ATG13 0.5ug/ATG13 0.5ug
1_analyzed.jpg


Processing: ATG13 0.5ug 2.tif
From directory: ./trial 1/72 hours/ATG13 0.5ug

Results:
Total cells: 173
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 0.5ug/ATG13 0.5ug
2_analyzed.jpg


Processing: ATG13 0.5ug 3.tif
From directory: ./trial 1/72 hours/ATG13 0.5ug

Results:
Total cells: 272
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/ATG13 0.5ug/ATG13 0.5ug
3_analyzed.jpg


Processing: DFCP1 0.5ug 3.tif
From directory: ./trial 1/72 hours/DFCP1 0.5ug

Results:
Total cells: 106
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/DFCP1 0.5ug/DFCP1 0.5ug
3_analyzed.jpg


Processing: DFCP1 0.5ug 2.tif
From directory: ./trial 1/72 hours/DFCP1 0.5ug

Results:
```

Total cells: 106
Green cells: 1
Green percentage: 0.94%
Visualization saved to: ./trial 1/72 hours/DFCP1 0.5ug/DFCP1 0.5ug
2_analyzed.jpg

Processing: DFCP1 0.5ug 1.tif
From directory: ./trial 1/72 hours/DFCP1 0.5ug

Results:
Total cells: 110
Green cells: 3
Green percentage: 2.73%
Visualization saved to: ./trial 1/72 hours/DFCP1 0.5ug/DFCP1 0.5ug
1_analyzed.jpg

Processing: control 3.tif
From directory: ./trial 1/72 hours/control

Results:
Total cells: 247
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/control/control 3_analyzed.jpg

Processing: control 2.tif
From directory: ./trial 1/72 hours/control

Results:
Total cells: 212
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/control/control 2_analyzed.jpg

Processing: control 1.tif
From directory: ./trial 1/72 hours/control

Results:
Total cells: 278
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/72 hours/control/control 1_analyzed.jpg

Processing: DFCP1 1ug 2.tif
From directory: ./trial 1/48 hours/DFCP1 1ug

Results:
Total cells: 48

```
Green cells: 2
Green percentage: 4.17%
Visualization saved to: ./trial 1/48 hours/DFCP1 1ug/DFCP1 1ug 2_analyzed.jpg


Processing: DFCP1 1ug 3.tif
From directory: ./trial 1/48 hours/DFCP1 1ug

Results:
Total cells: 45
Green cells: 1
Green percentage: 2.22%
Visualization saved to: ./trial 1/48 hours/DFCP1 1ug/DFCP1 1ug 3_analyzed.jpg


Processing: DFCP1 1ug 1.tif
From directory: ./trial 1/48 hours/DFCP1 1ug

Results:
Total cells: 64
Green cells: 3
Green percentage: 4.69%
Visualization saved to: ./trial 1/48 hours/DFCP1 1ug/DFCP1 1ug 1_analyzed.jpg


Processing: ATG13 0.5ug 1.tif
From directory: ./trial 1/48 hours/atg13 0.5

Results:
Total cells: 212
Green cells: 2
Green percentage: 0.94%
Visualization saved to: ./trial 1/48 hours/atg13 0.5/ATG13 0.5ug 1_analyzed.jpg


Processing: ATG13 0.5ug 2.tif
From directory: ./trial 1/48 hours/atg13 0.5

Results:
Total cells: 81
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/atg13 0.5/ATG13 0.5ug 2_analyzed.jpg


Processing: ATG13 0.5ug 3.tif
From directory: ./trial 1/48 hours/atg13 0.5

Results:
Total cells: 224
Green cells: 1
Green percentage: 0.45%
Visualization saved to: ./trial 1/48 hours/atg13 0.5/ATG13 0.5ug 3_analyzed.jpg
```

```
Processing: ATG13 2ug2.tif
From directory: ./trial 1/48 hours/ATG13 2ug

Results:
Total cells: 157
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/ATG13 2ug/ATG13 2ug2_analyzed.jpg

Processing: ATG13 2ug 1.tif
From directory: ./trial 1/48 hours/ATG13 2ug

Results:
Total cells: 88
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/ATG13 2ug/ATG13 2ug 1_analyzed.jpg

Processing: ATG13 2ug 3.tif
From directory: ./trial 1/48 hours/ATG13 2ug

Results:
Total cells: 116
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/ATG13 2ug/ATG13 2ug 3_analyzed.jpg

Processing: DFCP1 1ug 2.tif
From directory: ./trial 1/48 hours/DFCP1 2ug

Results:
Total cells: 127
Green cells: 2
Green percentage: 1.57%
Visualization saved to: ./trial 1/48 hours/DFCP1 2ug/DFCP1 1ug 2_analyzed.jpg

Processing: DFCP1 1ug 3.tif
From directory: ./trial 1/48 hours/DFCP1 2ug

Results:
Total cells: 95
Green cells: 1
Green percentage: 1.05%
Visualization saved to: ./trial 1/48 hours/DFCP1 2ug/DFCP1 1ug 3_analyzed.jpg

Processing: DFCP1 1ug 1.tif
From directory: ./trial 1/48 hours/DFCP1 2ug
```

```
Results:
Total cells: 116
Green cells: 4
Green percentage: 3.45%
Visualization saved to: ./trial 1/48 hours/DFCP1 2ug/DFCP1 1ug 1_analyzed.jpg

Processing: ATG13 1ug 2.tif
From directory: ./trial 1/48 hours/ATG13 1ug

Results:
Total cells: 122
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/ATG13 1ug/ATG13 1ug 2_analyzed.jpg

Processing: ATG13 1ug 3.tif
From directory: ./trial 1/48 hours/ATG13 1ug

Results:
Total cells: 117
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/ATG13 1ug/ATG13 1ug 3_analyzed.jpg

Processing: ATG13 1ug 1.tif
From directory: ./trial 1/48 hours/ATG13 1ug

Results:
Total cells: 93
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/ATG13 1ug/ATG13 1ug 1_analyzed.jpg

Processing: DFCP1 0.5ug 3.tif
From directory: ./trial 1/48 hours/DFCP1 0.5ug

Results:
Total cells: 127
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/DFCP1 0.5ug/DFCP1 0.5ug
3_analyzed.jpg

Processing: DFCP1 0.5ug 2.tif
From directory: ./trial 1/48 hours/DFCP1 0.5ug

Results:
```

```
Total cells: 123
Green cells: 2
Green percentage: 1.63%
Visualization saved to: ./trial 1/48 hours/DFCP1 0.5ug/DFCP1 0.5ug
2_analyzed.jpg

Processing: DFCP1 0.5ug 1.tif
From directory: ./trial 1/48 hours/DFCP1 0.5ug

Results:
Total cells: 89
Green cells: 4
Green percentage: 4.49%
Visualization saved to: ./trial 1/48 hours/DFCP1 0.5ug/DFCP1 0.5ug
1_analyzed.jpg

Processing: control 48h.tif
From directory: ./trial 1/48 hours/control

Results:
Total cells: 112
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/control/control 48h_analyzed.jpg

Processing: control 48h 3.tif
From directory: ./trial 1/48 hours/control

Results:
Total cells: 328
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/control/control 48h 3_analyzed.jpg

Processing: control 48h 2.tif
From directory: ./trial 1/48 hours/control

Results:
Total cells: 290
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/48 hours/control/control 48h 2_analyzed.jpg

Processing: DFCP1 1ug 4.tif
From directory: ./trial 1/24 hours/DFCP1 1ug

Results:
Total cells: 71
```

```
Green cells: 3
Green percentage: 4.23%
Visualization saved to: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 4_analyzed.jpg


Processing: DFCP1 1ug 2.tif
From directory: ./trial 1/24 hours/DFCP1 1ug

Results:
Total cells: 76
Green cells: 5
Green percentage: 6.58%
Visualization saved to: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 2_analyzed.jpg


Processing: DFCP1 1ug 3.tif
From directory: ./trial 1/24 hours/DFCP1 1ug

Results:
Total cells: 56
Green cells: 2
Green percentage: 3.57%
Visualization saved to: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 3_analyzed.jpg


Processing: DFCP1 1ug 1.tif
From directory: ./trial 1/24 hours/DFCP1 1ug

Results:
Total cells: 47
Green cells: 1
Green percentage: 2.13%
Visualization saved to: ./trial 1/24 hours/DFCP1 1ug/DFCP1 1ug 1_analyzed.jpg


Processing: ATG13 2ug 1.tif
From directory: ./trial 1/24 hours/ATG13 2ug

Results:
Total cells: 91
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 1_analyzed.jpg


Processing: ATG13 2ug 2.tif
From directory: ./trial 1/24 hours/ATG13 2ug

Results:
Total cells: 124
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 2_analyzed.jpg
```

```
Processing: ATG13 2ug 3.tif
From directory: ./trial 1/24 hours/ATG13 2ug

Results:
Total cells: 130
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 3_analyzed.jpg

Processing: ATG13 2ug 4.tif
From directory: ./trial 1/24 hours/ATG13 2ug

Results:
Total cells: 103
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 2ug/ATG13 2ug 4_analyzed.jpg

Processing: DFCP1 2ug 4.tif
From directory: ./trial 1/24 hours/DFCP1 2ug

Results:
Total cells: 163
Green cells: 2
Green percentage: 1.23%
Visualization saved to: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 4_analyzed.jpg

Processing: DFCP1 2ug 1.tif
From directory: ./trial 1/24 hours/DFCP1 2ug

Results:
Total cells: 182
Green cells: 1
Green percentage: 0.55%
Visualization saved to: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 1_analyzed.jpg

Processing: DFCP1 2ug 2.tif
From directory: ./trial 1/24 hours/DFCP1 2ug

Results:
Total cells: 124
Green cells: 2
Green percentage: 1.61%
Visualization saved to: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 2_analyzed.jpg

Processing: DFCP1 2ug 3.tif
From directory: ./trial 1/24 hours/DFCP1 2ug
```

```
Results:
Total cells: 127
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/DFCP1 2ug/DFCP1 2ug 3_analyzed.jpg

Processing: ATG13 1ug 2.tif
From directory: ./trial 1/24 hours/ATG13 1ug

Results:
Total cells: 62
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 2_analyzed.jpg

Processing: ATG13 1ug 3.tif
From directory: ./trial 1/24 hours/ATG13 1ug

Results:
Total cells: 58
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 3_analyzed.jpg

Processing: ATG13 1ug 1.tif
From directory: ./trial 1/24 hours/ATG13 1ug

Results:
Total cells: 82
Green cells: 2
Green percentage: 2.44%
Visualization saved to: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 1_analyzed.jpg

Processing: ATG13 1ug 4.tif
From directory: ./trial 1/24 hours/ATG13 1ug

Results:
Total cells: 127
Green cells: 0
Green percentage: 0.0%
Visualization saved to: ./trial 1/24 hours/ATG13 1ug/ATG13 1ug 4_analyzed.jpg

Processing: 2ug 4.tif
From directory: ./trial 1/24 hours/ATG13 0.5ug

Results:
Total cells: 86
```

```
Green cells: 1
Green percentage: 1.16%
Visualization saved to: ./trial 1/24 hours/ATG13 0.5ug/2ug 4_analyzed.jpg


Processing: 2ug 1.tif
From directory: ./trial 1/24 hours/ATG13 0.5ug

Results:
Total cells: 206
Green cells: 2
Green percentage: 0.97%
Visualization saved to: ./trial 1/24 hours/ATG13 0.5ug/2ug 1_analyzed.jpg


Processing: 2ug 3.tif
From directory: ./trial 1/24 hours/ATG13 0.5ug

Results:
Total cells: 221
Green cells: 1
Green percentage: 0.45%
Visualization saved to: ./trial 1/24 hours/ATG13 0.5ug/2ug 3_analyzed.jpg


Processing: 2ug 2.tif
From directory: ./trial 1/24 hours/ATG13 0.5ug

Results:
Total cells: 143
Green cells: 2
Green percentage: 1.4%
Visualization saved to: ./trial 1/24 hours/ATG13 0.5ug/2ug 2_analyzed.jpg


Processing: DFCP1 0.5ug 4.tif
From directory: ./trial 1/24 hours/DFCP1 0.5ug

Results:
Total cells: 64
Green cells: 1
Green percentage: 1.56%
Visualization saved to: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug
4_analyzed.jpg


Processing: DFCP1 0.5ug 3.tif
From directory: ./trial 1/24 hours/DFCP1 0.5ug

Results:
Total cells: 73
Green cells: 2
Green percentage: 2.74%
```

```
Visualization saved to: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug
3_analyzed.jpg

Processing: DFCP1 0.5ug 2.tif
From directory: ./trial 1/24 hours/DFCP1 0.5ug

Results:
Total cells: 115
Green cells: 1
Green percentage: 0.87%
Visualization saved to: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug
2_analyzed.jpg

Processing: DFCP1 0.5ug 1.tif
From directory: ./trial 1/24 hours/DFCP1 0.5ug

Results:
Total cells: 102
Green cells: 1
Green percentage: 0.98%
Visualization saved to: ./trial 1/24 hours/DFCP1 0.5ug/DFCP1 0.5ug
1_analyzed.jpg

Results saved to: cell_analysis_results.csv

Summary Statistics:
Total files processed: 130
Average total cells per image: 165.41
Average green cells per image: 7.22

First few rows of the results:
   Index                             File Path  Total Cell Count  \
0      1    ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 2.tif                251
1      2    ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 3.tif                251
2      3    ./trial 2/48h/DFCP1 1ug/DFCP1 1ug 1.tif                244
3      4  ./trial 2/48h/atg13 0.5/atg13 0.5ug 1.tif                 75
4      5  ./trial 2/48h/atg13 0.5/atg13 0.5ug 2.tif                114

   Green Cell Count
0                15
1                15
2                17
3                21
4                25
```

[ ]: